

**DEMOCRATIC SOCIALIST REPUBLIC OF  
SRI LANKA**



**UNIVERSITY OF JAFFNA, SRI LANKA**

**SUPPLY & INSTALLATION OF ELECTRICAL & ELECTRONIC  
ENGINEERING EQUIPMENT  
UNIVERSITY OF JAFFNA**

**UJ/F/PO/T/04/2016**

**Package 02**

**BIDDING DOCUMENT**

<b>Bid Opening on</b>	<b>13.07.2016</b>
<b>Bid Validity up to</b>	<b>13.10.2016</b>

**Client**

University of Jaffna,  
P. O. Box 57, Thirunelvely,  
Jaffna,  
Sri Lanka.

  
*M. G. L. Maveekumbura*  
Senior Assistant Bursar (Supplies)  
University of Jaffna  
Jaffna

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# Section I.

## Instructions to Bidders (ITB)

ITB shall be read in conjunction with the Section II, Bidding Data Sheet (BDS), which shall take precedence over ITB.

<b>General</b>	
<b>1. Scope of Bid</b>	<p>1.1 The Purchaser indicated in the Bidding Data Sheet (BDS), issues these Bidding Documents for the supply of Goods and Related Services incidental thereto as specified in Section V, Schedule of Requirements. The name and identification number of this procurement are specified in the BDS. The name, identification, and number of lots (individual contracts), if any, are provided in the BDS.</p> <p>1.2 Throughout these Bidding Documents:</p> <p>(a) the term “in writing” means communicated in written form by mail (other than electronic mail) or hand delivered with proof of receipt;</p> <p>(b) if the context so requires, “singular” means “plural” and vice versa; and</p> <p>(c) “Day” means calendar day.</p>
<b>2. Source of Funds</b>	<p>2.1 Payments under this contract will be financed by the source specified in the BDS.</p>
<b>3. Ethics, Fraud and Corruption</b>	<p>3.1 The attention of the bidders is drawn to the following guidelines of the Procurement Guidelines published by National Procurement Agency:</p> <ul style="list-style-type: none"><li>▪ Parties associated with Procurement Actions, namely, suppliers/contractors and officials shall ensure that they maintain strict confidentiality throughout the process;</li><li>▪ Officials shall refrain from receiving any personal gain from any Procurement Action. No gifts or inducement shall be accepted. Suppliers/contractors are liable to be disqualified from the bidding process if found offering any gift or inducement which may have an effect of influencing a decision or impairing the objectivity of an official.</li></ul> <p>3.2 The Purchaser requires the bidders, suppliers, contractors, and consultants to observe the highest standard of ethics during the procurement and execution of such contracts. In pursuit of this policy:</p> <p>(a) “corrupt practice” means the offering, giving, receiving, or soliciting, directly or indirectly, of anything of value to influence the action of a public official in the procurement process or in contract execution;</p> <p>(b) “fraudulent practice” means a misrepresentation or omission of facts in order</p>

	<p>to influence a procurement process or the execution of a contract;</p> <p>(c) “collusive practice” means a scheme or arrangement between two or more bidders, with or without the knowledge of the Purchaser to establish bid prices at artificial, noncompetitive levels; and</p> <p>(d) “Coercive practice” means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the procurement process or affect the execution of a contract.</p> <p>3.3 If the Purchaser found any unethical practices as stipulated under ITB Clause 3.2, the Purchaser will reject a bid, if it is found that a Bidder directly or through an agent, engaged in corrupt, fraudulent, collusive or coercive practices in competing for the Contract in question.</p>
<b>4. Eligible Bidders</b>	<p>4.1 All bidders shall possess legal rights to supply the Goods under this contract.</p> <p>4.2 A Bidder shall not have a conflict of interest. All bidders found to have conflict of interest shall be disqualified. Bidders may be considered to have a conflict of interest with one or more parties in this bidding process, if they:</p> <p>(a) are or have been associated in the past, with a firm or any of its affiliates which have been engaged by the purchaser to provide consulting services for the preparation of the design, specifications, and other documents to be used for the procurement of the goods to be purchased under these Bidding Documents ; or</p> <p>(b) Submit more than one bid in this bidding process. However, this does not limit the participation of subcontractors in more than one bid.</p> <p>4.3 A Bidder that is under a declaration of ineligibility by the National Procurement Agency (NPA), at the date of submission of bids or at the date of contract award, shall be disqualified. The list of debarred firms is available at the website of NPA, <a href="http://www.npa.gov.lk">www.npa.gov.lk</a> .</p> <p>4.4 Foreign Bidder may submit a bid only if so stated in the BDS.</p>
<b>5. Eligible Goods and Related Services</b>	<p>5.1 All goods supplied under this contract shall be complied with applicable standards stipulated by the Sri Lanka Standards Institute (SLSI). In the absence of such standards, the Goods supplied shall be complied to other internationally accepted standards.</p>
<b>Contents of Bidding Documents</b>	
<b>6. Sections of Bidding Documents</b>	<p>6.1 The Bidding Documents consist of 2 Volumes, which include all the sections indicated below, and should be read in conjunction with any addendum issued in accordance with ITB Clause 8.</p> <p>Volume 1</p> <ul style="list-style-type: none"> <li>• Section I. Instructions to Bidders (ITB)</li> <li>• Section VI. Conditions of Contract (CC)</li> <li>• Section VIII. Contract Forms</li> </ul>

	<p>Volume 2</p> <ul style="list-style-type: none"> <li>• Section II. Bidding Data Sheet (BDS)</li> <li>• Section III. Evaluation and Qualification Criteria</li> <li>• Section IV. Bidding Forms</li> <li>• Section V. Schedule of Requirements</li> <li>• Section VII. Contract Data</li> <li>• Invitation For Bid</li> </ul> <p>6.2 The Bidder is expected to examine all instructions, forms, terms, and specifications in the Bidding Documents. Failure to furnish all information or documentation required by the Bidding Documents may result in the rejection of the bid.</p>
<b>7. Clarification of Bidding Documents</b>	<p>7.1 A prospective Bidder requiring any clarification of the Bidding Documents including the restrictiveness of specifications shall contact the Purchaser in writing at the Purchaser's address specified in the BDS. The Purchaser will respond in writing to any request for clarification, provided that such request is received no later than ten (10) days prior to the deadline for submission of bids. The purchaser shall forward copies of its response to all those who have purchased the Bidding Documents, including a description of the inquiry but without identifying its source. Should the Purchaser deem it necessary to amend the Bidding Documents as a result of a clarification, it shall do so following the procedure under ITB Clause 8.</p>
<b>8. Amendment of Bidding Documents</b>	<p>8.1 At any time prior to the deadline for submission of bids, the Purchaser may amend the Bidding Documents by issuing addendum.</p> <p>8.2 Any addendum issued shall be part of the Bidding Documents and shall be communicated in writing to all who have purchased the Bidding Documents.</p> <p>8.3 To give prospective Bidders reasonable time in which to take an addendum into account in preparing their bids, the purchaser may, at its discretion, extend the deadline for the submission of bids, pursuant to ITB Sub-Clause 23.2</p>
<b>Preparation of Bids</b>	
<b>9. Cost of Bidding</b>	<p>9.1 The Bidder shall bear all costs associated with the preparation and submission of its bid, and the Purchaser shall not be responsible or liable for those costs, regardless of the conduct or outcome of the bidding process.</p>
<b>10. Language of Bid</b>	<p>10.1 The Bid, as well as all correspondence and documents relating to the Bid (including supporting documents and printed literature) exchanged by the Bidder and the Purchaser, shall be written in English language.</p>
<b>11. Documents Comprising the Bid</b>	<p>11.1 The Bid shall comprise the following:</p> <p>(a) Bid Submission Form and the applicable Price Schedules, in accordance with ITB Clauses 12, 14, and 15;</p> <p>(b) Bid Security or Bid-Securing Declaration, in accordance with ITB Clause 20;</p>

	<p>(c) documentary evidence in accordance with ITB Clauses 18 and 29, that the Goods and Related Services conform to the Bidding Documents;</p> <p>(d) documentary evidence in accordance with ITB Clause 18 establishing the Bidder's qualifications to perform the contract if its bid is accepted; and</p> <p>(e) Any other document required in the BDS.</p>
<b>12. Bid Submission Form and Price Schedules</b>	12.1 The Bidder shall submit the Bid Submission Form using the form furnished in Section IV, Bidding Forms. This form must be completed without any alterations to its format, and no substitutes shall be accepted. All blank spaces shall be filled in with the information requested.
<b>13. Alternative Bids</b>	13.1 Alternative bids shall not be considered.
<b>14. Bid Prices and Discounts</b>	<p>14.1 The Bidder shall indicate on the Price Schedule the unit prices and total bid prices of the goods it proposes to supply under the Contract.</p> <p>14.2 Any discount offered against any single item in the price schedule shall be included in the unit price of the item. However, a Bidder wishes to offer discount as a lot the bidder may do so by indicating such amounts appropriately.</p> <p>14.3 If so indicated in ITB Sub-Clause 1.1, bids are being invited for individual contracts (lots) or for any combination of contracts. Unless otherwise indicated in the BDS, prices quoted shall correspond to 100 % of the items specified for each lot and to 100% of the quantities specified for each item of a lot. Bidders wishing to offer any price reduction (discount) for the award of more than one Contract shall specify the applicable price reduction separately.</p> <p>14.4 (i) Prices indicated on the Price Schedule shall include all duties and sales and other taxes already paid or payable by the Supplier:</p> <p>(a) on components and raw material used in the manufacture or assembly of goods quoted; or</p> <p>(b) on the previously imported goods of foreign origin</p> <p>(ii) However, VAT shall not be included in the price but shall be indicated separately;</p> <p>(iii) the price for inland transportation, insurance and other related services to deliver the goods to their final destination;</p> <p>(iv) the price of other incidental services</p> <p>14.5 The Prices quoted by the Bidder shall be fixed during the Bidder's performance of the Contract and not subject to variation on any account. A bid submitted with an adjustable price quotation will be treated as non-responsive and rejected, pursuant to ITB Clause 31.</p> <p>14.6 All lots, if any, and items must be listed and priced separately in the Price Schedules. If a Price Schedule shows items listed but not priced, their prices shall be assumed to be included in the prices of other items.</p>

<b>15. Currencies of Bid</b>	15.1 Unless otherwise stated in Bidding Data Sheet, the Bidder shall quote in Sri Lankan Rupees and payment shall be payable only in Sri Lanka Rupees.
<b>16. Documents Establishing the Eligibility of the Bidder</b>	16.1 To establish their eligibility in accordance with ITB Clause 4, Bidders shall complete the Bid Submission Form, included in Section IV, Bidding Forms.
<b>17. Documents Establishing the Conformity of the Goods and Related Services</b>	<p>17.1 To establish the conformity of the Goods and Related Services to the Bidding Documents, the Bidder shall furnish as part of its Bid the documentary evidence that the Goods conform to the technical specifications and standards specified in Section V, Schedule of Requirements.</p> <p>17.2 The documentary evidence may be in the form of literature, drawings or data, and shall consist of a detailed item by item description (given in Section V, Technical Specifications) of the essential technical and performance characteristics of the Goods and Related Services, demonstrating substantial responsiveness of the Goods and Related Services to the technical specification, and if applicable, a statement of deviations and exceptions to the provisions of the Schedule of Requirements.</p> <p>17.3 The Bidder shall also furnish a list giving full particulars, including quantities, available sources and current prices of spare parts, special tools, etc., necessary for the proper and continuing functioning of the Goods during the period if specified in the BDS following commencement of the use of the goods by the Purchaser.</p>
<b>18. Documents Establishing the Qualifications of the Bidder</b>	<p>18.1 The documentary evidence of the Bidder's qualifications to perform the contract if its bid is accepted shall establish to the Purchaser's satisfaction:</p> <p>(a) A Bidder that does not manufacture or produce the Goods it offers to supply shall submit the Manufacturer's Authorization using the form included in Section IV, Bidding Forms to demonstrate that it has been duly authorized by the manufacturer or producer of the Goods to supply these Goods;</p> <p>(b) that, if required in the BDS, in case of a Bidder not doing business within Sri Lanka, the Bidder is or will be (if awarded the contract) represented by an Agent in Sri Lanka equipped and able to carry out the Supplier's maintenance, repair and spare parts stocking obligations prescribed in the Conditions of Contract and/or Technical Specifications; and</p> <p>(c) That the Bidder meets each of the qualification criteria specified in Section III, Evaluation and Qualification Criteria.</p>
<b>19. Period of Validity of Bids</b>	<p>19.1 Bids shall remain valid until the date specified in the BDS. A bid valid for a shorter date shall be rejected by the Purchaser as non-responsive.</p> <p>19.2 In exceptional circumstances, prior to the expiration of the bid validity date, the Purchaser may request bidders to extend the period of validity of their bids. The request and the responses shall be made in writing. If a Bid Security is requested in accordance with ITB Clause 20, it shall also be extended for a corresponding period. A Bidder may refuse the request without forfeiting its Bid Security. A Bidder granting the request shall not be required or permitted to modify its bid.</p>

<p><b>20. Bid Security</b></p>	<p>20.1 The Bidder shall furnish as part of its bid, a Bid Security as specified in the BDS.</p> <p>20.2 The Bid Security shall be in the amount specified in the BDS and denominated in Sri Lanka Rupees, and shall:</p> <ul style="list-style-type: none"> <li>(a) at the bidder’s option, be in the form of either a bank draft, a letter of credit, or a bank guarantee from a banking institution;</li> <li>(b) be issued by a institution acceptable to Purchaser. The acceptable institutes are published in the NPA website, <a href="http://www.npa.gov.lk">www.npa.gov.lk</a>.</li> <li>(c) be substantially in accordance with the form included in Section IV, Bidding Forms;</li> <li>(d) be payable promptly upon written demand by the Purchaser in case the conditions listed in ITB Clause 20.5 are invoked;</li> <li>(e) be submitted in its original form; copies will not be accepted;</li> <li>(f) Remain valid for the period specified in the BDS.</li> </ul> <p>20.3 Any bid not accompanied by a substantially responsive Bid Security in accordance with ITB Sub-Clause 20.1 and 20.2, may be rejected by the Purchaser as non-responsive.</p> <p>20.4 The Bid Security of unsuccessful Bidders shall be returned as promptly as possible upon the successful Bidder’s furnishing of the Performance Security pursuant to ITB Clause 43.</p> <p>20.5 The Bid Security may be forfeited:</p> <ul style="list-style-type: none"> <li>(a) if a Bidder withdraws its bid during the period of bid validity specified by the Bidder on the Bid Submission Form, except as provided in ITB Sub- Clause 19.2; or</li> <li>(b) if a Bidder does not agreeing to correction of arithmetical errors in pursuant to ITB Sub-Clause 30.3</li> <li>(c) if the successful Bidder fails to: <ul style="list-style-type: none"> <li>(i) sign the Contract in accordance with ITB Clause 42;</li> <li>(ii) Furnish a Performance Security in accordance with ITB Clause 43.</li> </ul> </li> </ul>
<p><b>21. Format and Signing of Bid</b></p>	<p>21.1 The Bidder shall prepare one original of the documents comprising the bid as described in ITB Clause 11 and clearly mark it as “ORIGINAL.” In addition, the Bidder shall submit a copy of the bid and clearly mark it as “COPY.” In the event of any discrepancy between the original and the copy, the original shall prevail.</p>



	<p>21.2 The original and the Copy of the bid shall be typed or written in indelible ink and shall be signed by a person duly authorized to sign on behalf of the Bidder.</p> <p>21.3 Any interlineations, erasures, or overwriting shall be valid only if they are signed or initialed by the person signing the Bid.</p>
<p><b>Submission and Opening of Bids</b></p>	
<p><b>22. Submission, Sealing and Marking of Bids</b></p>	<p>22.1 Bidders may always submit their bids by mail or by hand.</p> <p>(a) Bidders submitting bids by mail or by hand, shall enclose the original and the copy of the Bid in separate sealed envelopes, duly marking the envelopes as “ORIGINAL” and “COPY.” These envelopes containing the original and the copy shall then be enclosed in one single envelope.</p> <p>22.2 The inner and outer envelopes shall:</p> <p>(a) Bear the name and address of the Bidder;</p> <p>(b) be addressed to the Purchaser in accordance with ITB Sub-Clause 23.1;</p> <p>(c) bear the specific identification of this bidding process as indicated in the BDS; and</p> <p>(d) Bear a warning not to open before the time and date for bid opening, in accordance with ITB Sub-Clause 261. If all envelopes are not sealed and marked as required, the Purchaser will assume no responsibility for the misplacement or premature opening of the bid.</p>
<p><b>23. Deadline for Submission of Bids</b></p>	<p>23.1 Bids must be received by the Purchaser at the address and no later than the date and time specified in the BDS.</p> <p>23.2 The Purchaser may, at its discretion, extend the deadline for the submission of bids by amending the Bidding Documents in accordance with ITB Clause 8, in which case all rights and obligations of the Purchaser and Bidders previously subject to the deadline shall thereafter be subject to the deadline as extended.</p>
<p><b>24. Late Bids</b></p>	<p>24.1 The Purchaser shall not consider any bid that arrives after the deadline for submission of bids, in accordance with ITB Clause 23. Any bid received by the Purchaser after the deadline for submission of bids shall be declared late, rejected, and returned unopened to the Bidder.</p>
<p><b>25. Withdrawal, and Modification of Bids</b></p>	<p>25.1 A Bidder may withdraw, or modify its Bid after it has been submitted by sending a written notice in accordance with ITB Clause 22, duly signed by an authorized representative, and shall include a copy of the authorization in accordance with ITB Sub-Clause 21.2, (except that no copies of the withdrawal notice are required). The corresponding substitution or modification of the bid must accompany the respective written notice. All notices must be:</p> <p>(a) submitted in accordance with ITB Clauses 21 and 22 (except that withdrawal notices do not require copies), and in addition, the respective envelopes shall be clearly marked “WITHDRAWAL,” or “MODIFICATION;” and</p>

	<p>(b) Received by the Purchaser prior to the deadline prescribed for submission of bids, in accordance with ITB Clause 23.</p> <p>25.2 Bids requested to be withdrawn in accordance with ITB Sub-Clause 25.1 shall be returned to the Bidders only upon notification of contract award to the successful bidder in accordance with sub clause 41.1.</p> <p>25.3 No bid may be withdrawn, substituted, or modified in the interval between the deadline for submission of bids and the expiration of the period of bid validity specified by the Bidder on the Bid Submission Form or any extension thereof.</p>
<p><b>26. Bid Opening</b></p>	<p>26.1 The Purchaser shall conduct the bid opening in public at the address, date and time specified in the BDS.</p> <p>26.2 First, envelopes marked “WITHDRAWAL” shall be opened and read out and the envelope with the corresponding bid may be opened at the discretion of the Purchaser. No bid withdrawal shall be permitted unless the corresponding withdrawal notice contains a valid authorization to request the withdrawal and is read out at bid opening. Envelopes marked “MODIFICATION” shall be opened and read out with the corresponding Bid. No Bid modification shall be permitted unless the corresponding modification notice contains a valid authorization to request the modification and is read out at Bid opening. Only envelopes that are opened and read out at Bid opening shall be considered further.</p> <p>26.3 All other envelopes shall be opened one at a time, reading out: the name of the Bidder and whether there is a modification; the Bid Prices, including any discounts and alternative offers; the presence of a Bid Security or Bid- Securing Declaration, if required; and any other details as the Purchaser may consider appropriate. Only discounts and alternative offers read out at Bid opening shall be considered for evaluation. No Bid shall be rejected at Bid opening except for late bids, in accordance with ITB Sub Clause 24.1.</p> <p>26.4 The Purchaser shall prepare a record of the Bid opening that shall include, as a minimum: the name of the Bidder and whether there is a withdrawal, or modification; the Bid Price, per lot if applicable, including any discounts, and the presence or absence of a Bid Security. The bids that were opened shall be resealed in separate envelopes, promptly after the bid opening. The Bidders’ representatives who are present shall be requested to sign the attendance sheet. A copy of the record shall be distributed to all Bidders who submitted bids in time.</p>
<p><b>Evaluation and Comparison of Bids</b></p>	
<p><b>27. Confidentiality</b></p>	<p>27.1 Information relating to the examination, evaluation, comparison, and post-qualification (if applicable) of bids, and recommendation of contract award, shall not be disclosed to bidders or any other persons not officially concerned with such process until publication of the Contract Award.</p> <p>27.2 Any effort by a Bidder to influence the Purchaser in the examination, evaluation, comparison, and post-qualification of the bids or contract award decisions may result in the rejection of its Bid.</p>

	<p>27.3 Notwithstanding ITB Sub-Clause 27.2, if any Bidder wishes to contact the Purchaser on any matter related to the bidding process, from the time of bid opening to the time of Contract Award, it should do so in writing.</p>
<p><b>28. Clarification of Bids</b></p>	<p>28.1 To assist in the examination, evaluation, comparison and post-qualification of the bids, the Purchaser may, at its discretion, request any Bidder for a clarification of its Bid. Any clarification submitted by a Bidder in respect to its Bid and that is not in response to a request by the Purchaser shall not be considered for purpose of evaluation. The Purchaser's request for clarification and the response shall be in writing. No change in the prices or substance of the Bid shall be sought, offered, or permitted, except to confirm the correction of arithmetic errors discovered by the Purchaser in the Evaluation of the bids, in accordance with ITB Clause 30.</p>
<p><b>29. Responsiveness of Bids</b></p>	<p>29.1 The Purchaser's determination of a bid's responsiveness is to be based on the contents of the bid itself.</p> <p>29.2 A substantially responsive Bid is one that conforms to all the terms, conditions, and specifications of the Bidding Documents without material deviation, reservation, or omission. A material deviation, reservation, or omission is one that:</p> <p>(a) affects in any substantial way the scope, quality, or performance of the Goods and Related Services specified in the Contract; or</p> <p>(b) limits in any substantial way, inconsistent with the Bidding Documents, the Purchaser's rights or the Bidder's obligations under the Contract; or</p> <p>(c) if rectified would unfairly affect the competitive position of other bidders presenting substantially responsive bids. 29.3 If a bid is not substantially responsive to the Bidding Documents, it shall be rejected by the Purchaser and may not subsequently be made responsive by the Bidder by correction of the material deviation, reservation, or omission.</p>
<p><b>30. Nonconformities, Errors and Omissions</b></p>	<p>30.1 Provided that a Bid is substantially responsive, the Purchaser may waive any non-conformities or omissions in the Bid that do not constitute a material deviation.</p> <p>30.2 Provided that a bid is substantially responsive, the Purchaser may request that the Bidder submit the necessary information or documentation, within a reasonable period of time, to rectify nonmaterial nonconformities or omissions in the bid related to documentation requirements. Such omission shall not be related to any aspect of the price of the Bid. Failure of the Bidder to comply with the request may result in the rejection of its Bid.</p> <p>30.3 Provided that the Bid is substantially responsive, the Purchaser shall correct arithmetical errors on the following basis:</p> <p>(a) if there is a discrepancy between the unit price and the line item total that is obtained by multiplying the unit price by the quantity, the unit price shall prevail and the line item total shall be corrected, unless in the opinion of the Purchaser there is an obvious misplacement of the decimal point in the unit price, in which case the line item total as quoted shall govern and the unit price shall be corrected;</p>

	<p>(b) if there is an error in a total corresponding to the addition or subtraction of subtotals, the subtotals shall prevail and the total shall be corrected; and</p> <p>(c) If there is a discrepancy between words and figures, the amount in words shall prevail, unless the amount expressed in words is related to an arithmetic error, in which case the amount in figures shall prevail subject to (a) and (b) above.</p> <p>30.4 If the Bidder that submitted the lowest evaluated Bid does not accept the correction of errors, its Bid shall be disqualified and its Bid Security shall be forfeited or its Bid- Securing Declaration shall be executed.</p>
<b>31. Preliminary Examination of Bids</b>	<p>31.1 The Purchaser shall examine the bids to confirm that all documents and technical documentation requested in ITB Clause 11 have been provided, and to determine the completeness of each document submitted.</p> <p>31.2 The Purchaser shall confirm that the following documents and information have been provided in the Bid. If any of these documents or information is missing, the Bid shall be rejected.</p> <p>(a) Bid Submission Form, in accordance with ITB Sub- Clause 12.1;</p> <p>(b) Price Schedules, in accordance with ITB Sub-Clause 12;</p> <p>(c) Bid Security, in accordance with ITB Clause 20.</p>
<b>32. Examination of Terms and Conditions; Technical Evaluation</b>	<p>32.1 The Purchaser shall examine the Bid to confirm that all terms and conditions specified in the CC and the Contract Data have been accepted by the Bidder without any material deviation or reservation.</p> <p>32.2 The Purchaser shall evaluate the technical aspects of the Bid submitted in accordance with ITB Clause 17, to confirm that all requirements specified in Section V, Schedule of Requirements of the Bidding Documents have been met without any material deviation or reservation.</p> <p>32.3 If, after the examination of the terms and conditions and the technical evaluation, the Purchaser determines that the Bid is not substantially responsive in accordance with ITB Clause 29, the Purchaser shall reject the Bid.</p>
<b>33. Conversion to Single Currency</b>	<p>34.1 If the bidders are allowed to quote in foreign currencies in accordance with sub clause 15.1, for evaluation and comparison purposes, the Purchaser shall convert all bid prices expressed in foreign currencies in to Sri Lankan Rupees using the selling rates prevailed 28 days prior to closing of bids as published by the Central Bank of Sri Lanka. If this date falls on a public holiday the earliest working day prior to the date shall be applicable.</p>
<b>34. Domestic Preference</b>	<p>34.1 Domestic preference shall be a factor in bid evaluation only if stated in the BDS. If domestic preference shall be a bid evaluation factor, the methodology for calculating the margin of preference and the criteria for its application shall be as specified in Section III, Evaluation and Qualification Criteria.</p>
<b>35. Evaluation of Bids</b>	<p>35.1 The Purchaser shall evaluate each bid that has been determined, up to this stage of the evaluation, to be substantially responsive.</p> <p>35.2 To evaluate a Bid, the Purchaser shall only use all the factors, methodologies and criteria defined in this ITB Clause 35.</p>

	<p>35.3 To evaluate a Bid, the Purchaser shall consider the following:</p> <p>(a) the Bid Price as quoted in accordance with clause 14;</p> <p>(b) price adjustment for correction of arithmetic errors in accordance with ITB Sub-Clause 30.3;</p> <p>(c) price adjustment due to discounts offered in accordance with ITB Sub-Clause 14.2; and 14.3</p> <p>(d) adjustments due to the application of the evaluation criteria specified in the BDS from amongst those set out in Section III, Evaluation and Qualification Criteria;</p> <p>(e) Adjustments due to the application of a domestic preference, in accordance with ITB Clause 34 if applicable.</p> <p>35.4 The Purchaser’s evaluation of a bid may require the consideration of other factors, in addition to the factors stated in ITB Sub-Clause 35.3, if specified in BDS. These factors may be related to the characteristics, performance, and terms and conditions of purchase of the Goods and Related Services. The effect of the factors selected, if any, shall be expressed in monetary terms to facilitate comparison of bids</p> <p>35.5 If so specified in the BDS, these Bidding Documents shall allow Bidders to quote for one or more lots, and shall allow the Purchaser to award one or multiple lots to more than one Bidder. The methodology of evaluation to determine the lowest-evaluated lot combinations is specified in Section III, Evaluation and Qualification Criteria.</p>
<p><b>36. Comparison of Bids</b></p>	<p>36.1 The Purchaser shall compare all substantially responsive bids to determine the lowest-evaluated bid, in accordance with ITB Clause 35.</p>
<p><b>37. Post qualification of the Bidder.</b></p>	<p>37.1 The Purchaser shall determine to its satisfaction whether the Bidder that is selected as having submitted the lowest evaluated and substantially responsive bid is qualified to perform the Contract satisfactorily.</p> <p>37.2 The determination shall be based upon an examination of the documentary evidence of the Bidder’s qualifications submitted by the Bidder, pursuant to ITB Clause 18.</p> <p>37.3 An affirmative determination shall be a prerequisite for award of the Contract to the Bidder. A negative determination shall result in disqualification of the bid, in which event the Purchaser shall proceed to the next lowest evaluated bid to make a similar determination of that Bidder’s capabilities to perform satisfactorily.</p>
<p><b>38. Purchaser’s Right to Accept Any Bid, and to Reject Any or All Bids</b></p>	<p>38.1 The Purchaser reserves the right to accept or reject any bid, and to annul the bidding process and reject all bids at any time prior to contract award, without thereby incurring any liability to Bidders.</p>

<b>Award of Contract</b>	
<b>39. Award Criteria</b>	39.1 The Purchaser shall award the Contract to the Bidder whose offer has been determined to be the lowest evaluated bid and is substantially responsive to the Bidding Documents, provided further that the Bidder is determined to be qualified to perform the Contract satisfactorily.
<b>40. Purchaser's Right to Vary Quantities at Time of Award</b>	40.1 At the time the Contract is awarded, the Purchaser reserves the right to increase or decrease the quantity of Goods and Related Services originally specified in Section V, Schedule of Requirements, provided this does not exceed twenty five percent (25%) or one unit whichever is higher and without any change in the unit prices or other terms and conditions of the bid and the Bidding Documents.
<b>41. Notification of Award</b>	<p>41.1 Prior to the expiration of the period of bid validity, the Purchaser shall notify the successful Bidder, in writing, that its Bid has been accepted.</p> <p>41.2 Until a formal Contract is prepared and executed, the notification of award shall constitute a binding Contract.</p> <p>41.3 Upon the successful Bidder's furnishing of the signed Contract Form and performance security pursuant to ITB Clause 43, the Purchaser will promptly notify each unsuccessful Bidder and will discharge its bid security, pursuant to ITB Clause 20.4.</p>
<b>42. Signing of Contract</b>	<p>42.1 Within Seven (7) days after notification, the Purchaser shall complete the Agreement, and inform the successful Bidder to sign it.</p> <p>42.2 Within Seven (7) days of receipt of such information, the successful Bidder shall sign the Agreement.</p>
<b>43. Performance Security</b>	<p>43.1 Within fourteen (14) days of the receipt of notification of award from the Purchaser, the successful Bidder, if required, shall furnish the Performance Security in accordance with the CC, using for that purpose the Performance Security Form included in Section VIII Contract forms. The Employer shall promptly notify the name of the winning Bidder to each unsuccessful Bidder and discharge the Bid Securities of the unsuccessful bidders pursuant to ITB Sub-Clause 20.4.</p> <p>43.2 Failure of the successful Bidder to submit the abovementioned Performance Security or sign the Contract shall constitute sufficient grounds for the annulment of the award and forfeiture of the Bid Security or execution of the Bid- Securing Declaration. In that event the Purchaser may award the Contract to the next lowest evaluated Bidder, whose offer is substantially responsive and is determined by the Purchaser to be qualified to perform the Contract satisfactorily.</p>

## Section VI. Conditions of Contract

<b>1. Definitions</b>	<p>1.1 The following words and expressions shall have the meanings hereby assigned to them:</p> <p>(a) “Contract” means the Contract Agreement entered into between the Purchaser and the Supplier, together with the Contract Documents referred to therein, including all attachments, appendices, and all documents incorporated by reference therein.</p> <p>(b) “Contract Documents” means the documents listed in the Contract Agreement, including any amendments thereto.</p> <p>(c) “Contract Price” means the price payable to the Supplier as specified in the Contract Agreement, subject to such additions and adjustments thereto or deductions there from, as may be made pursuant to the Contract.</p> <p>(d) “Day” means calendar day.</p> <p>(e) “Completion” means the fulfillment of the supply of Goods to the destination specified and completion of the Related Services by the Supplier in accordance with the terms and conditions set forth in the Contract.</p> <p>(f) “CC” means the Conditions of Contract.</p> <p>(g) “Goods” means all of the commodities, raw material, machinery and equipment, and/or other materials that the Supplier is required to supply to the Purchaser under the Contract.</p> <p>(h) “Purchaser” means the entity purchasing the Goods and Related Services, as specified in the Contract Data.</p> <p>(i) “Related Services” means the services incidental to the supply of the goods, such as insurance, installation, training and initial maintenance and other such obligations of the Supplier under the Contract.</p> <p>(j) “Subcontractor” means any natural person, private or government entity, or a combination of the above, to whom any part of the Goods to be supplied or execution of any part of the Related Services is subcontracted by the Supplier. Section VI General Conditions of Contract 51</p> <p>(k) “Supplier” means the natural person, private or government entity, or a combination of the above, whose bid to perform the Contract has been accepted by the Purchaser and is named as such in the Contract Agreement.</p>
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	(l) "The Project Site," where applicable, means the place named in the Contract Data.
<b>2. Contract Documents</b>	2.1 Subject to the order of precedence set forth in the Contract Agreement, all documents forming the Contract (and all parts thereof) are intended to be correlative, complementary, and mutually explanatory. The Contract Agreement shall be read as a whole.
<b>3. Fraud and Corruption</b>	<p>3.1 The Government of Sri Lanka requires the Purchaser as well as bidders, suppliers, contractors, and consultants to observe the highest standard of ethics during the procurement and execution of such contracts. In pursuit of this policy:</p> <p>(i) "corrupt practice" means offering, giving, receiving, or soliciting, directly or indirectly, of anything of value to influence the action of a public official in the procurement process or in contract execution;</p> <p>(ii) "fraudulent practice" means a misrepresentation or omission of facts in order to influence a procurement process or the execution of a contract;</p> <p>(iii) "collusive practice" means a scheme or arrangement between two or more bidders, with or without the knowledge of the Purchaser to establish bid prices at artificial, noncompetitive levels; and</p> <p>(iv) "Coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the procurement process or affect the execution of a contract.</p>
<b>4. Interpretation</b>	<p>4.1 If the context so requires it, singular means plural and vice versa.</p> <p>4.2 Entire Agreement</p> <p>The Contract constitutes the entire agreement between the Purchaser and the Supplier and supersedes all communications, negotiations and agreements (whether 52 Section VII. General Conditions of Contract written or oral) of the parties with respect thereto made prior to the date of Contract.</p> <p>4.3 Amendment</p> <p>No amendment or other variation of the Contract shall be valid unless it is in writing, is dated, expressly refers to the Contract, and is signed by a duly authorized representative of each party thereto.</p> <p>4.4 Severability</p> <p>If any provision or condition of the Contract is prohibited or rendered invalid or unenforceable, such prohibition, invalidity or unenforceability shall not affect the validity or enforceability of any other provisions and conditions of the Contract.</p>
<b>5. Language</b>	5.1 The Contract as well as all correspondence and documents relating to the Contract exchanged by the Supplier and the Purchaser,



	<p>shall be written in English language. Supporting documents and printed literature that are part of the Contract may be in another language provided they are accompanied by an accurate translation of the relevant passages in the language specified, in which case, for purposes of interpretation of the Contract, this translation shall govern.</p> <p>5.2 The Supplier shall bear all costs of translation to the governing language and all risks of the accuracy of such translation, for documents provided by the Supplier.</p>
<b>6. Joint Venture, Consortium or Association</b>	<p>6.1 If the Supplier is a joint venture, consortium, or association, all of the parties shall be jointly and severally liable to the Purchaser for the fulfillment of the provisions of the Contract and shall designate one party to act as a leader with authority to bind the joint venture, consortium, or association. The composition or the constitution of the joint venture, consortium, or association shall not be altered without the prior consent of the Purchaser.</p>
<b>7. Eligibility</b>	<p>7.1 All goods supplied under this contract shall be complied with applicable standards stipulated by the Sri Lanka Standards Institute. In the absence of such standards, the Goods supplied shall be complied to other internationally accepted standards, such as British Standards.</p>
<b>8. Notices</b>	<p>8.1 Any notice given by one party to the other pursuant to the Contract shall be in writing to the address specified in the Contract Data. The term “in writing” means communicated in written form with proof of receipt. Section VI General Conditions of Contract 53</p> <p>8.2 A notice shall be effective when delivered or on the notice’s effective date, whichever is later.</p>
<b>9. Governing Law</b>	<p>9.1 The Contract shall be governed by and interpreted in accordance with the laws of the Democratic Socialist Republic of Sri Lanka.</p>
<b>10. Settlement of Disputes</b>	<p>10.1 The Purchaser and the Supplier shall make every effort to resolve amicably by direct informal negotiation any disagreement or dispute arising between them under or in connection with the Contract.</p> <p>10.2 If, after twenty-eight (28) days, the parties have failed to resolve their dispute or difference by such mutual consultation, then either the Purchaser or the Supplier may give notice to the other party of its intention to commence arbitration, as hereinafter provided, as to the matter in dispute, and no arbitration in respect of this matter may be commenced unless such notice is given. Any dispute or difference in respect of which a notice of intention to commence arbitration has been given in accordance with this Clause shall be finally settled by arbitration. Arbitration may be commenced prior to or after delivery of the Goods under the Contract. Arbitration proceedings shall be conducted in accordance with the Arbitration Act No:11 of 1995.</p> <p>10.3 Notwithstanding any reference to arbitration herein,</p>

	<p>(a) the parties shall continue to perform their respective obligations under the Contract unless they otherwise agree; and</p> <p>(b) the Purchaser shall pay the Supplier any monies due the Supplier.</p>
<b>11. Scope of Supply</b>	11.1 The Goods and Related Services to be supplied shall be as specified in the Schedule of Requirements.
<b>12. Delivery and Documents</b>	12.1 Subject to CC Sub-Clause 32.1, the Delivery of the Goods and Completion of the Related Services shall be in accordance with the Delivery and Completion Schedule specified in the Schedule of Requirements. Where applicable the details of shipping and other documents to be furnished by the Supplier are specified in the Contract Data.
<b>13. Supplier's Responsibilities</b>	13.1 The Supplier shall supply all the Goods and Related Services included in the Scope of Supply in accordance with CC Clause 11, and the Delivery and Completion Schedule, as per CC Clause 12.
<b>14. Contract Price</b>	14.1 Prices charged by the Supplier for the Goods supplied and the Related Services performed under the Contract shall not vary from the prices quoted by the Supplier in its bid.
<b>15. Terms of Payment</b>	<p>15.1 The Contract Price shall be paid as specified in the Contract Data.</p> <p>15.2 The Supplier's request for payment shall be made to the Purchaser in writing, accompanied by invoices describing, as appropriate, the Goods delivered and Related Services performed, and by the documents submitted pursuant to CC Clause 12 and upon fulfillment of all other obligations stipulated in the Contract.</p> <p>15.3 Payments shall be made promptly by the Purchaser, but in no case later than twenty eight (28) days after submission of an invoice or request for payment by the Supplier, and after the Purchaser has accepted it.</p>
<b>16. Taxes and Duties</b>	16.1 The Supplier shall be entirely responsible for all taxes, duties, license fees, etc., incurred until delivery of the contracted Goods to the Purchaser.
<b>17. Performance Security</b>	<p>17.1 If required as specified in the Contract Data, the Supplier shall, within fourteen (14) days of the notification of contract award, provide a performance security of Ten percent (10%) of the Contract Price for the performance of the Contract.</p> <p>17.2 The proceeds of the Performance Security shall be payable to the Purchaser as compensation for any loss resulting from the Supplier's failure to complete its obligations under the Contract.</p> <p>17.3 As specified in the Contract Data, the Performance Security, if required, shall be in Sri Lanka Rupees and shall be in the format stipulated by the Purchaser in the Contract Data, or in another format acceptable to the Purchaser.</p> <p>17.4 The Performance Security shall be discharged by the Purchaser</p>

	and returned to the Supplier not later than twenty-eight (28) days following the date of Completion of the Supplier's performance obligations under the Contract, including any warranty obligations.
<b>18. Copyright</b>	18.1 The copyright in all drawings, documents, and other materials containing data and information furnished to the Purchaser by the Supplier herein shall remain vested in the Supplier, or, if they are furnished to the Purchaser directly or through the Supplier by any third party, including suppliers of materials, the copyright in such materials shall remain vested in such third party.
<b>19. Confidential Information</b>	<p>19.1 The Purchaser and the Supplier shall keep confidential and shall not, without the written consent of the other party hereto, divulge to any third party any documents, data, or other information furnished directly or indirectly by the other party hereto in connection with the Contract, whether such information has been furnished prior to, during or following completion or termination of the Contract. Notwithstanding the above, the Supplier may furnish to its Subcontractor such documents, data, and other information it receives from the Purchaser to the extent required for the Subcontractor to perform its work under the Contract, in which event the Supplier shall obtain from such Subcontractor an undertaking of confidentiality similar to that imposed on the Supplier under CC Clause 19.</p> <p>19.2 The Purchaser shall not use such documents, data, and other information received from the Supplier for any purposes unrelated to the contract. Similarly, the Supplier shall not use such documents, data, and other information received from the Purchaser for any purpose other than the performance of the Contract.</p> <p>19.3 The above provisions of CC Clause 19 shall not in any way modify any undertaking of confidentiality given by either of the parties hereto prior to the date of the Contract in respect of the Supply or any part thereof.</p> <p>19.4 The provisions of CC Clause 19 shall survive completion or termination, for whatever reason, of the Contract.</p>
<b>20. Subcontracting</b>	<p>20.1 The Supplier shall notify the Purchaser in writing of all subcontracts awarded under the Contract if not already specified in the bid. Such notification, in the original bid or later shall not relieve the Supplier from any of its obligations, duties, responsibilities, or liability under the Contract.</p> <p>20.2 Subcontracts shall comply with the provisions of CC Clauses 3 and 7.</p>
<b>21. Specifications and Standards</b>	<p>21.1 Technical Specifications and Drawings</p> <p>(a) The Goods and Related Services supplied under this Contract shall conform to the technical specifications and standards mentioned in Section V, Schedule of Requirements and, when no applicable standard is mentioned, the standard shall be equivalent or superior to the official standards whose application is appropriate to the Goods' country of origin.</p>

	<p>(b) The Supplier shall be entitled to disclaim responsibility for any design, data, drawing, specification or other document, or any modification thereof provided or designed by or on behalf of the Purchaser, by giving a notice of such disclaimer to the Purchaser.</p> <p>(c) Wherever references are made in the Contract to codes and standards in accordance with which it shall be executed, the edition or the revised version of such codes and standards shall be those specified in the Schedule of Requirements. During Contract execution, any changes in any such codes and standards shall be applied only after approval by the Purchaser and shall be treated in accordance with CC Clause 32.</p>
<b>22. Packing and Documents</b>	22.1 The Supplier shall pack the Goods as is required to prevent their damage or deterioration during transit to their final destination, as indicated in the Contract.
<b>23. Insurance</b>	23.1 Unless otherwise specified in the Contract Data, the Goods supplied under the Contract shall be fully insured against loss or damage incidental to manufacture or acquisition, transportation, storage, and delivery.
<b>24. Transportation</b>	24.1 Unless otherwise specified in the Contract Data, responsibility for arranging transportation of the Goods shall be a responsibility of the supplier.
<b>25. Inspections and Tests</b>	<p>25.1 The Supplier shall at its own expense and at no cost to the Purchaser carry out all such tests and/or inspections of the Goods and Related Services as are specified in the Contract Data.</p> <p>25.2 The inspections and tests may be conducted on the premises of the Supplier or its Subcontractor, at point of delivery, and/or at the Goods' final destination, or in another place as specified in the Contract Data. Subject to CC Sub-Clause 25.3, if conducted on the premises of the Supplier or its Subcontractor, all reasonable facilities and assistance, including access to drawings and production data, shall be furnished to the inspectors at no charge to the Purchaser.</p> <p>25.3 The Purchaser or its designated representative shall be entitled to attend the tests and/or inspections referred to in CC Sub-Clause 25.2, provided that the Purchaser bear all of its own costs and expenses incurred in connection with such attendance including, but not limited to, all traveling and board and lodging expenses.</p> <p>25.4 Whenever the Supplier is ready to carry out any such test and inspection, it shall give a reasonable advance notice, including the place and time, to the Purchaser. The Supplier shall obtain from any relevant third party or manufacturer any necessary permission or consent to enable the Purchaser or its designated representative to attend the test and/or inspection.</p> <p>25.5 The Purchaser may require the Supplier to carry out any test and/or inspection not required by the Contract but deemed necessary to verify that the characteristics and performance of the Goods</p>

	<p>comply with the technical specifications codes and standards under the Contract, provided that the Supplier's reasonable costs and expenses incurred in the carrying out of such test and/or inspection shall be added to the Contract Price. Further, if such test and/or inspection impede the progress of manufacturing and/or the Supplier's performance of its other obligations under the Contract, due allowance will be made in respect of the Delivery Dates and Completion Dates and the other obligations so affected.</p> <p>25.6 The Supplier shall provide the Purchaser with a report of the results of any such test and/or inspection.</p> <p>25.7 The Purchaser may reject any Goods or any part thereof that fail to pass any test and/or inspection or do not conform to the specifications. The Supplier shall either rectify or replace such rejected Goods or parts thereof or make alterations necessary to meet the specifications at no cost to the Purchaser, and shall repeat the test and/or inspection, at no cost to the Purchaser, upon giving a notice pursuant to CC Sub-Clause 25.4.</p> <p>25.8 The Supplier agrees that neither the execution of a test and/or inspection of the Goods or any part thereof, nor the attendance by the Purchaser or its representative, nor the issue of any report pursuant to CC Sub-Clause 25.6, shall release the Supplier from any warranties or other obligations under the Contract.</p>
<p><b>26. Liquidated Damages</b></p>	<p>26.1 Except as provided under CC Clause 31, if the Supplier fails to deliver any or all of the Goods by the Date(s) of delivery or perform the Related Services within the period specified in the Contract, the Purchaser may without prejudice to all its other remedies under the Contract, deduct from the Contract Price, as liquidated damages, a sum equivalent to the percentage specified in the Contract Data of the delivered price of the delayed Goods or unperformed Services for each week or part thereof of delay until actual delivery or performance, up to a 58 Section VII. General Conditions of Contract maximum deduction of the percentage specified in those Contract Data. Once the maximum is reached, the Purchaser may terminate the Contract pursuant to CC Clause 34.</p>
<p><b>27. Warranty</b></p>	<p>27.1 The Supplier warrants that all the Goods are new, unused, and of the most recent or current models, and that they incorporate all recent improvements in design and materials, unless provided otherwise in the Contract.</p> <p>27.2 Subject to CC Sub-Clause 21.1(b), the Supplier further warrants that the Goods shall be free from defects arising from any act or omission of the Supplier or arising from design, materials, and workmanship, under normal use in the conditions prevailing in the country of final destination.</p> <p>27.3 Unless otherwise specified in the Contract Data, the warranty shall remain valid for twelve (12) months after the Goods, or any portion thereof as the case may be, have been delivered to and</p>

	<p>accepted at the final destination indicated in the Contract Data.</p> <p>27.4 The Purchaser shall give notice to the Supplier stating the nature of any such defects together with all available evidence thereof, promptly following the discovery thereof. The Purchaser shall afford all reasonable opportunity for the Supplier to inspect such defects.</p> <p>27.5 Upon receipt of such notice, the Supplier shall, within the period specified in the Contract Data, expeditiously repair or replace the defective Goods or parts thereof, at no cost to the Purchaser.</p> <p>27.6 If having been notified, the Supplier fails to remedy the defect within the period specified in the Contract Data, the Purchaser may proceed to take within a reasonable period such remedial action as may be necessary, at the Supplier's risk and expense and without prejudice to any other rights which the Purchaser may have against the Supplier under the Contract.</p>
<p><b>28. Patent Indemnity</b></p>	<p>28.1 The Supplier shall, subject to the Purchaser's compliance with CC Sub-Clause 28.2, indemnify and hold harmless the Purchaser and its employees and officers from and against any and all suits, actions or administrative proceedings, claims, demands, losses, damages, costs, and expenses of any nature, including attorney's fees and expenses, which the Purchaser may suffer as a result of any infringement or alleged infringement of any patent, utility model, registered design, trademark, copyright, or other intellectual property right registered or otherwise existing at the date of the contract by reason of:</p> <p>(a) the installation of the Goods by the Supplier or the use of the Goods in the country where the Site is located; and</p> <p>(b) The sale in any country of the products produced by the Goods. Such indemnity shall not cover any use of the Goods or any part thereof other than for the purpose indicated by or to be reasonably inferred from the Contract, neither any infringement resulting from the use of the Goods or any part thereof, or any products produced thereby in association or combination with any other equipment, plant, or materials not supplied by the Supplier, pursuant to the Contract.</p> <p>28.2 If any proceedings are brought or any claim is made against the Purchaser arising out of the matters referred to in CC Sub-Clause 28.1, the Purchaser shall promptly give the Supplier a notice thereof, and the Supplier may at its own expense and in the Purchaser's name conduct such proceedings or claim and any negotiations for the settlement of any such proceedings or claim.</p> <p>28.3 If the Supplier fails to notify the Purchaser within twenty eight (28) days after receipt of such notice that it intends to conduct any such proceedings or claim, then the Purchaser shall be free to conduct</p>

	<p>the same on its own behalf.</p> <p>28.4 The Purchaser shall, at the Supplier’s request, afford all available assistance to the Supplier in conducting such proceedings or claim, and shall be reimbursed by the Supplier for all reasonable expenses incurred in so doing.</p> <p>28.5 The Purchaser shall indemnify and hold harmless the Supplier and its employees, officers, and Subcontractors from and against any and all suits, actions or administrative proceedings, claims, demands, losses, damages, costs, and expenses of any nature, including attorney’s fees and expenses, which the Supplier may suffer as a result of any infringement or alleged infringement of any patent, utility model, registered design, trademark, copyright, or other intellectual property right registered or otherwise existing at the date of the Contract arising out of or in connection with any design, data, drawing, specification, or other documents or materials provided or designed by or on behalf of the Purchaser.</p>
<p><b>29. Limitation of Liability</b></p>	<p>29.1 Except in cases of criminal negligence or willful misconduct,</p> <p>(a) the Supplier shall not be liable to the Purchaser, whether in contract, tort, or otherwise, for any indirect or consequential loss or damage, loss of use, loss of production, or loss of profits or interest costs, provided that this exclusion shall not apply to any obligation of the Supplier to pay liquidated damages to the Purchaser and</p> <p>(b) the aggregate liability of the Supplier to the Purchaser, whether under the Contract, in tort or otherwise, shall not exceed the total Contract Price, provided that this limitation shall not apply to the cost of repairing or replacing defective equipment, or to any obligation of the supplier to indemnify the purchaser with respect to patent infringement</p>
<p><b>30. Change in Laws and Regulations</b></p>	<p>30.1 Unless otherwise specified in the Contract, if after the date of 28 days prior to date of Bid submission, any law, regulation, ordinance, order or bylaw having the force of law is enacted, promulgated, abrogated, or changed in Sri Lanka that subsequently affects the Delivery Date and/or the Contract Price, then such Delivery Date and/or Contract Price shall be correspondingly increased or decreased, to the extent that the Supplier has thereby been affected in the performance of any of its obligations under the Contract. Notwithstanding the foregoing, such additional or reduced cost shall not be separately paid or credited if the same has already been accounted for in the price adjustment provisions where applicable, in accordance with CC Clause 14.</p>

<p><b>31. Force Majeure</b></p>	<p>31.1 The Supplier shall not be liable for forfeiture of its Performance Security, liquidated damages, or termination or default if and to the extent that its delay in performance or other failure to perform its obligations under the Contract is the result of an event of Force Majeure.</p> <p>31.2 For purposes of this Clause, “Force Majeure” means an event or situation beyond the control of the Supplier that is not foreseeable, is unavoidable, and its origin is not due to negligence or lack of care on the part of the Supplier. Such events may include, but not be limited to, acts of the Purchaser in its sovereign capacity, wars or revolutions, fires, floods, epidemics, quarantine restrictions, and freight embargoes.</p> <p>31.3 If a Force Majeure situation arises, the Supplier shall promptly notify the Purchaser in writing of such condition and the cause thereof. Unless otherwise directed by the Purchaser in writing, the Supplier shall continue to perform its obligations under the Contract as far as is reasonably practical, and shall seek all reasonable alternative means for performance not prevented by the Force Majeure event.</p>
<p><b>32. Change Orders and Contract Amendments</b></p>	<p>32.1 The Purchaser may at any time order the Supplier through notice in accordance CC Clause 8, to make changes within the general scope of the Contract in any one or more of the following:</p> <ul style="list-style-type: none"> <li>(a) drawings, designs, or specifications, where Goods to be furnished under the Contract are to be specifically manufactured for the Purchaser;</li> <li>(b) the method of shipment or packing;</li> <li>(c) the place of delivery; and</li> <li>(d) The Related Services to be provided by the Supplier.</li> </ul> <p>32.2 If any such change causes an increase or decrease in the cost of, or the time required for, the Supplier’s performance of any provisions under the Contract, an equitable adjustment shall be made in the Contract Price or in the Delivery/Completion Schedule, or both, and the Contract shall accordingly be amended. Any claims by the Supplier for adjustment under this Clause must be asserted within twenty-eight (28) days from the date of the Supplier’s receipt of the Purchaser’s change order.</p> <p>32.3 Prices to be charged by the Supplier for any Related Services that might be needed but which were not included in the Contract shall be agreed upon in advance by the parties and shall not exceed the prevailing rates charged to other parties by the Supplier for similar services.</p> <p>32.4 Subject to the above, no variation in or modification of the terms of the Contract shall be made except by written amendment signed by the parties.</p>



<p><b>33. Extensions of Time</b></p>	<p>33.1 If at any time during performance of the Contract, the Supplier or its subcontractors should encounter conditions impeding timely delivery of the Goods or completion of Related Services pursuant to CC Clause 12, the Supplier shall promptly notify the Purchaser in writing of the delay, its likely duration, and its cause. As soon as practicable after receipt of the Supplier's notice, the Purchaser shall evaluate the situation and may at its discretion extend the Supplier's time for performance, in which case the extension shall be ratified by the parties by amendment of the Contract.</p> <p>33.2 Except in case of Force Majeure, as provided under CC Clause 31, a delay by the Supplier in the performance of its Delivery and Completion obligations shall render the Supplier liable to the imposition of liquidated damages pursuant to CC Clause 26, unless an extension of time is agreed upon, pursuant to CC Sub-Clause 33.1.</p>
<p><b>34. Termination</b></p>	<p>34.1 Termination for Default</p> <p>(a) The Purchaser, without prejudice to any other remedy for breach of Contract, by written notice of default sent to the Supplier, may terminate the Contract in whole or in part:</p> <p>(i) if the Supplier fails to deliver any or all of the Goods within the period specified in the Contract, or within any extension thereof granted by the Purchaser pursuant to CC Clause 33;</p> <p>(ii) if the Supplier fails to perform any other obligation under the Contract; or</p> <p>(iii) If the Supplier, in the judgment of the Purchaser has engaged in fraud and corruption, as defined in CC Clause 3, in competing for or in executing the Contract.</p> <p>(b) In the event the Purchaser terminates the Contract in whole or in part, pursuant to CC Clause 34.1(a), the Purchaser may procure, upon such terms and in such manner as it deems appropriate, Goods or Related Services similar to those undelivered or not performed, and the Supplier shall be liable to the Purchaser for any additional costs for such similar Goods or Related Services. However, the Supplier shall continue performance of the Contract to the extent not terminated.</p> <p>34.2 Termination for Insolvency.</p> <p>(a) The Purchaser may at any time terminate the Contract by giving notice to the Supplier if the Supplier becomes bankrupt or otherwise insolvent. In such event, termination will be without compensation to the Supplier, provided that such termination will not prejudice or affect any right of action or remedy that has accrued or will accrue thereafter to the Purchaser</p>

	<p>34.3 Termination for Convenience.</p> <p>(a) The Purchaser, by notice sent to the Supplier, may terminate the Contract, in whole or in part, at any time for its convenience. The notice of termination shall specify that termination is for the Purchaser's convenience, the extent to which performance of the Supplier under the Contract is terminated, and the date upon which such termination becomes effective.</p> <p>(b) The Goods that are complete and ready for shipment within twenty-eight (28) days after the Supplier's receipt of notice of termination shall be accepted by the Purchaser at the Contract terms and prices. For the remaining Goods, the Purchaser may elect:</p> <p>(i) to have any portion completed and delivered at the Contract terms and prices; and/or</p> <p>(ii) to cancel the remainder and pay to the Supplier an agreed amount for partially completed Goods and Related Services and for materials and parts previously procured by the Supplier.</p>
<p><b>35. Assignment</b></p>	<p>35.1 Neither the Purchaser nor the Supplier shall assign, in whole or in part, their obligations under this Contract, except with prior written consent of the other party.</p>

  
*M. G. L. Maveekumbura*  
 Senior Assistant Bursar (Supplies)  
 University of Jaffna  
 Jaffna

## **Section VIII.**

### **Contract Forms**

#### **1. Contract Agreement**

THIS CONTRACT AGREEMENT is made

the [ insert: number ] day of [ insert: month ], [ insert: year ].

BETWEEN

(1) [ insert complete name of Purchaser ], a [ insert description of type of legal entity, for example, an agency of the Ministry of ..... or corporation and having its principal place of business at [ insert address of Purchaser ] (hereinafter called “the Purchaser”), and

(2) [ insert name of Supplier ], a corporation incorporated under the laws of [ insert: country of Supplier ] and having its principal place of business at [ insert: address of Supplier ] (hereinafter called “the Supplier”).

WHEREAS the Purchaser invited bids for certain Goods and ancillary services, viz., [insert brief description of Goods and Services] and has accepted a Bid by the Supplier for the supply of those Goods and Services in the sum of [insert Contract Price in words and figures, expressed in the Contract currency (ies)] (hereinafter called “the Contract Price”).

NOW THIS AGREEMENT WITNESSETH AS FOLLOWS:

1. In this Agreement words and expressions shall have the same meanings as are respectively assigned to them in the Conditions of Contract referred to.

2. The following documents shall constitute the Contract between the Purchaser and the Supplier, and each shall be read and construed as an integral part of the Contract:

(a) This Contract Agreement

(b) Contract Data

(c) Conditions of Contract

(d) Technical Requirements (including Schedule of Requirements and Technical Specifications)

(e) The Supplier’s Bid and original Price Schedules

(f) The Purchaser’s Notification of Award

(g) [Add here any other document(s)]

3. This Contract shall prevail over all other Contract documents. In the event of any discrepancy or inconsistency within the Contract documents, then the documents shall prevail in the order listed above.

4. In consideration of the payments to be made by the Purchaser to the Supplier as hereinafter mentioned, the Supplier hereby covenants with the Purchaser to provide the Goods and Services and to remedy defects therein in conformity in all respects with the provisions of the Contract.

5. The Purchaser hereby covenants to pay the Supplier in consideration of the provision of the Goods and Services and the remedying of defects therein, the Contract Price or such other sum as may become payable under the provisions of the Contract at the times and in the manner prescribed by the Contract.

IN WITNESS whereof the parties hereto have caused this Agreement to be executed in accordance with the laws of Democratic Socialist Republic of Sri Lanka on the day, month and year indicated above.

For and on behalf of the Purchaser

Signed: [insert signature]

in the capacity of [ insert title or other appropriate designation ]

in the presence of [insert identification of official witness]

For and on behalf of the Supplier

Signed: [insert signature of authorized representative(s) of the Supplier]

in the capacity of [ insert title or other appropriate designation ]

in the presence of [ insert identification of official witness]

  
*M. G. L. Maveekumbura*  
Senior Assistant Bursar (Supplies)  
University of Jaffna  
Jaffna

## 2. Performance Security

[The issuing agency, as requested by the successful Bidder, shall fill in this form in accordance with the instructions indicated] ----- [Issuing Agency's Name, and Address of Issuing Branch or Office] ----- \* Beneficiary: -----  
- [Name and Address of Employer] -----

Date: -----

PERFORMANCE GUARANTEE No.: -----

We have been informed that ----- [name of Supplier] (hereinafter called "the Supplier") has entered into Contract No. ----- [reference number of the contract] dated ----- with you, for the ----- Supply of ----- [name of contract and brief description] (hereinafter called "the Contract").

Furthermore, we understand that, according to the conditions of the Contract, a performance guarantee is required. At the request of the Supplier, we ----- [name of Agency] hereby irrevocably undertake to pay you any sum or sums not exceeding in total an amount of -----

[Amount in figures] (-----) [amount in words], such sum being payable in the types and proportions of currencies in which the Contract Price is payable, upon receipt by us of your first demand in writing accompanied by a written statement stating that the Contractor is in breach of its obligation(s) under the Contract, without your needing to prove or to show grounds for your demand or the sum specified therein. This guarantee shall expire, no later than the .... Day of ....., 20.. [Insert date, 28 days beyond the scheduled completion date including the warranty period] and any demand for payment under it must be received by us at this office on or before that date.

[Signature(s)]

  
*M. G. L. Maveekumbura*  
Senior Assistant Bursar (Supplies)  
University of Jaffna  
Jaffna

### 3. Guarantee for Advance Payment

[The issuing agency, as requested by the successful Bidder, shall fill in this form in accordance with the instructions indicated.]

Date: [insert date (as day, month, and year) of Bid Submission] ICB No. and title: [insert number and title of bidding process] [issuing agency's letterhead] Beneficiary: [insert legal name and address of Purchaser]

ADVANCE PAYMENT GUARANTEE No.: [insert Advance Payment Guarantee no.]

We, [insert legal name and address of issuing agency], have been informed that [insert complete name and address of Supplier] (hereinafter called "the Supplier") has entered into Contract No. [Insert number] dated [insert date of Agreement] with you, for the supply of [insert types of Goods to be delivered] (hereinafter called "the Contract").

Furthermore, we understand that, according to the conditions of the Contract, an advance is to be made against an advance payment guarantee.

At the request of the Supplier, we hereby irrevocably undertake to pay you any sum or sums not exceeding in total an amount of [insert amount(s) in figures and words] upon receipt by us of your first demand in writing declaring that the Supplier is in breach of its obligation under the Contract because the Supplier used the advance payment for purposes other than toward delivery of the Goods.

It is a condition for any claim and payment under this Guarantee to be made that the advance payment referred to above must have been received by the Supplier on its account [insert number and domicile of the account]

This Guarantee shall remain valid and in full effect from the date of the advance payment received by the Supplier under the Contract until [insert date].

\_\_\_\_\_  
[Signature of authorized representative(s) of the issuing agency]

  
*M. G. L. Maveekumbura*  
Senior Assistant Bursar (Supplies)  
University of Jaffna  
Jaffna

## Section II.

### Bidding Data Sheet (BDS)

The following specific data for the goods to be procured shall complement, supplement, or amend the provisions in the Instructions to Bidders (ITB). Whenever there is a conflict, the provisions herein shall prevail over those in ITB.

[Instructions for completing the Bid Data Sheet are provided, as needed, in the relevant ITB Clauses.]

<b>ITB Clause Reference</b>	<b>A. General</b>
<b>ITB 1.1</b>	The Purchaser is: <b>University of Jaffna</b>
<b>ITB 1.1</b>	The name and identification number of the Contract are:  <b>“Supply &amp; Installation of Electrical &amp; Electronic Engineering Equipment, University of Jaffna. – Package 02 - UJ/F/PO/T/04/2016”</b>
<b>ITB 1.2</b>	The bidder should have at least three years experience in the relevant industry in Sri Lanka and should submit documents to prove experience in the industry.
<b>ITB 2.1</b>	The source of funding is: <b>GOSL</b>
<b>ITB 4.4</b>	Foreign bidders are allowed to participate in bidding: <b>Not allowed</b>
	<b>B. Contents of Bidding Documents</b>
<b>ITB 7.1</b>	For Clarification of bid purposes only, the Purchaser’s address is: Attention: <b>Senior Assistant Bursar/Supplies</b> Address: 57, University of Jaffna, Thirunelvely, Jaffna Telephone: 021-2220962 Electronic mail address:bursaruj@gmail.com
	<b>C. Preparation of Bids</b>
<b>ITB 11.1 (e)</b>	The Bidder shall submit the following additional documents: <b>A complete company profile of the bidders including, but not limited to, the following:</b> <ul style="list-style-type: none"> <li>• <b>Data commencing business in Sri Lanka</b></li> <li>• <b>Names of current Directors</b></li> <li>• <b>Annual turnover, assets and liabilities</b></li> <li>• <b>List of client who use the products</b></li> <li>• <b>Number of staff supporting to proceed the operation in Sri Lanka and their competence</b></li> <li>• <b>Past 3 years relevant experience in the relevant industry in Sri Lanka</b></li> </ul>

<b>ITB 15.1</b>	The bidder shall quote the local expenditure in Sri Lankan Rupees.
<b>ITB 18.1 (b)</b>	After sales service is: required
<b>ITB 19.1</b>	The bid shall be validity until: <b>13.10.2016</b>
<b>ITB 20.1</b>	(a) Bid shall include a Bid Security (issued by bank or surety) included in Section IV Bidding Forms;
<b>ITB 20.2</b>	The amount of the Bid Security shall be: <b>As per the advertisement</b> Beneficiary: <b>Vice Chancellor, University of Jaffna.</b> The validity period of the bid security shall be until: <b>11.11.2016</b>
	<b>D. Submission and Opening of Bids</b>
<b>ITB 22.2 (c)</b>	The inner and outer envelopes shall bear the following identification marks: “ <b>Supply &amp; Installation of Electrical &amp; Electronic Engineering Equipment, University of Jaffna. – Package 02 - UJ/F/PO/T/04/2016</b> ”
<b>ITB 23.1</b>	For bid submission purposes, the Purchaser’s address is:  Attention: Bursar  Address: University of Jaffna, P.O.Box 57, Thirunelvely, Jaffna.  The deadline for the submission of bids is:  Date: <b>13.07.2016</b> Time: <b>2.00pm</b>
<b>ITB 26.1</b>	The bid opening shall take place at:  Address: Board Room, University of Jaffna, P.O.Box 57, Thirunelvely, Jaffna.  Date: <b>13.07.2016</b> Time: <b>2.00 pm</b>
	<b>E. Evaluation and Comparison of Bids</b>
<b>ITB 34.1</b>	Domestic preference shall not be a bid evaluation factor.
<b>ITB 35.3(d)</b>	The adjustments shall be determined using the following criteria, from amongst those set out in Section III, Evaluation and Qualification Criteria:  (a) Deviation in Delivery schedule: Option 2 is selected and the adjustment is 0.5% per week or part thereof



	<p>(b) Deviation in payment schedule: Not applicable</p> <p>(c) the cost of major replacement components, mandatory spare parts, and service: Not applicable</p>
ITB 35.4	The following factors and methodology will be used for evaluation: Not applicable
ITB 35.5	Bidders shall be allowed to quote for one or more lots. [refer to Section III Evaluation and Qualification Criteria] Purchaser will evaluate the bid item by item basis.

  
*M. G. L. Maveekumbura*  
 Senior Assistant Bursar (Supplies)  
 University of Jaffna  
 Jaffna

## Section III.

### Evaluation and Qualification Criteria

#### 1. Evaluation Criteria (ITB 35.3 (d))

The Purchaser's evaluation of a bid may take into account, in addition to the Bid Price quoted in accordance with ITB Clause 14, one or more of the following factors as specified in ITB Sub-Clause 35.3(d) and in BDS referring to ITB 35.3(d), using the following criteria and methodologies.

(a) Delivery schedule

##### Option 2

The goods covered under this invitation are required to be delivered within an acceptable range of weeks specified in the Schedule of Requirement. No credit will be given to earlier deliveries, and bids offering delivery beyond this range will be treated as nonresponsive. Within this acceptable range, an adjustment per week, as specified in the Bid Data Sheet, will be added for evaluation purposes only, to the bid price of bids offering deliveries later than the earliest delivery period specified in the Section V, Schedule of Requirements

(a) Deviation in payment schedule. **Not applicable**

(c) Cost of major replacement components, mandatory spare parts, and service: **Not applicable**

(d) Specific additional criteria: **None**

#### 2. Evaluation Criteria (ITB 35.4)

#### 3. Multiple Contracts (ITB 35.5)

The Purchaser shall award multiple contracts to the Bidder that offers the lowest evaluated combination of bids (one contract per bid) and meets the post-qualification criteria (this Section III, Sub-Section ITB 37.2 Post-Qualification Requirements)

The Purchaser shall:

(a) Evaluate only lots or contracts that include items per lot and quantity per item

(b) Take into account: The lowest-evaluated bid for each lot

### 3. Post qualification Requirements (ITB 37.2)

After determining the lowest-evaluated bid in accordance with ITB Sub-Clause 36.1, the Purchaser shall carry out the post qualification of the Bidder in accordance with ITB Clause 37, using only the requirements specified. Requirements not included in the text below shall not be used in the evaluation of the Bidder's qualifications.

#### Qualification Criteria:

- (a) Bid may be submitted by any reputed supplier of **Electrical & Electronic Engineering Equipment** registered business in Sri Lanka or any accredited local agent who takes fullest responsibility for the whole bid. The local agent shall submit evidence of status, obligations, power of attorney and any other documentary evidence that he is duly authorized and eligible to bid on behalf of the manufacturer.
- (b) The bidders should also have previous experience of at least three years in relevant industry in the supply and also technical and financial capability necessary to perform the contract.
- (c) Bids will be rejected as non- responsive if documentary evidence in proof of above has not been provided.
- (d) If an Agent submits bids on behalf of more than one supplier, unless each such bid is accompanied by a separate Bid Form for each bid, and a bid security when required for each bid, and authorization from the respective Manufacturer, and valid vendor certificate, all such bids will be rejected as non- responsive.
- (e) Bidders should possess the Certificate of Business Registration issued by a Governmental Authority/ Registrar of Companies/ Provincial Registrar of Business in the relevant category.
- (f) Bidders offering goods under their own brand names should provide along with their bids a current certification/s of quality; Bid not complying with this requirement may be treated as non - responsive.
- (g) Having a service center in Jaffna will be considered as an added qualification.

### 4. Domestic Preference (ITB 34.1) – **Not applicable**

# Section IV

## Bidding Forms

### Bid Submission Form.

[The Bidder shall fill in this Form in accordance with the instructions indicated no alterations to its format shall be permitted and no substitutions shall be accepted.]

Date:

No:

To: **University of Jaffna**

We, the undersigned, declare that:

- a) We have examined and have no reservations to the Bidding Documents, including Addenda No.:
- b) We offer to supply in conformity with the Bidding Documents and in accordance with the Delivery Schedules specified in the Schedule of Requirements the following Goods and Related Service Supply of **Electrical & Electronic Engineering Equipment** to the University of Jaffna.
- c) The total price of our Bid without VAT, including any discounts offered is:
- d) The total price of our Bid including VAT, and any discounts offered is:
- e) Our bid shall be valid for the period of time specified in ITB sub-Clause 19.1, from the date fixed for the bid submission deadline in accordance with ITB Sub-Clause 23.1, and it shall remain bidding upon us and may be accepted at any time before the expiration of that period;
- f) If our bid is accepted, we commit to obtain a performance security in accordance with ITB Clause 43 and CC Clause 17 for the due performance of the Contract;
- g) We have no conflict of interest in accordance with ITB Sub-Clause 4.3;
- h) Our firm, its affiliates or subsidiaries- including any subcontractors or suppliers for any part of the contract-has not been declared blacklisted by the National Procurement Agency;
- i) We understand that bid, together with your written acceptance thereof include in your notification of award, shall constitute a binding contract between us, until a formal contract is prepared and executed.

j) We understand that you are not bound to accept the lowest evaluated bid or any other bid that you may receive.

Signed:

In the capacity of

Name:

Duly authorized to sign the bid for and on behalf of:

Dated on ----- day of -----

  
*M. G. L. Maveekumbura*  
Senior Assistant Bursar (Supplies)  
University of Jaffna  
Jaffna

### Price Schedule \*

No	Description of the Item and ITEM CODE	(1)	(2)	(3)	(4)	(5)
		Qty	Unit Rate	VAT	Price with VAT (2+3)	Total (1x4)
2.1	Raspberry Pi Single board Linux platform	10				
2.2	Beagle Bone Single board Linux platform	4				
2.3	Banana Pi Single board Linux platform	5				
2.4	Programable microcontroller development board	15				
2.5	Micro controller programmer with universal programing adapter seat, USB cable and 6 pin cable	5				
2.6	Programmable microcontroller development board with bread board included	15				
2.7	Microcontroller starter kit with necessary software tools (builder, simulator ,emulator) and ISP programmer(USB).	15				
2.8	FPGA trainer board	15				
2.9	Transistor based voltage regulator trainer kit	4				
2.10	Digital combinatory logic training kit	4				
2.11	Digital sequential logic trainer kit	2				
2.12	Digital Electronic trainer kit	4				
2.13	Step Motor Control kit	4				
2.14	Universal motor control board	3				
2.15	Digital Lux meter	1				
2.16	3 Phase Power Pack	1				
2.17	Power Factor Control Unit	1				
2.18	Asynchronous Wind Mill System including HVDC Light Line	1				
2.19	Flex Stand	6				
2.20	Flex set	1				
2.21	Flywheel	1				
2.22	TECNEL. Unit	1				
2.23	Pulse Generator	1				

2.24	Power factor meter	2				
2.25	Frequency meter	2				
2.26	Current Transformer	3				
2.27	PWM DC-Machine Control Module	2				
2.28	Drill Bench	1				
2.29	PCB shears	1				
2.30	Electrical hand driller	1				
2.31	Rheostat	4				
2.32	Rheostat	4				
2.33	Rheostat	4				
2.34	Digital and Analog Communication Trainer kit with jumper wire	1				
2.35	Digital Storage Oscilloscope	10				
2.36	Inductor bank	2				
2.37	Resistor bank	3				
2.38	Capacitor bank	2				
2.39	Glue gun and sticks	10				
2.40	Wireless Microphone set	2				
2.41	Wheatstone Bridge	5				
2.42	NI ELVIS II+ for Labview	2				
2.43	Multisim Education 25 user	1				
2.44	Digital Duplicator machine	1				
2.45	Colour Laser Printer	1				
2.46	Hot air gun	3				
2.47	QUADCOPTER FOR DEVELOPERS	1				
2.48	humanoid robot	1				
2.49	Three phase synchronous generator	2				
2.50	Three phase induction motor	2				
2.51	Single phase motor	2				
2.52	Synchronizing module	3				
2.53	Optical fibre training kit	1				
2.54	UV Laser based PCB machine	1				
2.55	Reflow oven	1				

2.56	Altera FPGA Starter Development Kit	20				
2.57	Signal Generators	10				
2.58	Spectrum Analyzer	5				
2.59	Arbitrary Waveform Generator	2				
2.60	Transmission Line trainer	1				
2.61	AnalogMultimeter	10				
2.62	Genuino Starter Kit (Original)	20				
2.63	Arduino MEGA 2560 / Genuino MEGA 2560 (Original)	20				
2.64	Arduino Due(Original)	20				
2.65	Arduino ZERO/ Genuino ZERO(Original)	10				
2.66	ArduinoYún(Original)	10				
2.67	ArduinoWiFi Shield(Original)	5				
2.68	Arduino Ethernet Shield WITH PoE Module(Original)	5				
2.69	Arduino GSM Shield (integrated antenna)(Original)	5				
2.70	Arduino Motor Shield (Original)	15				
2.71	Motor/Stepper/Servo Shield for Arduino Kit(Original)	20				
2.72	Assembled Data Logging shield for Arduino(Original)	20				
2.73	Android Phone to generic shield converter for Arduino(Original)	20				
2.74	Music Shield(Original)	20				
2.75	USB Stick DSP Development Tool(Original)	20				
2.76	Advanced USB Stick DSP Development Tool(Original)	20				
2.77	DSP Evaluation Module(Original)	15				
2.78	DSP Starter Kit (DSK)(Original)	20				
2.79	Proteous	1				
2.80	4DOF Robot Arm Kit	5				
2.81	6DOF Robot Arm	1				
2.82	dual measurement multimeter digital	10				



\*Use separate price schedule for options

.....

.....

**Signature and seal of the Bidder**

**Date**

Total Price without Taxes (in SLR): .....

Total Price without Taxes (in Words):.....

Vat Registration No:.....

Total Price with VAT:.....

Total Price with VAT (in Words):.....

Maintenance charges as a percentage after the warranty period:.....

Name of the Authorized persons:.....

Signature of the Authorized persons:.....

Date: .....

  
*M. G. L. Maveekumbura*  
Senior Assistant Bursar (Supplies)  
University of Jaffna  
Jaffna

## Bid Guarantee

[This Bank Guarantee form shall be filled in accordance with the instructions indicated in brackets]

----- [insert issuing agency's name, and address of issuing branch or office] -----  
Beneficiary: ----- [ name and address of Purchaser] Date: ----- [insert (by issuing agency) date] BID GUARANTEE No.: ----- [insert (by issuing agency) number] We have been informed that ----- [insert (by issuing agency) name of the Bidder; if a joint venture, list complete legal names of partners] (hereinafter called "the Bidder") has submitted to you its bid dated ----- [insert (by issuing agency) date](hereinafter called "the Bid") for the supply of [insert name of Supplier] under Invitation for Bids No. ----- [insert IFB number] ("the IFB").

Furthermore, we understand that, according to your conditions, Bids must be supported by a Bid Guarantee.

At the request of the Bidder, we ----- [insert name of issuing agency] hereby irrevocably undertake to pay you any sum or sums not exceeding in total an amount of ----- [insert amount in figures] ----- [insert amount in words]) upon receipt by us of your first demand in writing accompanied by a written statement stating that the Bidder is in breach of its obligation(s) under the bid conditions, because the Bidder:

- (a) Has withdrawn its Bid during the period of bid validity specified; or
- (b) Does not accept the correction of errors in accordance with the Instructions to Bidders (hereinafter "the ITB"); or
- (c) having been notified of the acceptance of its Bid by the Purchaser during the period of bid validity, (i) fails or refuses to execute the Contract Form, if required, or (ii) fails or refuses to furnish the Performance Security, in accordance with the ITB.

This Guarantee shall expire: (a) if the Bidder is the successful bidder, upon our receipt of copies of the Contract signed by the Bidder and of the Performance Security issued to you by the Bidder; or (b) if the Bidder is not the successful bidder, upon the earlier of (i) our receipt of a copy of your notification to the Bidder that the Bidder was unsuccessful, otherwise it will remain in force up to ----- (insert date) Consequently, any demand for payment under this Guarantee must be received by us at the office on or before that date. \_\_\_\_\_signature(s) of authorized representative(s) ]

## Manufacturer's Authorization

[The Bidder shall require the Manufacturer to fill in this Form in accordance with the instructions indicated. This letter of authorization should be on the letterhead of the Manufacturer and should be signed by a person with the proper authority to sign documents that are binding on the Manufacturer. The Bidder shall include it in its bid, if so indicated in the BDS.]

Date: [insert date (as day, month and year) of Bid Submission]

No.: [insert number of bidding process]

To: [insert complete name of Purchaser]

### WHEREAS

We [insert complete name of Manufacturer], who are official manufacturers of [insert type of goods manufactured], having factories at [insert full address of Manufacturer's factories], do hereby authorize [insert complete name of Bidder] to submit a bid the purpose of which is to provide the following Goods, manufactured by us [insert name and or brief description of the Goods], and to subsequently negotiate and sign the Contract.

We hereby extend our full guarantee and warranty in accordance with Clause 27 of the Conditions of Contract, with respect to the Goods offered by the above firm.

Signed: [insert signature(s) of authorized representative(s) of the Manufacturer]

Name: [insert complete name(s) of authorized representative(s) of the Manufacturer]

Title: [insert title]

Duly authorized to sign this Authorization on behalf of: [insert complete name of Bidder]

Dated on \_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_ [insert date of signing]

## Section V

### Schedule of Requirements

#### 1. List of Goods and Delivery Schedule

[The Purchaser shall fill in this table, with the exception of the column “Bidder’s offered Delivery date” to be filled by the Bidder]

No	Description of Goods	Qty	Final Destination as specified in BDS	Delivery Date		
				Earliest Delivery Date	Latest Delivery Date	Bidder’s offered Delivery date
2.1	Raspberry Pi Single board Linux platform	10	University of Jaffna	2 Weeks	4 Weeks	
2.2	Beagle Bone Single board Linux platform	4				
2.3	Banana Pi Single board Linux platform	5				
2.4	Programable microcontroller development board	15				
2.5	Micro controller programmer with universal programing adapter seat, USB cable and 6 pin cable	5				
2.6	Programmable microcontroller development board with bread board included	15				
2.7	Microcontroller starter kit with necessary software tools (builder, simulator ,emulator) and ISP programmer(USB).	15				
2.8	FPGA trainer board	15				
2.9	Transistor based voltage regulator trainer kit	4				
2.10	Digital combinatory logic training kit	4				
2.11	Digital sequential logic trainer kit	2				
2.12	Digital Electronic trainer kit	4				
2.13	Step Motor Control kit	4				
2.14	Universal motor control board	3				

2.15	Digital Lux meter	1	University of Jaffna	2 Weeks	4 Weeks	
2.16	3 Phase Power Pack	1				
2.17	Power Factor Control Unit	1				
2.18	Asynchronous Wind Mill System including HVDC Light Line	1				
2.19	Flex Stand	6				
2.20	Flex set	1				
2.21	Flywheel	1				
2.22	TECNEL. Unit	1				
2.23	Pulse Generator	1				
2.24	Power factor meter	2				
2.25	Frequency meter	2				
2.26	Current Transformer	3				
2.27	PWM DC-Machine Control Module	2				
2.28	Drill Bench	1				
2.29	PCB shears	1				
2.30	Electrical hand driller	1				
2.31	Rheostat	4				
2.32	Rheostat	4				
2.33	Rheostat	4				
2.34	Digital and Analog Communication Trainer kit with jumper wire	1				
2.35	Digital Storage Oscilloscope	10				
2.36	Inductor bank	2				
2.37	Resistor bank	3				
2.38	Capacitor bank	2				
2.39	Glue gun and sticks	10				
2.40	Wireless Microphone set	2				
2.41	Wheatstone Bridge	5				
2.42	NI ELVIS II+ for Labview	2				
2.43	Multisim Education 25 user	1				
2.44	Digital Duplicator machine	1				
2.45	Colour Laser Printer	1				
2.46	Hot air gun	3				
2.47	QUADCOPTER FOR DEVELOPERS	1				

2.48	humanoid robot	1	University of Jaffna	2 Weeks	4 Weeks	
2.49	Three phase synchronous generator	2				
2.50	Three phase induction motor	2				
2.51	Single phase motor	2				
2.52	Synchronizing module	3				
2.53	Optical fibre training kit	1				
2.54	UV Laser based PCB machine	1				
2.55	Reflow oven	1				
2.56	Altera FPGA Starter Development Kit	20				
2.57	Signal Generators	10				
2.58	Spectrum Analyzer	5				
2.59	Arbitrary Waveform Generator	2				
2.60	Transmission Line trainer	1				
2.61	AnalogMultimeter	10				
2.62	Genuino Starter Kit (Original)	20				
2.63	Arduino MEGA 2560 / Genuino MEGA 2560 (Original)	20				
2.64	Arduino Due(Original)	20				
2.65	Arduino ZERO/ Genuino ZERO(Original)	10				
2.66	ArduinoYún(Original)	10				
2.67	ArduinoWiFi Shield(Original)	5				
2.68	Arduino Ethernet Shield WITH PoE Module(Original)	5				
2.69	Arduino GSM Shield (integrated antenna)(Original)	5				
2.70	Arduino Motor Shield (Original)	15				
2.71	Motor/Stepper/Servo Shield for Arduino Kit(Original)	20				
2.72	Assembled Data Logging shield for Arduino(Original)	20				
2.73	Android Phone to generic shield converter for Arduino(Original)	20				
2.74	Music Shield(Original)	20				
2.75	USB Stick DSP Development Tool(Original)	20				
2.76	Advanced USB Stick DSP Development Tool(Original)	20				

2.77	DSP Evaluation Module(Original)	15				
2.78	DSP Starter Kit (DSK)(Original)	20				
2.79	Proteous	1				
2.80	4DOF Robot Arm Kit	5				
2.81	6DOF Robot Arm	1				
2.82	dual measurement multimeter digital	10				

\* Destination of delivery: - Faculty of Engineering,  
University of Jaffna,  
Ariviyal Nagar,  
Kilinochchi.

  
*M. G. L. Maveekumbura*  
Senior Assistant Bursar (Supplies)  
University of Jaffna  
Jaffna

## 2. Technical Specifications

The bidder shall follow the following technical requirement and other requirement

Item No	Name and Minimum Specifications		Qty	Remarks
<b>2.1</b>	<b>Raspberry Pi Single board Linux platform</b>		<b>10</b>	
	Model	Specify		
	Country of Origin	Specify		
	Architecture	Raspberry Pi 2(B)		
	CPU	A 900MHz quad-core ARM Cortex-A7		
	RAM	1GB		
	No. of USB 2.0 ports	4		
	No. of GPIO pins	40 pins with 2 EEPROM Plate identification pins		
	Full HDMI port	required (on-board)		
	Ethernet port	required (on-board)		
	Camera interface (CSI)	required (on-board)		
	Display interface (DSI)	required (on-board)		
	Micro SD card slot	required (on-board)		
	Video core	video core IV with 3D graphics core		
	Power supply	5V		
	Supply protection	polarity protection		
		2A fuse		
		hot-swap protection		
	Warranty	Specify		
	User manual and product documentation	Required		
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents		
<b>2.2</b>	<b>Beagle Bone Single board Linux platform</b>		<b>04</b>	
	Model	Specify		
	Country of Origin	Specify		
	CPU	AM3358BZCZ100		
	Architecture	BeagleBone		
	Clock speed	1GHz		
	DRAM	512MB DDR3L 800MHZ		
	JTAG	onboard 20-pin CTI		
	Serial debug interface	Header (UART0 access via 6-pin 3.3V TTL header)		
	on-board flash storage	4GB 8-bit eMMC		
	floating-point accelerator	NEON		



	32-bit microcontrollers	2 x PRU type		
	USB client for power & communication	required		
	USB host	required (2.0)		
	10/100 RJ45 Ethernet port	required		
	HDMI port	required (on-board)		
	Pin Header	92-pin header with cape compatibility		
	Power supply	5V		
	Warranty	Specify		
	User manual and product documentation	Required		
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents		
<b>2.3</b>	<b>Banana Pi Single board Linux platform</b>		<b>05</b>	
	Model	Specify		
	Country of Origin	Specify		
	SoC	ARM Cortex-A7 dual-core, 1GHz, Mali400MP2 GPU		
	Architecture	Banana Pi		
	System Memory	1GB DDR3 DRAM		
	Video output	HDMI		
		Composite		
		Extensible with on-board LVDS		
	Audio output	3.5mm stereo jack output		
		On-board microphone input		
	Connectivity	Gigabit Ethernet		
	USB	2 x USB 2.0 ports		
		1 x OTG micro USB port		
		1 x micro USB for power supply		
	Expansion	Extensible 26-pin headers		
		Camera connector,		
		Display connector for LVDS and touch screen		
	Misc.	3 x on-board buttons, (Power, Reset, Uboot key)		
		IR receiver		
	Warranty	Specify		
	User manual and product documentation	Required		
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide,		

		Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents		
<b>2.4</b>	<b>Programmable microcontroller development board</b>		<b>15</b>	
	Model	Specify		
	Country of Origin	Specify		
	Microcontrollers	Microchip PIC16F & 18F (40 pin)		
	Dual layered PCB with SMD components	required		
	40 Pin ZIF socket(for microcontroller insertion)	required		
	LEDs (SMD)	8 (on-board)		
	Keypad	4 x 4 model		
	Real time clock	DS1307 (with battery holder)		
	Temperature sensor	DS18B20 (on-board)		
	Buzzer	required (on-board)		
	EEPROM	required (on-board)		
	IR sensor	required (on-board)		
	Seven segment display	4		
	MicroSD card slot	required		
	Potentiometer	2 x variable (0 - 5 V)		
	on-board LCD display module	16x2 Blue Character with separate brightness control		
	RS232 Connectivity	required		
	USB connectivity	required		
	On-board 5V voltage regulator	required (LM2596)		
	On board socket to insert variable Oscillator	required		
	audio output	required		
	Accessories	Crystal oscillators(4MHz,8MHz,20 MHz)		
		Micro jumpers for configuration		
		User manual/ documentation		
	Warranty	Specify		
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the		

		product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents		
<b>2.5</b>	<b>Micro controller programmer with universal programming adapter seat, USB cable and 6 pin cable</b>		<b>05</b>	
	Model	Specify		
	Country of Origin	Specify		
	Supported microcontrollers (for both programmer and adapter seat)	Microship PIC16/18XX 40PIN Series devices (except 16F59)		
		Microship PIC16/18XX 28PIN Series devices (except 16F57)		
		Microship PIC16/18XX 18PIN Series devices		
		Microship PIC 8PIN/14PIN/20PIN family of devices (except 10FXX)		
	Real-time clock execution	Required		
	MPLAB IDE compatible	Required		
	Built-in over-voltage/short circuit monitor	required		
	Firmware upgradeable from PC/web download	required		
	Supply voltage	2 - 6 V		
	Diagnostic LED	required		
	Required functionalities	Read/Write program in data memory of microcontroller.		
		Erase the program memory and verify it.		
	Accessories	USB cable (Full speed 12 Mbits/s interface to host PC)		
		6 pin cable (connects the programmer and adapter seat)		
		User manual/documentation		
	Warranty	Specify		
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the		

		product. Manufactures' authorization should be submitted with the tender documents		
<b>2.6</b>	<b>Programmable microcontroller development board with bread board included</b>		<b>15</b>	
	Model	Specify		
	Country of Origin	Specify		
	Compatible microcontroller	Microchip PIC18F4550		
	In-built power supply components	Required (on-board)		
	Internal Flash Program Memory	32 kb		
	Direct USB in-circuit programming interface	Required		
	On-board push buttons	4		
	Adjustable analog inputs	4		
	Test LEDs	4		
	Bread board (on-board)	required		
	Connectivity	RS232 and USB		
	In-circuit debugger	required with Microchip ICD2 Unit		
	Warranty	Specify		
	User manual/documentation	Required		
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents		
<b>2.7</b>	<b>Microcontroller starter kit with necessary software tools (builder, simulator ,emulator) and ISP programmer(USB)</b>		<b>15</b>	
	Model	Specify		
	Country of Origin	Specify		
	Device support	ATtiny series (13, 26, 2313, 45, 261, 461, 85, 861, 24, 44, 84-ISP only)		
		ATmega series (48, 8, 88, 16, 161, 162, 163, 164P, 165, 168, 169, 32, 325, 324P, 329, 644, 644P, 645, 649, 8515, 8535)		
		AT90CAN series (32, 64, 128)		
		AT90PWM series (2/3, 31)		

	Required sockets	1 x 8		
		2 x 20		
		1 x 28		
		2 x 40		
	Port Headers	0.1” (2.54mm) DIL headers for all ports, including a Vcc and Ground pin for external circuitry		
	8-way bar LED	required		
	Switches (on-board)	>= 8		
	On-board RS232 port with DB9 connector	required		
	LCD Interface connector	14-way connector		
	Compatible supply voltages	3.3V and 5V		
	Brownout circuitry	required		
	ADC interface with reference pin	required		
	External Memory	74HC573 address latch and Flash RAM sockets		
	UART connectivity	required (for peripherals)		
	Accessories	Necessary AVR device		
		ISP Parallel Port Programmer (USB)		
		. Programming lead, LED and Socket leads		
		Software tools and manuals: - Programming software - Application Builder - User Manual - Code Examples - Board schematics - Device datasheets - Atmel AVR Studio3 and 4. - AVREdit IDE/Editor with AVRGCC 3.2 C Compiler		
	Warranty	Specify		
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures’ authorization should be submitted with the tender documents		

2.8	FPGA trainer board		15	
	Model	Specify		
	Country of Origin	Specify		
	Device (IC)	Xilinx Artix-7 FPGA (XC7A35T-1CPG236C)		
	Connectivity	USB A		
		USB micro-B		
		Four 12-pin Pmod connectors		
		VGA		
	No. of logical cells	>=33,280		
	RAM	>=1800 kb		
	clock management tiles	5 (each with a PLL)		
	DSP slices	>=90		
	Internal clock speed	450 MHz		
	On-chip analog-to-digital converters	required		
	USB-JTAG port	required		
	Required on-board items.	Serial Flash		
		USB-UART Bridge		
		12-bit VGA output		
		USB HID Host for mice, keyboards and memory sticks		
		>=16 user switches		
		>=16 user LEDs		
		>=5 user pushbuttons		
		4-digit 7-segment display		
		4 Pmod connectors		
	3 Standard 12-pin Pmod connectors			
	Accessories	User manual/ documents	Required	
		Standard USB A to micro-B cable	2.0 and above	
			5ft (nearly)	
	Warranty	Minimum one year		
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents		
2.9	Transistor based voltage regulator trainer kit		04	
	Model	Specify		
	Country of Origin	Specify		
	Demonstration circuit for Zener voltage regulation circuit	required		
	Demonstration circuit for Zener voltage regulator with series and parallel	required		

	transistor			
	Demonstration circuit for Voltage regulator with variable output	required		
	Demonstration circuit for voltage regulator with short-circuit protection and Darlington transistor	required		
	Training manual	required		
	Power supply	15 Vdc, 750 mA		
	Warranty	Minimum one year		
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents		
<b>2.10</b>	<b>Digital combinatory logic training kit</b>		<b>04</b>	
	Model	Specify		
	Country of Origin	Specify		
	Required operations (with isolated circuit for each operation)	adders		
		subtractors		
		multipliers		
		code converters		
		Multiplexers		
		demultiplexers		
	Minimum no. Of logic gates	-4 AND (2-input) -3 AND (3-input) -12 NAND (2-input) -4 NAND (4-input) -2 NAND TRIGGER (4-input) -4 OR (2-input) -2 OR (3-input) -1 OR (4-input)		

		-4 NOR (2-input) -2 NOR (4-input) -4 XOR (2-input) -6 inverters -2 AOI (2 and 3 input) -12 silicon diodes -1 dual-in-line 16-pin socket		
	Power supply	5Vdc, 5W		
	Accessories	Instruction manual/ teaching material		
	Warranty	Minimum one year		
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents		
<b>2.11</b>	<b>Digital sequential logic trainer kit</b>		<b>02</b>	
	Model	Specify		
	Country of Origin	Specify		
	Required operations (with isolated circuit for each operation)	MSI circuits in TTL logic		
		synchronous and asynchronous counters		
		shift registers		
		astable and monostablemultivibrators		
		seven segment displays		
	Minimum no. Of components (used in the circuits)	<ul style="list-style-type: none"> <li>• 4 JK/MS flip-flop</li> <li>• 2 D flip-flop</li> </ul>		



		<ul style="list-style-type: none"> <li>• a BCD synchronous counter</li> <li>• a binary 4-bit synchronous counter</li> <li>• a BCD asynchronous counter</li> <li>• a binary 4-bit asynchronous counter</li> <li>• 2 monostablemultivibrators</li> <li>• a shift register, 8-bit SI-SO</li> <li>• 2 BCD 7-segment decoders</li> <li>• 2 7-segment displays</li> <li>• 2 BCD rotating switches</li> <li>• 8 capacitors</li> <li>• 2 linear potentiometers</li> </ul>		
	Power supply	5Vdc, 5W		
	Accessories	Instruction manual/ teaching material		
	Warranty	Minimum one year		
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents		
<b>2.12</b>	<b>Digital Electronic trainer kit</b>		<b>04</b>	
	Model	Specify		
	Country of Origin	Specify		
	Required operations	Basic logic circuits		
		Schmitt triggers		
		Bistablemultivibrators		
		Monostablemultivibrators		
		Code converters, coders		
		Arithmetic circuits		
		Counting circuits		
		Register circuits		
		Multiplex mode Arithmetic Logic		

		Unit		
		Memory circuits		
		Analog-Digital converters		
		Digital-Analog converters		
	Minimum no. Of components (used in the circuits)	-4-bit comparator -4 JK-flip flops / RS flip flops -4 D-flip flops -2 adders (4-bit), with input and output carry -Multiplexer (4 channels) -Demultiplexer (4 channels) -Shift register (4-bit, parallel and serial operation possible, bi-directional ) -ALU (for conducting 16 arithmetic and 16 logical computing operations with 4-bit dual numbers) -Binary counter (4-bit, up/down counter) -2 inverters -2 Schmitt triggers( inverting ) -Units complements for negating a 4-bit binary number -Antivalence and equivalence gates EEPROM -AD/DA converter 8-bit		
	Auxiliary section (on board)	8 logic probes with led for high and low level		
		8 switches with led to generate logic level		
		B192 seven segment led displays with BCD decoder		
	Accessories	Instruction manual/ teaching material		
	Warranty	Minimum one year		
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents		
<b>2.13</b>	<b>Stepper Motor Control kit</b>		<b>04</b>	
	Model	Specify		
	Country of Origin	Specify		

	Required operations	Analysis of the operation of a stepper motor		
		Analysis of the control criteria and of the power modules		
		Full step or half step		
		Variable speed rotation control		
		Inversion of the rotation direction		
	Power supply	230 Vac, 50 Hz		
	Technical features	Step angle: 1.8°		
		Number of phases: 4		
		Max. power: 16 W		
		Sense of rotation: reversible		
		Current/phase max: 1.5 A		
		Variable frequency from 20 Hz to 500 Hz through potentiometer		
	Accessories	Instruction manual/ teaching material		
	Warranty	Minimum one year		
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents		
<b>2.14</b>	<b>Universal motor control board</b>		<b>03</b>	
	Model	Specify		
	Country of Origin	Specify		
	Required features (operational)	Integrated four-quadrant display		
		Variable centrifugal mass		
		Dual-channel encoder		
		Built-in four-quadrant amplifier		
	Technical features	Linear H bridge to have full motor control		
		Dual optical sensor for speed and direction		
		Main Motor/Generator 12 V (around), 3000 rpm (around), 1.2 A (around), 3.2 Ncm (around)		
		Load to be connected to the secondary Motor/Generator		
		Shunt to limit and measure the current		

	Accessories	Instruction manual/ teaching material				
	Warranty	Minimum one year				
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents				
<b>2.15</b>	<b>Digital Lux meter</b>				<b>01</b>	
	Model	Specify				
	Country of Origin	Specify				
	Classification	DIN 5032-7: 1985 class B JIS C 1609-1: 2006 general AA class				
	Light receiving element	Silicon photo diode				
	Display	Display: 4 digit, 2000 count LCD				
		Display unit: lx (lux) Display update rate: 500 ms $\pm$ 20 ms				
	Preferred measurement ranges	Range	Measurement range	Display step		
		20 lx	0.00 lx to 20.00 lx	1 count/step		
		200 lx	0.0 lx to 200.0 lx			
		2000 lx	0 lx to 2000 lx			
		20000 lx	00 lx to 20000 lx	10 count/step		
	200000 lx	000 lx to 200000 lx	100 count/step			
	Range selection	Auto/Manual				
	Linearity	$\leq \pm 2\%$ rdg				
	Temperature characteristics	$\leq \pm 3\%$ rdg				
	Humidity characteristics	$\leq \pm 3\%$ rdg				
	Response time	Auto range: within 5 seconds				
		Manual range: within 2 seconds				
	Power supply	AA/LR6 alkaline battery $\times$ 2				
		R6 Manganese battery $\times$ 2				
		USB bus power 5V DC				
	Operating temperature and humidity	-10°C to 40°C (14°F to 104°F), 80% RH or less (non-condensing)				
	Storage temperature and humidity	-20°C to 50°C (-4°F to 122°F), 80% RH or less (non-condensing)				
	Applicable standards	Safety: EN61010, EMC: EN61326				
	Dustproof and waterproof	IP40 (EN60529)				
	Accessories	Instruction Manual $\times$ 1				
		AA/LR6 alkaline battery $\times$ 2				
		Sensor cap (with strap) $\times$ 1				
		Carrying case (soft) $\times$ 1				
		Strap $\times$ 1, USB cable (0.9 m) $\times$ 1				

		CD-R (USB driver)		
		dedicated computer application software		
		communications specifications) ×1		
	Warranty	Minimum one year		
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents		
<b>2.16</b>	<b>Power Pack</b>		<b>01</b>	
	Model	Specify		
	Country of Origin	Specify		
	Supply voltage	380-400/220-230V		
	Frequency	50Hz. 3-ph.		
	Output voltage	DC fixed	220 V 3.5 A	
		DC variable	0-220 V 16 A	
		AC fixed	230/133 V 10 A 3-ph	
		AC variable	3 x 0-230 V 10 A 3-ph	
	Standard Fixed AC	230 V 10 A		
	Physical requirements	Mobile unit		
	Warranty	Minimum one year		
	User manual and product documentation	Required		
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents		
<b>2.17</b>	<b>Power Factor Control Unit</b>		<b>01</b>	
	Model	Specify		
	Country of Origin	Specify		
	Number of 3-ph groups	>= 6		
	Power factor setting	0.7 inductive to 0.7 capacitive		
	Nominal voltage	3 x 400 V, 50 Hz		
	Nominal power	0 – 2 kVAr cap.		
	PF-Controller	Automatic or manual		
		Adjustable delay times, switching sequences and strategies		
	Monitoring and Measurement on the controller	Voltage		
		Current		
		Power factor		

	Switching modes	Linear and circular		
	Indication lamps	Indication lamps for the capacitor groups which are connect		
	Power supply	1-ph 220 - 240 V, 50 Hz		
	Warranty	Minimum one year		
	User manual and product documentation	Required		
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents		
<b>2.18</b>	<b>Asynchronous Wind Mill System including HVDC Light Line</b>		<b>01</b>	
	Model	Specify		
	Country of Origin	Specify		
	Minimum/maximum power by design	$\leq 0.5$ and $\geq 2.0$ kVA input		
	Magnetising capacitors	3-step selector (switch)		
	Compensating inductors	3-step selector (switch)		
	Resistiveloadbank onDC-side	continuously controlled by PWM-unit		
	3-phase rectifier block	Required		
	V-meter for AC-input	250 V AC		
	V-meter for DC-output	400 V DC		
	A-meter for AC-input	6 A AC		
	A-meter for capacitive current	6 A AC		
	A-meter for inductive current	4 A AC		
	A-meter for DC-output	6 A DC		
	Short- and long HVDC cable model	Required		
	Suitable induction machine std	$\sim 0.75 - 1.5$ kW		
	Advanced 4Q-converter including software	$>1.5$ kW		
	External alternative inputs from	3x230 V generator, ind. or synchr. 3x230 V power supply max 300 V DC		
	Power supply	3x400V AC,16A,50Hz		
	Warranty	Minimum one year		
	User manual and product documentation	Required		
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where		

		the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents		
<b>2.19</b>	<b>Flex Stand</b>		<b>06</b>	
	Model	Specify		
	Country of Origin	Specify		
	Height	1 – 1.5 m		
	Weight	<= 10kg		
	No. of slots	>= 12		
	Warranty	Minimum one year		
	User manual and product documentation	Required		
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents		
<b>2.20</b>	<b>Flex set</b>		<b>01</b>	
	Model	Specify		
	Country of Origin	Specify		
	No. of Leads	100		
	Area	2.5 mm <sup>2</sup>		
	No. colours	5 (Red, Yellow, Blue, Black, Yellow/Green)		
	Required Lengths	25 cm		
		50 cm		
		100 cm		
		200 cm		
	Quantity	Red	5 in each length	
		Yellow	5 in each length	
		Blue	5 in each length	
		Black	5 in each length	
		Yellow/green	5 in each length	
	Warranty	Minimum one year		
	User manual and product documentation	Required		
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents		
<b>2.21</b>	<b>Flywheel</b>		<b>01</b>	
	Model	Specify		

	Country of Origin	Specify		
	Moment of inertia	~0.4kgm <sup>2</sup>		
	Dimensions	400*300*300mm (Aprox.)		
	Weight	50 - 60kg		
	Balancing	Dynamic		
	protective casing	Required		
	Couplings	2		
	Required foundation material	Aluminium		
	Warranty	Minimum one year		
	User manual and product documentation	Required		
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents		
<b>2.22</b>	<b>TECNEL. Unit</b>		<b>01</b>	
	Model	Specify		
	Country of Origin	Specify		
	Diagram in the front panel with similar distribution of elements like in the real unit.	Required		
	Enclosure	Steel Box		
	Front panel contents:	Diode modules	>= 6 diodes	
		Thyristors module	>= 6 thyristors	
		IGBTS Module	>= 6 IGBTS	
		Snubber net	Required	
		Sensors module:	Voltage sensors >= 4	
			Current sensors >= 2	
		Power supply connections :	For Vr, Vs, Vt, Neutral and Ground	
		Practice schemes	Required	
	Back panel contents:	Data Acquisition Board Connector	Required	



		(SCSI connector)			
		Tachodynamo connector	Required		
		Main fuses (Vr, Vs, Vt) and LEDs	Required		
		Circuit breaker (main switch)	Required		
	Single-phase driver and Three-phase driver	Required			
	IGBT driver	Required			
	TSI board	Required			
	PIC board	Required			
	SKHI61 board	Required			
	Relays board	$\geq 4$			
	Three-phase relays	$\geq 2$			
	Commutated power supply	Required			
	Three-phase magnetothermal	Required			
	Control Interface	Required			
	DAB(Data Acquisition Board) Requirements:	<ul style="list-style-type: none"> <li>-PCI Data acquisition board (National Instruments) to be placed in a computer slot</li> <li>-Bus PCI</li> <li><b>Analog input:</b> <ul style="list-style-type: none"> <li>- Number of channels <math>\geq 16</math> single-ended or <math>\geq 8</math> differential.</li> <li>-Resolution =16 bits, 1 in 65536.</li> </ul> </li> <li>- Sampling rate up to: 250 KSPS (Kilo samples per second).</li> <li>- Input range (V) = <math>\pm 10V</math></li> <li>-Data transfers=DMA, interrupts, programmed I/O</li> <li>Number of DMA channels <math>\geq 6</math>.</li> <li><b>Analog output:</b> <ul style="list-style-type: none"> <li>-Number of channels <math>\geq 2</math></li> <li>-Resolution =16 bits, 1 in 65536</li> <li>-Maximum output rate up to: 833 KS/s</li> <li>-Output range (V) = <math>\pm 10V</math></li> <li>-Data transfers=DMA, interrupts, programmed I/O</li> </ul> </li> <li><b>Digital Input/Output:</b> <ul style="list-style-type: none"> <li>-Number of channels <math>\geq 24</math> inputs/outputs.</li> <li>-D0 or DI Sample Clock frequency: 0 to 1 MHz</li> <li>- Timing: Counter/timers = 2</li> <li>-Resolution <math>\geq 32</math> bits</li> </ul> </li> </ul>			
	TECNEL/CCSOF.ComputerControl+DataAcquisition+Data Management Software:	<ul style="list-style-type: none"> <li>- Compatible with Windows operating system. Graphic and intuitive simulation of the process in screen. Compatible with the industry standards.</li> </ul>			

		<ul style="list-style-type: none"> <li>- Registration and visualization of all process variables in an automatic and simultaneous way.</li> <li>- Flexible, open and multicontrol software developed with actual windows graphic systems, acting simultaneously on all process parameters.</li> <li>- Management, processing, comparison and storage of data.</li> <li>- Sampling rate up to 250,000 data per second.</li> <li>- Comparative analysis of the obtained data, after the process and modification of the conditions during the process.</li> </ul>		
	Cables and Accessories	Required (for normal operation)		
	Warranty	Minimum one year		
	Set of manuals should include:	Required Services, Assembly and Installation, Interface and Control Software, Starting-up, Safety, Maintenance, Calibration & Practices Manuals		
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents		
<b>2.23</b>	<b>Pulse Generator (1)</b>		<b>01</b>	
	Model	Specify		
	Country of Origin	Specify		
	Frequency range	1mHz to 150 MHz		
	Timing resolution	4digits ,10ps best case		
	RMS jitter(period, width, delay)	0.003%+20ps		
	Period range	6.65ns to 999s		
		Accuracy ±0.1%		
	Variable Transitions	<= 2 ns		
	Output	10 Vpp (20 Vpp) into 50 Ω		
	Resolution	<= 10 ps		
	Frequency Accuracy	<= 0.1%		
	Pattern per Channel	4 kbit		
	3 and 4 Level Signals	Required		
	Output Channels	2		
	Programming Commands	SCPI		
	Graphic Display	Required		

	Warranty	Minimum one year		
	User manual and product documentation	Required		
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents		
<b>2.24</b>	<b>Power factor meter</b>		<b>02</b>	
	Model	Specify		
	Country of Origin	Specify		
	Three-phase instrument, symmetric load.	Required		
	Measuring range	cap. 0.5 ... 1 ... 0.5 ind.		
	Current range	0-5 A		
	Voltage range	380 V $\pm$ 20 % 3-phase		
	Frequency range	40-65 Hz		
	Accuracy class	1.5		
	Warranty	Minimum one year		
	User manual and product documentation	Required		
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents		
<b>2.25</b>	<b>Frequency meter</b>		<b>02</b>	
	Model	Specify		
	Country of Origin	Specify		
	Measuring range	~46-54 Hz		
	Accuracy class	0.5		
	Warranty	Minimum one year		
	User manual and product documentation	Required		
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product.		

		Manufactures' authorization should be submitted with the tender documents		
<b>2.26</b>	<b>Current Transformer</b>		<b>03</b>	
	Model	Specify		
	Country of Origin	Specify		
	Primary	20-10-5 A		
	Secondary	1 A		
	Accuracy class	1		
	Warranty	Minimum one year		
	User manual and product documentation	Required		
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents		
<b>2.27</b>	<b>PWM DC-Machine Control Module</b>		<b>02</b>	
	Model	Specify		
	Country of Origin	Specify		
	Functional principle	1-quadrant		
	max current	6A		
	Terminal for excitation	190V/2A		
	Duty cycle	0-100%		
	Frequency	~200-1300Hz		
	Current limit	0-100%		
	Loads	R/L active and passive		
	Control signal	0-10V		
	Power supply	220-240V 1-phase AC,50Hz		
		3*230V 3-phase AC,50HZ		
	Warranty	Minimum one year		
	User manual and product documentation	Required		
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents		
<b>2.28</b>	<b>Drill Bench (1)</b>		<b>01</b>	
	Model	Specify		
	Country of Origin	Specify		

	Power source:	Electrical		
	Control type	manually-controlled		
	Structure	column type		
	bench-top model	Required		
	Diameter:	Min.<= 0.8 mm Max.>= 3.2 mm		
	Voltage	230 V AC 50 Hz		
	Rotational speed	Min<=11000 rpm (69115.04 rad/min) Max>=33000 rpm (207345.12 rad/min)		
	Drilling depth	>=260 mm		
	Accessories	Set of drill bits – 3 Sets		
	Warranty	Minimum one year		
	User manual and product documentation	Required		
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents		
<b>2.29</b>	<b>PCB shears</b>		<b>01</b>	
	Model	Specify		
	Country of Origin	Specify		
	Cutting Capacity	Max>= 305mm		
	Aluminium Cutting Capacity:	>= 1.5mm		
	External Depth:	~440mm		
	External Width:	>= 245mm		
	Cut Width Max:	>= 305mm		
	Cut Thickness for Aluminium	Max >= 1.5mm		
	Cut Thickness for PCBs	Max >= 2mm		
	Warranty	Minimum one year		
	User manual and product documentation	Required		
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents		

<b>2.30</b>	<b>Electric hand driller</b>		<b>01</b>	
	Model	Specify		
	Country of Origin	Specify		
	Input voltage	230V AC 50 Hz		
	Power input	500W		
	No load speed	~0-2800 rpm		
	Max drilling capacity:	Steel/concrete	>=12 mm	
		Wood	>=20 mm	
	Weight	~2kg		
	Accessories	3 sets of drill bits suitable for Steel (1), Concrete(1) and Wood(1) containing at least 50 bits each.		
	Warranty	Specify		
	User manual and product documentation	Required		
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents		
<b>2.31</b>	<b>Rheostat (4)</b>		<b>04</b>	
	Model	Specify		
	Country of Origin	Specify		
	Rating	5 kOhms, 10A		
	Tolerance	10%		
	Temperature	70 deg C maximum		
	Type	Linear or Rotary		
	Warranty	Specify		
	User manual and product documentation	Required		
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents		
<b>2.32</b>	<b>Rheostat</b>		<b>04</b>	
	Model	Specify		
	Country of Origin	Specify		
	Resistance	1000 Ohms		
	Current Rating	1 or 2 A		

	Adjustable Type	Screwdriver slot		
	Resistive Element	Wire Wound		
	Warranty	Specify		
	User manual and product documentation	Required		
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents		
<b>2.33</b>	<b>Rheostat</b>		<b>04</b>	
	Model	Specify		
	Country of Origin	Specify		
	Value	1 ohm		
	Current Rating	10 A		
	Adjustable Type	Screwdriver slot		
	Resistive Element	Wire Wound		
	Warranty	Specify		
	User manual and product documentation	Required		
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents		
<b>2.34</b>	<b>Digital and Analog Communication Trainer kit with jumper wire</b>		<b>01</b>	
	Model	Specify		
	Country of Origin	Specify		
	Experiments covered with the trainer:	RF Oscillator Circuits Design		
		Second Order Filter Circuits Design		
		AM, FM modulation and Demodulation Circuit Design		
		A/D, D/A converter circuit design		
		Pulse Width Modulation/ Demodulation Circuit Design		

		ASK, FSK,PSK QPSK modulation and demodulation circuit design				
		ASK Coherent Detection Circuit				
	Accessories	Cables: Signal Cables – 200 Nos. , Power Cables -100 Nos., Jumper cables – 40 Nos.				
	Warranty	Minimum one year				
	User manual and product documentation	Required				
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents				
<b>2.35</b>	<b>Digital Storage Oscilloscope</b>				<b>10</b>	
	Model	Specify				
	Country of Origin	Specify				
	<b>Quantity</b>	<b>1</b>	<b>4</b>	<b>5</b>		
	<b>Vertical</b>					
	Channels	2	2	2		
	Bandwidth	DC-500MHz (- 3dB)	DC-70MHz (- 3dB)	DC-150MHz (- 3dB)		
	Rise time	<= 700ps Approx.	<= 5ns Approx.	<=2.5 ns Approx.		
	Input coupling	AC, DC & Ground				
	Input Impedance	1MΩ±2%, -15pF				
	Polarity	Normal &Invert				
	Maximum Input	≥ 300V (DC+AC peak), CATI				
	Waveform Signal Process	+, -, FFT				
	<b>EXT Trigger</b>					
	Range	±15V				
	Input Impedance	1MΩ±2%, ~16pF				
	<b>Signal Aquisition</b>					
	Sampling rate	Real-Time	≥ 4GSa/s	≥ 2GSa/s	≥ 1GSa/s	
		Equivalent-Time	≥ 100GSa/s	≥ 100GSa/s	≥ 25GSa/s	
	Vertical Resolution	8 Bits				
	Memory Length per Channel	≥ 25k points		≥ 2M points		
	Acquisition Mode	Normal, Peak Detect, Average				
	Peak Detect	≤ 2ns		≤10ns		
	Voltage Measurement	V pp , V amp , V avg , V rms , V hi , V lo , V max , V min , Rise-Preshoot/Overshoot, Fall-Preshoot/Overshoot				



	Time Measurement	Freq, Period, Rise Time, Fall Time, Positive, Width, Negative, Width, Duty Cycle, delay measurements			
	Cursors Measurement	Voltage difference between cursors ( $\Delta V$ ) Time difference between cursors ( $\Delta T$ )			
	Control Panel Functions				
	Save Setup	Up to 20 sets of measurement conditions	Up to 15 sets.		
	Save Waveform	24 sets of waveform	15 sets.		
	USB Port for PC Connection	Required			
	Data Logger	Required			
	GPIO	Required	No		
	Power Source	240 V/ 50 Hz			
	Warranty	Minimum one year			
	User manual and product documentation	Required			
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents			
<b>2.36</b>	<b>Inductor bank</b>			<b>02</b>	
	Model	Specify			
	Country of Origin	Specify			
	Description	This is a (300j) Inductive Load Module fitted with 9 inductors in three identical groups to realise balanced or unbalanced 3-phase loads (star and delta) and single phase loads. Each phase shall be independently changed in 7 uniform steps from 0 to max current value of full load. Single phase connection provides 21 regulation steps.			
	Power variation:	0-100%			
	Duty cycle:	100%			
	Input/Outputs:	4 mm CE safety sockets			
	Unit type	Table top / frame unit			
	Warranty	Minimum one year			
	User manual and product documentation	Required			
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents			

2.37 Resistor bank		03	
Model	Specify		
Country of Origin	Specify		
Description	This is a (300, 600, 1200 ohms) Resistive Load Module fitted with 9 resistors in three identical groups to realise balanced or unbalanced 3-phase loads (star and delta) and single phase loads. Each phase can be independently varied in 7 uniform steps from 0 to max current value for full power. Single phase connection provides 21 regulation steps.		
Power variation:	0-100%		
Duty cycle:	100%		
Input/Outputs:	4 mm CE safety sockets		
Unit type:	Table top / frame unit		
Warranty	Minimum one year		
User manual and product documentation	Required		
Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents		
2.38 Capacitor bank		02	
Model	Specify		
Country of Origin	Specify		
Bank	Capacitor 30 P.F 300j 50V plate		
Capacitance	0.8 ~ 1.2 uF. +/-3%		
Rated Voltage	2,100 VAC		
Frequency	50/60 Hz.		
Dissipation Factor	0.0035 maximum		
Operating Temperature	-10 to +85 degC		
Insulation Resistance : T- C	1,000 MOhms		
Test Voltage: T – T	T – T: 9,030 VDC for 60 seconds		
Test Voltage: T – C	T – C: 9000 VAC 10seconds		
Warranty	Minimum one year		
User manual and product documentation	Required		
Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the		

		product. Manufactures' authorization should be submitted with the tender documents			
<b>2.39</b>	<b>Glue gun and sticks</b>			<b>10</b>	
	Model	Specify			
	Country of Origin	Specify			
	Description	Uses standard hot melt glue sticks			
	Power Supply	230V 50 Hz			
	Fold out stand for safety	Required			
	Trigger feed mechanism	Required			
	Compatible glue sticks	GS20DT/25DT, GS260/500			
	Included glue stick sizes	GS20DT	20		
		GS25DT	20		
		GS260	20		
		GS500	20		
	Warranty	Specify			
	User manual and product documentation	Required			
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents			
<b>2.40</b>	<b>Wireless Microphone set</b>			<b>02</b>	
	Model	Specify			
	Country of Origin	Specify			
	Features	Automatic frequency and interference management Secure 256 bit AES encryption			
		Speech optimized condenser microphone capsule (MME 865)			
		Remote controllable Long operation time (more than 10 hours)			
		AF frequency response	20 to 20,000 Hz		
		Signal-to-noise ratio	> 90 dB(A)		
		Modulation	GFSK with back channel		
		Transmission method	TDMA, space diversity		
	Handheld	RF output power	adaptive, up to 250 mW		
		AF frequency response	50 to 20,000 Hz		
		Mute switch	available		
	Receiver	RF sensitivity	< -90 dBm		
		RF output power back channel	adaptive, up to 250 mW		

		Network socket	available				
Accessories		Handheld transmitter	3				
		MME 865 microphone capsule	3				
		BA 10 accupack	3				
		Rack Receiver (including power supply)	1				
		Rack mount kit	available				
Warranty		Minimum one year					
User manual and product documentation		Required					
Additional Requirement		All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents					
<b>2.41</b>	<b>Wheatstone Bridge</b>			<b>05</b>			
	Model	Specify					
	Country of Origin	Specify					
	Description	Each set consists of a resistance bridge, three resistance decades, two precision resistors and a zero point Galvanometer					
Resistance Bridge	Resistance Bridge	Scale	0-1000mm				
		Scale divisions	mm				
		Resistance wire	Length	~1m			
			Material	NiCr			
		Connection	4mm safety jacks				
		Maximum voltage	~8V				
		Maximum Current	~1.5A				
Resistance decade -1	Resistance decade -1	Measurement Range	0.1 $\Omega$ to 1 $\Omega$				
		Step Size	0.1 $\Omega$				
		Max. Current	~1A				
		Accuracy	$\leq 1\%$				
Resistance decade -2	Resistance decade -2	Measurement Range	1 $\Omega$ to 10 $\Omega$				
		Step Size	1 $\Omega$				
		Max. Current	~750 mA				
		Accuracy	$\leq 1\%$				
Resistance decade -3	Resistance decade -3	Measurement Range	10 $\Omega$ to 100 $\Omega$				
		Step Size	10 $\Omega$				
		Max. Current	~250 mA				
		Accuracy	$\leq 0.5\%$				
Precision resistor-1	Precision resistor-1	Resistance	10 $\Omega$				

		Tolerance	<= 1%			
		Load rating	~4W			
	Precision resistor-2	Resistance	1 Ω			
		Tolerance	<= 1%			
		Load rating	~4W			
	Zero Point Galvanometer	Measurement ranges	100mV DC, 30μA DC, 3 mA DC			
		Integrated resistance	3333 Ohm, 460 Ohm, 500 Ohm			
		Accuracy	± 1.5%			
		Zero point	center			
		Mirrored scale	yes			
		Connection	4-mm-security sockets			
		Fuse	0.315 A HBC 380 V 50 kA			
	Accessories	Connecting leads				
	Warranty	Minimum one year				
	User manual and product documentation	Required				
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents				
<b>2.42</b>	<b>NI ELVIS II+ for LabView</b>			<b>02</b>		
	Model	Specify				
	Country of Origin	Specify				
	Included items in system configuration	<b>NI ELVIS II+</b> Workstation NI ELVISmx driver software Detachable protoboard USB cable and connection				
	NI ELVIS II+ Oscilloscope	Maximum sampling rate	100 MS/s			
	Accessories- Optional	Oscilloscope Probes (2), Courseware (Electronics and Circuits)				
	Warranty	Minimum one year				
	User manual and product documentation	Required				
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier				

		has supplied the product. Manufactures' authorization should be submitted with the tender documents		
<b>2.43</b>	<b>Multisim Education 25 User</b>		<b>01</b>	
	Model	Specify		
	Country of Origin	Specify		
	License Type	25 Users		
	Warranty	Specify		
	User manual and product documentation	Required		
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents		
<b>2.44</b>	<b>Duplo machine</b>		<b>01</b>	
	Model	Specify		
	Country of Origin	Specify		
	Resolution	600 X 600 dpi		
	Document Size	4" x 6" (100 mm x 148 mm) to 11" x 17" (297 mm x 432 mm)		
	Image Mode	Text, Photo, Text/Photo, Pencil, Screen		
	Paper Weight	46gsm - 210 gsm		
	Colour duplication	available		
	LAN network interface	Available to print directly from computers		
	Paper supply capacity	Minimum 1000 sheets (64g/m2)		
	Print speed	60ppm – 150ppm		
		Five steps variable from the control panel (60, 80, 100, 110, 120ppm), 150ppm: Selectable from the touch panel		
	User interface	LCD Touch Panel with Progress Arrow indicators		
	Input port	USB2.0, 3.0 , Ethernet		
	Sound level (100ppm at operating position)	Less than 65dB		
	Power source	220V – 240V AC, 50Hz		
	duplex	available		
	Warranty	Minimum one year		
	User manual and product documentation	Required		
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where		

		the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents		
<b>2.45</b>	<b>Colour Laser Printer</b>		<b>01</b>	
	Model	Specify		
	Country of Origin	Specify		
	Processor speed	minimum 800 MHz		
	Print Speed Black	Minimum 14 ppm		
	Print Speed Colour	Minimum 14 ppm		
	Print Resolution, Black	Minimum to 600 x 600 dpi		
	Print Resolution, Colour	Minimum to 600 x 600 dpi		
	Maximum Number Of Copies	Up to 99 copies		
	Connectivity, Standard	Wireless, Ethernet direct printing USB printing		
	Compatible Operating Systems	Full software installs supported on: Microsoft Windows 7 32 bit and 64 bit or above and Windows server 2008 or above		
	Power Supply	Input voltage: 220 to 240 VAC (+/- 10%), 50 Hz (+/- 2 Hz)		
	Warranty	Minimum one year		
	User manual and product documentation	Required		
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents		
<b>2.46</b>	<b>Hot air station</b>		<b>03</b>	
	Model	Specify		
	Country of Origin	Specify		
	Description	Includes soldering iron, desoldering gun and hot air with mechanical arm		
	Power	230 V 50 Hz		
	Hot air gun	Power Consumption	Up to 500 watts	
		Temperature Range	100 deg to 480 deg C	
		Heating Element	Metal Heating Core	
	Soldering iron	Power Consumption	60 watts max	
		Heating Element	Ceramic	

		Temp Range	200 deg-480 deg C		
	Desoldering gun	Power Consumption	70 watts max		
		Temp Range	200-480 deg C		
		Number of nozzles	3 (1.2mm, 1.5mm, 1.8mm)		
	accessories	Replacement heating element for hot air gun			
		Six nozzles for hot air gun			
		Cleaning pin			
		3 nozzles for de-soldering pistol			
		And necessary items			
	Warranty	Minimum one year			
	User manual and product documentation	Required			
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents			
<b>2.47</b>	<b>Quadcopter for developers</b>			<b>01</b>	
	Model	Specify			
	Country of Origin	Specify			
	Features	Universal power and communication ports			
		Expansion bays			
		Customizable mounting and balancing			
		Adjustable arm angle for greater torque			
		50% less vibrations, rigid, strong system			
		Responsive, quick release landing pads			
		Dedicated remote controller 3.1 miles range(5km)			
		Full mobile app support			
	Performance	Enhanced GPS			
		Hovering Accuracy	Vertical: 0.5 m, Horizontal: 2.5 m		
		Tilt Angle	~ 35°		
		Speed	20 m/s		
	Remote controller	Transmission Distance	~ 5km		
		Video Output	USB, Mini-HDMI		
		Power Supply	Built-in battery		
		Output Power	9 W		
	Battery	Capacity	~ 4500 mAh		
		Voltage	~ 20 V		



	Guidance	sensors	ultrasonic sensors, images and IMU readings.		
		Velocity Detection Range	0~16 m/s		
		Velocity Detection Accuracy	0.04 m/s		
		Effective Sensor Range	0.20 m ~ 20 m		
	Warranty	Minimum one year			
	User manual and product documentation	Required			
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents			
<b>2.48</b>	<b>humanoid robot</b>			<b>01</b>	
	Model	Specify			
	Country of Origin	Specify			
	<b>Description</b>	It has a humanoid shape that enables it to move and adapt to the world around it. It has at least 7 sensors for natural interaction. It is designed to be personalised.			
	Motherboard	CPU	ATOM Z350 1.6 GHz or better		
		RAM	>= 1GB		
		Flash memory	>= 2GB		
		Micro SDHC	>=8GB		
	Sensors	Force Sensitive Resistors, Inertial unit (3-axis Gyrometers with an angular speed of ~500°/s) , Sonars, Joint position sensors			
	Contact and tactile sensors	Tactile Head, Chest Button, Tactile Hands, Feet Bumpers etc			
	Connectivity	at least two cameras with high resolution to recognise shapes and objects			
	Connecting	Ethernet, WiFi, USB			
	Interactions	Loudspeakers, microphones, video cameras, LEDs			
	Battery	Nominal voltage/capacity	21.6 V / 2.25 Ah		
		Charging	<= 3 hrs		

		duration		
		Autonomy	~ 1hr use	
	Warranty	5 Years		
	User manual and product documentation	Required		
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents		
<b>2.49</b>	<b>Three phase synchronous generator</b>			<b>02</b>
	Model	Specify		
	Country of Origin	Specify		
	salient pole rotor	Required		
	Motor/ Generator dual mode	Required		
	Nominal voltage	230 V (phase)		
	Nominal frequency	50 Hz		
	Excitation voltage	220 V DC		
	Nominal speed	~ 3000 rpm		
	Nominal power	~ 2kW (generator) / 1 kW (motor)		
	Parallel operation	The same size or a different size of this series alternator can be operated in parallel, reactive power sharing conform the standards and technical conditions		
	Excitation System	Load depended excitation with thyristor voltage regulator		
	Required Accessories	Direct coupling of motor and generator shafts		
	Warranty	Minimum one year		
	User manual and product documentation	Required		
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents		
<b>2.50</b>	<b>Three phase induction motor</b>			<b>02</b>
	Model	Specify		
	Country of Origin	Specify		
	Output Power	175 W		
	Stator Voltage (3 phase)	240/415 V – 50 Hz		
	Rotor Voltage (3 phase)	120/208 V – 50 Hz		
	Full Load Speed	1315 rpm		

	Full load current	0.48 A		
	Faceplate	Should permit delta or star configuration  Rotor winding terminals should be brought out to the faceplate		
	Possible Operations	Wound rotor induction motor, phase shifter, Single phase variable coupling motor, Asynchronous generator, frequency converter		
	Warranty	Minimum one year		
	User manual and product documentation	Required		
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents		
<b>2.51</b>	<b>Single phase motor</b>		<b>02</b>	
	Model	Specify		
	Country of Origin	Specify		
	Motor/ Generator dual mode	Required		
	Nominal voltage	220 V		
	Excitation voltage	220 V DC		
	Nominal speed	3000 rpm		
	Nominal power	2 kW		
	Warranty	Minimum one year		
	User manual and product documentation	Required		
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents		
<b>2.52</b>	<b>Synchronizing module</b>		<b>03</b>	
	Model	Specify		
	Country of Origin	Specify		
	Power supply	12/24Vdc (9.5 to 32 Vdc)		
	Consumption	max. 20W		
	Ambient temperature (storage)	~20 to 80 °C		

	Ambient temperature (operation)	~20 to 70 °C		
	Ambient humidity	RH 95 %, non-condensing		
	Voltage AC input	480Vac true RMS		
	Accuracy	Class 1		
	Current AC input	1A or 5A true RMS, isolated		
	Accuracy Iac	Class 1		
	Discrete inputs (isolated)	Range: 12/24Vdc (6 to 32Vdc)		
	Relay outputs	Relays, dry contacts		
	Load (resistive)	2A@24Vdc and 250Vac		
	Analog inputs	0/4 to 20mA		
	Analog outputs (isolated)	0/4 to 20 mA (freely scalable)		
	<b>Housing</b>			
	Front panel mounting	Plastic housing		
	Sealing (front/back)	IP42/IP21		
	Warranty	Minimum one year		
	User manual and product documentation	Required		
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents		
<b>2.53</b>	<b>Optical fibre training kit</b>		<b>01</b>	
	Model	Specify		
	Country of Origin	Specify		
	<b>Fibre cleaver</b>			
	Cladding diameter	125µm		
	Fiber count/Size	Single fiber (for fiber coating ø0.25~ø0.9mm)		
	Cleave length	5~20mm (for fiber coating ø0.25mm)		
		10~20mm (for fiber coating ø0.9mm)		
	Off-cut collector	Required		
	Automatic blade rotation	Required		
	Blade life	>= 60,000fibers		
	<b>Fusion splicer</b>			
	Material	Silica glass		
	Fiber count / Profile types	Single/SMF(G.652), MMF(G.651), DSF(G.653), NZDSF(G.655), BIF(G.657), EDF		
	Fiber diameter	Cladding diameter: ~80 - 150µm, Coating diameter : ~100 - 1,000µm		
	Cleave length	5 - 16mm with coating clamp		
	Splice loss (typical)	SMF : ~0.01dB, MMF : ~0.01dB, DSF : ~0.05dB, NZDSF : ~0.03dB		
	Return loss (typical)	60dB or greater		
	Splice time (typical)	6sec(SM G652), 7sec(SM G652 Std. Mode)		
	Heating time (typical)	14sec ( Slim 60mm - Quick Mode )		
	Splice & Heat cycles per	Approx. 250		

	battery full charge"			
	Fiber view & magnification	2 CMOS cameras preferred, ~ 520X (zoom : 700X) for X or Y single axis view, ~88X for both X & Y dual axis view		
	Splice programs	Max. >= 300		
	Heating programs	Max. >= 100		
	Splice image capture / splice data storage	>= 200 images / 10,000 splice data internal memory, >= 50,200/20,000 (with 8GB SD card)		
	Attenuation splicing	0.1dB to 15dB in 0.1dB increments		
	Universal clamps	Required,( 250um, 900um tight & loose buffer fiber)		
	Reversible coating clamps	Required		
	Automatic fiber identification	Required		
	USB port	Required		
	Battery pack and charger	Required		
	Power Supply	230V, 50 Hz		
	Required Accessories	AC adapter (1), AC power cord(1), Cooling tray(1), Spare electrode(1), Carrying case with worktable(1), Hand strap (1), USB Cable (1), V-groove cleaning brush (1), Loose tube cutter (1), Alcohol dispenser (1), Fibre protection sleeve(60mm,40mm,61mm) (100 each), Jacket Remover(1), Hot Jacket Remover(1), Handheld fiber cleaver (1), Cable stripper(1), Fiber Holders(For 0.25mm single fiber, 0.9mmsingle fiber, 0.9mm loose buffered single fiber, fro drop/indoor cabl-typ.2.0x3.1 or 2.6mm, indoor cable-typ.1.6x2.0mm , 3mm cable)		
	Warranty	Minimum one year		
	User manual and product documentation	Required		
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents		
<b>2.54</b>	<b>UV Laser based PCB machine</b>		<b>01</b>	
	<b>Purpose</b>	Multipurpose rapid prototyping (ex: structuring, engraving, and depaneling in one pass)		
	<b>Technical specifications</b>			
	Model	Specify		
	Country of Origin	Specify		
	Laser	Ultraviolet		
	accuracy	2 um		

	Laser power	~5W		
	diameter of focused LASER beam	~20 um		
	LASER wavelength	355 nm		
	LASER pulse frequency	~25 - 200 kHz		
	allowable PCB board size	L 230 mm W 300 mm H 10 mm		
	Software	Required (at least compatible with Windows 7 and above)		
		Efficient CAM software which can import existing CAD data and converts them into laser process.		
	<b>Additional tools</b>			
	Dust extraction unit	Required (compatible unit)		
	Compressor system compressed air supply	Required (compatible unit)		
	Adjustment tool	Required (compatible unit)		
	Measuring microscope	Required (~x60)		
	Warranty	Minimum three year		
	User manual and product documentation	Required		
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents		
<b>2.55</b>	<b>Reflow oven</b>		<b>01</b>	
	Purpose	RoHS compliant lead-free reflow soldering		
	<b>Technical specifications</b>			
	Model	Specify		
	Country of Origin	Specify		
	allowable PCB board size	~ L 230mm W 300mm		
	maximum preheat temperature/ time	220 deg. C / ~999 s		
	maximum reflow temperature/time	320 deg. C/ ~600 s		
	Long thermal treatment: temperature/time	220 deg. C/ ~64 hours		
	temperature stabilizing time	less than 5 min.		
	PCB cooling method	Required: Two fans with adjustable speed		
	Power Supply	230V, 50Hz		
	Max. Power consumption	<= 3.2 kW		
	Operating conditions	Temp ~15-30 deg.C, Humidity:~ 30-80%		
	Software	Required (at least compatible with Windows 7 and above)		
		-Process control and analysis		
	USB interface	Required		

	Required accessories	Temperature indicating device		
	Warranty	Minimum one year		
	User manual and product documentation	Required		
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents		
<b>2.56</b>	<b>Altera FPGA Starter Development Kit</b>		<b>20</b>	
	Model	Specify		
	Country of Origin	Specify		
	<b>Configuration</b>	USB-Blaster™ download cable (embedded)		
		EPCS4 serial configuration device		
	<b>Memory</b>	8-Mbyte SDRAM		
		512-Kb SRAM		
		1- to 4-Mbyte flash		
	Clocking	SMA connector (external clock input)		
	Audio	24-bit coder/decoder (CODEC)		
	<b>Switches and indicators</b>	Ten switch and four push buttons		
		Four, 7-segment displays		
		Ten red and eight green LEDs		
	<b>Connectors</b>	VGA, RS-232, and PS/2 ports		
		Two 40-pin expansion ports		
		SD/MMC socket		
	Cables/power	USB cable		
		External power supply		
	HDL design software	Quartus II		
	Other required accessories	Reference guide, User manual, Reference designs and demo for FPGA Starter Kit		
	Warranty	Minimum one year		
	User manual and product documentation	Required		
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents		

2.57 Signal Generators		10
Model	Specify	
Country of Origin	Specify	
Frequency Range	0.5Hz ~ 5MHz	
Amplitude	>10Vpp (into 50Ω load)	
Impedance	50Ω±10%	
Attenuator	-20dB±1dBx2	
DC Offset	<-5V ~ >5V (into 50Ω load)	
Duty Control	80% ~ 20%, maximum 1MHz (continuously adjustable)	
<b>Sine wave</b>		
Distortion	< 1%, 0.5Hz ~ 100kHz	
THD (Total Harmonic Distortion)	< 30dB, below fundamental in all ranges, from Max to 1/10 level	
Flatness	< 0.3dB, below 500kHz < 1dB, below 5MHz	
<b>Triangle Wave</b>		
Linear	> 98%, 0.5Hz ~ 100kHz > 95%, 100kHz ~ 5MHz	
<b>SQUARE WAVE</b>		
Symmetry	±2%, 1Hz ~ 100kHz	
Rise or Fall Time	< 50nS at maximum output (into 50Ω load)	
<b>CMOS OUTPUT</b>		
Level	4Vpp±1Vpp ~ 14.5Vpp±0.5Vpp adjustable	
Rise or Fall Time	< 120nS	
<b>TTL OUTPUT</b>		
Level	> 3Vpp	
Fan Out	20 TTL load	
Rise or Fall Time	< 25nS	
<b>VCF (Voltage Controlled Frequency)</b>		
Input Voltage	0V ~ 10V±1V (100 : 1)	
Input Impedance	10kΩ±10%	
<b>GCV (Generator Controlled Voltage)</b>		
Output Voltage	Sets the voltage between 0V ~ 2V according to the frequency	
<b>SWEEP OPERATION</b>		
Sweep Selection	Switch selector	
Sweep Rate	Maximum 100 : 1, adjustable	
Sweep Time	0.5sec ~ 30sec, adjustable	
Sweep Mode	Lin/Log switch selector	
<b>AMPLITUDE MODULATION</b>		
Depth	0 ~ 100%	
MOD. Frequency	400Hz (INT), DC ~ 1MHz(EXT)	
Carrier Bandwidth	100Hz ~ 5MHz (-3dB)	
EXT Sensitivity	< 10Vpp for 100% modulation	
<b>FREQUENCY COUNTER</b>		
INT/EXT	Switch selector	



	Range	0.5Hz ~ 5MHz (5Hz ~ 150MHz EXT)		
	Accuracy	Time base accuracy±1 count		
	Time Base	±20ppm(23° C ± 5° C)after 30 minutes warm up OR better		
	Resolution	100nHz for 1Hz, 1Hz for 100MHz OR better		
	Input Impedance	1MΩ // 150pF		
	Sensitivity	< 35mVrms (5Hz ~ 100MHz) < 45mVrms (100MHz ~ 150MHz)		
	<b>POWER SOURCE</b>	AC 230V, 50Hz		
	Warranty	Minimum one year		
	User manual and product documentation	Required		
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents		
<b>2.58</b>	<b>Spectrum Analyzer</b>		<b>05</b>	
	Model	Specify		
	Country of Origin	Specify		
	Frequency Range	9 kHz to 3.0 GHz		
	Resolution	1 Hz		
	<b>Frequency Reference:</b>			
	Aging Rate	<= ±2 ppm max.		
	Frequency Stability over Temperature	<= ±0.025 ppm (0 to 50 °C )		
	Supply Voltage Stability	<=±0.02 ppm		
	<b>Frequency Readout Accuracy :</b>			
	Sweep points	Span >= 100 Hz (601) Span = 0 Hz (6 to 601)		
	<b>Marker Frequency Counter :</b>			
	Resolution	1 Hz, 10 Hz, 100 Hz, 1 kHz		
	Accuracy related	RBW/Span >=0.02 Mkr level to DNL>30 dB		
	<b>Frequency Span :</b>			
	Range	0 Hz (zero span), 100 Hz to 3 GHz		
	Resolution	1 Hz		
	<b>Phase Noise :</b>			
	Offset from Carrier	Fc =1 GHz; RBW = 1 kHz, VBW = 10 Hz;Average ≥ 40		
	10 kHz	<-88 dBc/Hz		
	100 kHz	<-95 dBc/Hz		
	1 MHz	<-113 dBc/Hz		
	<b>Resolution Bandwidth (RBW) Filter :</b>			
	Filter Bandwidth	1 Hz to 1 MHz in 1-3-10 sequence (-3dB		

		bandwidth ) 200 Hz, 9 kHz, 120 kHz, 1 MHz (-6dB bandwidth )		
	Accuracy:	$\leq \pm 8\%$ , RBW = 1 MHz $\leq \pm 5\%$ , RBW < 1 MHz		
	Shape Factor	< 4.5:1		
	Video Bandwidth (VBW) Filter	1 Hz to 1 MHz in 1-3-10 sequence (-3dB bandwidth )		
	<b>Amplitude Range:</b>			
	100 kHz to 1 MHz	Displayed Average Noise Level (DANL) to 18 dBm		
	1 MHz to 10 MHz	DANL to 21 dBm		
	10 MHz to 3 GHz	DANL to 30 dBm		
	Input Attenuator Range :	0 to 50 dB, in 1 dB step (Auto or manual setup)		
	<b>Maximum Safe Input Level :</b>			
	Average Total Power	$\geq 33$ dBm		
	DC Voltage	$\pm 50$ V		
	<b>1 dB Gain Compression :</b>			
	Total Power at 1st Mixer	> 0 dBm		
	Total Power at the Preamp	> -22 dBm		
	<b>Displayed Average Noise Level (DANL) :</b>			
	Preamp off	(@Setting: 0 dB attenuation; RF Input is terminated with a 50 Ohm load. RBW 10 Hz; VBW 10 Hz; span 500 Hz; reference level = -60dBm; trace average $\geq 40$ )  9 kHz to 100 kHz, < -93 dBm  100 kHz to 1 MHz, < -90 dBm - 3 x (f/100 kHz) dB  1 MHz to 10 MHz, < -122 dBm  10 MHz to 3 GHz, < -122 dBm		
	Preamp on	(@Setting: 0 dB attenuation; RF Input is terminated with a 50 Ohm load. RBW 10 Hz; VBW 10Hz; span 500 Hz; reference level = -60dBm; trace average $\geq 40$ )  100 kHz to 1 MHz, < -108 dBm - 3 x (f/100 kHz) dB  1 MHz to 10 MHz, < -142 dBm  10 MHz to 3 GHz, < -142 dBm + 3 x (f/1 GHz) dB		
	<b>Internal Data storage</b>	$\geq 16$ MB nominal		
	<b>Warm-up Time</b>	< 30 minutes		
	<b>Temperature Range</b>	+5 °C to +45 °C (Operating) or better -20 °C to + 70 °C (Storage ) or better		
	<b>Tracking Generator:</b>			
	Frequency Range	100 kHz to 3 GHz		

	Output Power	-50 dBm to 0 dBm in 0.5 dB steps		
	Absolute Accuracy	± 0.5 dB		
	Output Flatness	Referenced to 160 MHz, -10 dBm		
		100 kHz to 2 GHz : ± 1.5 dB		
		2 GHz to 3 GHz: ± 2.0 dB		
	Output Level Switching Uncertainty	± 0.8 dB		
	Harmonics	< -30 dBc		
	Reverse Power	+30 dBm max.		
	Connector type	N-type female		
	Impedance	50 ohm		
	Output VSWR	< 1.6:1 (when source attenuation is 12dB)		
	<b>Front Panel Input/output</b>	RF Input Power for Option USB Host MicroSD Socket		
	<b>Rear Panel Input/output</b>	Reference Output Reference Input Alarm Output Trigger Input/ Gated Sweep Input LAN TCP/IP Interface USB Device IF Output Earphone Output RS232 Interface GPIB Interface AC Power Input Battery Pack (Optional)		
	Warranty	Minimum one year		
	User manual and product documentation	Required		
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents		
<b>2.59</b>	<b>Arbitrary Waveform Generator</b>		<b>02</b>	
	Model	Specify		
	Country of Origin	Specify		
	Maximum frequency	120MHz		
	Channels	2		
	Memory	Volatile: >=64 MSa/Channel, Non-Volatile: >=950 MB in file system		
	Waveforms	Standard(Sine, Square, Ramp, Pulse, Triangle, Gaussian Noise, PRBS (Pseudorandom Binary Sequence), DC), Built-in arbitrary(Cardiac, Exponential Fall,		

		Exponential Rise, Gaussian Pulse, Haversine, Lorentz, D-Lorentz, Negative Ramp, Sinc), User-defined arbitrary (with multi-segment sequencing)		
	Operating Modes	Continuous, Modulate, Frequency Sweep, Counted Burst, Gated Burst		
	Modulation Types	AM, FM, PM, FSK, BPSK, PWM, Sum (carrier + modulation)		
	Interfaces	10/100Base-T (Sockets & VXI-11 protocols), USB 2.0 (USB-TMC488 protocol), GPIB/IEEE-488.1, IEEE-488.2		
	Web user interface for remote operation and monitoring	Required		
	Display	Color TFT, at least WQVGA (480x272) with LED backlight		
	Waveform Characteristics (Sine)	Resolution: 1- $\mu$ Hz		
		Harmonic distortion( for freq>10MHz and Vout=10Vpp): $\leq -39$ dBc		
		Phase Noise (@100kHz offset and freq 120MHz): $\leq -125$ dBc		
	Waveform Characteristics (Square and pulse)	Duty cycle: 0.01% to 99.99%, resolution: 0.01%		
	Waveform output characteristics	Connector: Front-panel BNC, shell and pin isolated from chassis ( $\pm 42$ V maximum); Function: On, Off, or Inverted; Output impedance (nom:) 50 $\Omega$ ; Overload protection: required		
	<b>Two channel characteristics</b>	Operating modes	Independent, Coupled parameter(s), Combined (Ch 1 + Ch 2), Equal (Ch 1 = Ch 2), or Differential (Ch 1 = -Ch 2)	
		IQ Player	Required	
	Output characteristics	Connector: Rear-panel BNC, chassis-referenced ; Frequency (nom): 10 MHz ; Level (nom) 0 dBm (632 mVpp) into 50 $\Omega$ ; Impedance(nom): 50 $\Omega$		
	Power source	230 V AC, 50 Hz		
	Warranty	Minimum one year		
	User manual and product documentation	Required		
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents		
<b>2.60</b>	<b>Transmission Line trainer</b>		<b>01</b>	
	Model	Specify		

	Country of Origin	Specify		
	Display	LED columns indicating positive and negative voltages at 13 positions.		
	Propagation time	Switch 0.25, 0.5, 2 s at zero attenuation, representing line lengths L, 2L, 8L respectively.		
	Attenuation	Simulates attenuation due to the lines series resistance. Continuously variable.		
	Step input	A centre-stable 2-way switch applies a signal to either end of the line.		
	Line impedance	~600Ω		
	Plug--in terminations	short-circuit link (2)		
	Matched load :			
		Resistive loads (unmatched: low ~50Ω, medium ~200Ω, high ~1.8kΩ, large ~100kΩ		
		Capacitive Load ~100μF nominal (reversible electrolytic)		
	Hold	Signals on the line are held at the instant of switching		
	Power supply	240V 50Hz		
		Fuse : Required		
	Additional materials	Manual of practical demonstrations and assignments, covering all the important aspects of these characteristics		
	Warranty	Minimum one year		
	User manual and product documentation	Required		
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents		
<b>2.61</b>	<b>Analog Multimeter</b>		<b>10</b>	
	Model	Specify		
	Country of Origin	Specify		
	DCV (Range selection)	0.1/0.5/2.5/10/50/250/1000V		
	ACV(Range selection)	10/50/250/1000V		
	DCA(Range selection)	50μ/ 2.5m/ 25m/250mA		
	Ω(Range selection)	2k/20k/200k/2M(×1/ ×10/ ×1k)/200M (x100k)		
	LI- Load Current(Range selection)	1.5μ/150μ/1.5m/15m/150mA		
	Decibel (Range)	<=-10dB to >=+22dB for 10VAC upto >= +62dB		
	DC high voltage	>=25kV		
	hFE	1000 at x10 range or better		
	Fuse	Required (250V/0.5A)		

	Operating conditions	0deg C-40 deg C, 25%-80%RH		
	Power source	R6(IEC) or UM-3 (1.5V)x2		
	Drop shock proof	Required		
	Protective body cover	Required		
	Required Accessories	High voltage probe, hFE probe, Clip adapters		
	Warranty	Specify		
	User manual and product documentation	Required		
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents		
<b>2.62</b>	<b>Genuino Starter Kit (Original)</b>		<b>20</b>	
	Model	Specify		
	Country of Origin	Specify		
	Each Kit should include	<ul style="list-style-type: none"> <li>- Arduino Projects Book (170 pages) (1 No)</li> <li>- Arduino / GenuinoUnoboard(latest version)(1 No)</li> <li>- USB cable (1 No)</li> <li>- Breadboard 400 points (1 No)</li> <li>- Easy-to-assemble wooden base (1 No)</li> <li>- 9v battery snap (1 No)</li> <li>- Solid core jumper wires (70 Nos)</li> <li>- Stranded jumper wires (2 Nos)</li> <li>- Photoresistor [VT90N2 LDR] (6 Nos)</li> <li>- Potentiometer 10kilohm (3 Nos)</li> <li>- Pushbuttons (10 Nos)</li> <li>- Temperature sensor [TMP36] (1 No)</li> <li>- Tilt sensor (1 No)</li> <li>- alphanumeric LCD (16x2 characters) (1 No)</li> <li>- LED (bright white) (1 No)</li> <li>- LED (RGB) (1 No)</li> <li>- LEDs (red) (8 Nos)</li> <li>- LEDs (green) (8 Nos)</li> <li>- LEDs (yellow) (8 Nos)</li> <li>- LEDs (blue) (3 Nos)</li> <li>- Small DC motor 6/9V (1 No)</li> <li>- Small servo motor (1 No)</li> <li>- Piezo capsule [PKM17EPP-4001-B0] (1 No)</li> </ul>		

		<ul style="list-style-type: none"> <li>- H-bridge motor driver [L293D] (1 No)</li> <li>- Optocouplers [4N35] (2 Nos)</li> <li>- Transistor [BC547] (5 Nos)</li> <li>- Mosfet transistors [IRF520] (2 Nos)</li> <li>- Capacitors 100nF (5 Nos)</li> <li>- Capacitors 100uF (3 Nos)</li> <li>- Capacitor 100pF (5 Nos)</li> <li>- Diodes [1N4007] (5 Nos)</li> <li>- Transparent gels (red, green, blue) 3 Nos)</li> <li>- Male pins strip (40x1) (1 No)</li> <li>- Resistors 220 ohm (20 Nos)</li> <li>- Resistors 560 ohm (5 Nos)</li> <li>- Resistors 1 kilohm (5 Nos)</li> <li>- Resistors 4.7 kilohm (5 Nos)</li> <li>- Resistors 10 kilohm (20 Nos)</li> <li>- Resistors 1 megohm (5 Nos)</li> <li>- Resistors 10 megohm (5 Nos)</li> <li>- 9V Rechargeable battery (1 No)</li> </ul>		
	User manual and product documentation	Required		
	Warranty	Specify		
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents		
<b>2.63</b>	<b>Arduino MEGA 2560 / Genuino MEGA 2560 (Original)</b>		<b>20</b>	
	Model	Specify		
	Country of Origin	Specify		
	Version	Latest		
	Microcontroller	ATmega2560		
	Operating Voltage	5V		
	Input Voltage (recommended)	7-12V		
	Input Voltage (limit)	6-20V		
	Digital I/O Pins	54 (of which 15 provide PWM output)		
	Analog Input Pins	16		
	DC Current per I/O Pin	20 mA		
	DC Current for 3.3V Pin	50 mA		
	Flash Memory	256 KB of which 8 KB used by bootloader		
	SRAM	8 KB		
	EEPROM	4 KB		
	Clock Speed	16 MHz		
	Warranty	Specify		

	User manual and product documentation	Required		
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents		
<b>2.64</b>	<b>Arduino Due(Original)</b>		<b>20</b>	
	Model	Specify		
	Country of Origin	Specify		
	Version	Latest		
	Microcontroller	AT91SAM3X8E		
	Operating Voltage	3.3V		
	Input Voltage	7-12V		
	Input Voltage (limits)	6-16V		
	Digital I/O Pins	54 (of which 12 provide PWM output)		
	Analog Input Pins	12		
	Analog Output Pins	2 (DAC)		
	Total DC Output Current on all I/O lines	130 mA		
	DC Current for 3.3V Pin	800 mA		
	DC Current for 5V Pin	800 mA		
	Flash Memory	512 KB all available for the user applications		
	SRAM	96 KB (two banks: 64KB and 32KB)		
	Clock Speed	84 MHz		
	Length	~100 mm		
	Width	~55 mm		
	Weight	<40 g		
	Warranty	Specify		
	User manual and product documentation	Required		
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents		
<b>2.65</b>	<b>Arduino ZERO/ Genuino ZERO(Original)</b>		<b>10</b>	
	Model	Specify		
	Country of Origin	Specify		
	Version	Latest		
	Microcontroller	ATSAMD21G18, 32-Bit ARM Cortex		



		M0+		
	Operating Voltage	3.3V		
	PWM Pins	All but pins 2 and 7		
	UART	2 (Native and Programming)		
	Digital I/O Pins	20		
	Analog Input Pins	6, 12- bit ADC channels		
	Analog Output Pins	1, 10-bit (DAC)		
	Flash Memory	256 kB		
	SRAM	32 kB		
	Clock Speed	48 MHz		
	Warranty	Specify		
	User manual and product documentation	Required		
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents		
<b>2.66</b>	<b>ArduinoYún(Original)</b>		<b>10</b>	
	Model	Specify		
	Country of Origin	Specify		
	Version	Latest		
	<b>AVR Arduino microcontroller</b>			
	Microcontroller	ATmega32U4		
	Operating Voltage	5V		
	Input Voltage	5		
	Digital I/O Pins	20		
	PWM Channels	7		
	Analog Input Pins	12		
	DC Current per I/O Pin	40 mA		
	DC Current for 3.3V Pin	50 mA		
	Flash Memory	32 KB (of which 4 KB used by bootloader)		
	SRAM	2.5 KB		
	EEPROM	1 KB		
	Clock Speed	16 MHz		
	<b>Linux Microprocessor</b>			
	Processor	Atheros AR9331		
	Architecture	MIPS @400MHz		
	Operating Voltage	3.3V		
	Ethernet	IEEE 802.3 10/100Mbit/s		
	WiFi	IEEE 802.11b/g/n		
	USB Type-A	2.0 Host		
	Card Reader	Micro-SD only		
	RAM	64 MB DDR2		
	Flash Memory	16 MB		
	SRAM	2.5 KB		

	EEPROM	1 KB		
	Clock Speed	16 MHz		
	Warranty	Specify		
	User manual and product documentation	Required		
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents		
<b>2.67</b>	<b>ArduinoWiFi Shield(Original)</b>		<b>05</b>	
	Model	Specify		
	Country of Origin	Specify		
	Version	Latest		
	On board indicators	The shield contains a number of informational LEDs as stated below		
		LINK (green) : indicates a connection to a network		
		ERROR (red): indicates when there is a communication error		
		DATA (blue): indicates data being transmitted/received		
	Operating voltage	5V (supplied from the Arduino Board)		
	Compatibility	Arduino Due		
	Connection	802.11b/g networks		
	Encryption types	WEP and WPA2 Personal		
	Interface	SPI port		
	Additional memory slot	on-board micro SD slot		
	Programmer	ICSP headers		
	serial debugging	FTDI connection for serial debugging of WiFi shield		
	Update	Mini-USB for updating WiFi shield firmware		
	Warranty	Specify		
	User manual and product documentation	Required		
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents		

<b>2.68</b>	<b>Arduino Ethernet Shield WITH PoE Module(Original)</b>		<b>05</b>	
	Model	Specify		
	Country of Origin	Specify		
	Version	Latest		
	<b>Technical specifications</b>			
	Length	~70 mm		
	Width	~55 mm		
	Operating voltage	5V (supplied from the ArduinoBoard)		
	Ethernet Controller	W5100 with internal 16K buffer		
	Connection speed	10/100Mb		
	communicate with controller	SPI port		
	<b>Power over Ethernet (PoE) module should have been designed to extract power from a conventional twisted pair Category 5 Ethernet cable</b>			
	IEEE802.3af compliance	Required		
	Maximum output ripple and noise	100mVpp		
	Input voltage range	36V to 57V		
	protection	Overload and short-circuit		
	Output	9V		
	Efficiency of DC/DC converter	Typ 75% @ 50% load		
	Isolation (input to output)	>=1500V		
	Warranty	Specify		
	User manual and product documentation	Required		
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents		
<b>2.69</b>	<b>Arduino GSM Shield</b>		<b>05</b>	
	Model	Specify		
	Country of Origin	Specify		
	Version	Latest		
	Board support	Arduino Uno		
		ArduinoMega		
		Arduino Mega ADK		
		Leonardo.		
	Onboard Indicators			
	On	shows the Shield gets power		
	Status	Turns on to when the modem is powered and data is being transferred to/from the GSM/GPRS network.		
	Net	Blinks when the modem is communicating with the radio network.		
	Warranty	Specify		
	User manual and product documentation	Required		
	Additional Requirement	All relevant technical brochures should		

		be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents		
<b>2.70</b>	<b>Arduino Motor Shield</b>		<b>15</b>	
	Model	Specify		
	Country of Origin	Specify		
	Version	Latest		
	Operating Voltage	5V to 12V		
	Motor controller	L298P, Drives 2 DC motors or 1 stepper motor		
	Max current	2A per channel or 4A max (with external power supply)		
	Current sensing	1.65V/A		
	Warranty	Specify		
	User manual and product documentation	Required		
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents		
<b>2.71</b>	<b>Motor/Stepper/Servo Shield for Arduino Kit</b>		<b>20</b>	
	Model	Specify		
	Country of Origin	Specify		
	Version	Latest		
	Connections for high precision servo-motor	2 (5V)		
	H bridges	Nos	4	
		Current per bridge	1.2 A	
		Voltage range	4.5 V DC to 13.5 V DC	
	DC bidirectional motors velocity selection (Arduino PWM) with resolution	8 bit		
	stepper motors [unipolar or bipolar,Pulldown resistors to take the motors off at startup, Header for polar cables]	2		
	No of stackable shields	32		
	Dimensions	~70mm x 55mm x 10mm		

	Warranty	Specify		
	User manual and product documentation	Required		
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents		
<b>2.72</b>	<b>Assembled Data Logging shield for Arduino</b>		<b>20</b>	
	Model	Specify		
	Country of Origin	Specify		
	Version	Latest		
	<b>Features</b>			
	SD card interface should support	FAT16 formatted cards		
		FAT32 formatted cards		
	Real Time	Clock keeps the time going even when the Arduino is unplugged. Battery backup should last for atleast a year		
	Prototyping area soldering connectors, circuitry or sensors.	Required		
	Onboard regulator	3.3 V		
	Support	Arduino UNO, Duemilanove, Diecimila, Leonardo or ADK/Mega R3 or higher.		
	Dimensions	~70mm x 55mm x 18mm		
	Weight	<=25g		
	This board/chip interface	I2C 7-bit		
	Warranty	Specify		
	User manual and product documentation	Required		
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents		
<b>2.73</b>	<b>Android Phone to generic shield converter for Arduino</b>		<b>20</b>	
	Model	Specify		
	Country of Origin	Specify		
	Version	Latest		
	Compatible	Arduino( 5V and 3.3V boards)		
	Bluetooth module	In built		
	No of shields	>=40		

	Application for smartphone	application( in Android) full version		
	Warranty	Specify		
	User manual and product documentation	Required		
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents		
<b>2.74</b>	<b>Music Shield</b>		<b>20</b>	
	Model	Specify		
	Country of Origin	Specify		
	Version	Latest		
	Compatible	Genuino/Arduino Uno, Genuino/Arduino Mega		
	multifunction button	1		
	Supported music formats	MP3, WMA, WAV, AAC, MIDI, OggVorbis		
	Supports memory reader	Micro SD card(minimum with 2GB)		
	Headphone jack	3.5mm		
	Interface breakout	MIDI		
	MIDI Latency	Low		
	Warranty	Specify		
	User manual and product documentation	Required		
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents		
<b>2.75</b>	<b>USB Stick DSP Development Tool</b>		<b>20</b>	
	Model	Specify		
	Country of Origin	Specify		
	Fixed point low power DSP	TMS320C5505		
	Embedded emulator	XDS100		
	EEPROM with protocol	I2C		
	32-bit programmable low power stereo codec	TLV320AIC3204		
	Connectors	Line In, Headphone Out Connectors		
		Expansion connector		
	Removable USB stick enclosure			
	Full documentation	CD-ROM		

	Software	Included		
	Software	Should enable designer to readily target the DSP board(USB Stick DSP Development Tool) provided		
		A complete Integrated Development Environment (IDE), an efficient optimizing C/C++ compiler assembler, linker, debugger, integrated Code Wright editor with Code Sense technology for faster code creation, data visualization, a profiler and a flexible project manager		
		Software IDE should support windows7 to latest version of windows		
		DSP/BIOS real-time kernel		
		Chip Support Library		
	Warranty	Specify		
	User manual and product documentation	Required		
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents		
<b>2.76</b>	<b>Advanced USB Stick DSP Development Tool</b>		<b>20</b>	
	Model	Specify		
	Country of Origin	Specify		
	Fixed point low power DSP	TMS320C5515		
	Embedded emulator	XDS100		
	EEPROM with protocol	I2C		
	32-bit programmable low power stereo codec	TLV320AIC3204		
	Connectors	Line In, Headphone Out Connectors		
		Expansion connector		
		USB and SD connectors		
	Flash memory	Required		
	Full documentation	CD-ROM		
	Software	Included		
	Software	Should enable designer to readily target the DSP board(Advanced USB Stick DSP Development Tool) provided		
		A complete Integrated Development Environment (IDE), an efficient optimizing C/C++ compiler assembler, linker, debugger, integrated Code Wright editor with Code Sense technology for faster code creation, data visualization, a profiler and a flexible project manager		

		Software IDE should support windows7 to newest version of windows		
		DSP/BIOS real-time kernel		
		Chip Support Library		
	Warranty	Specify		
	User manual and product documentation	Required		
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents		
<b>2.77</b>	<b>DSP Evaluation Module</b>		<b>15</b>	
	Model	Specify		
	Country of Origin	Specify		
	Fixed point low power DSP	TMS320C5515		
	On board embedded JTAG emulation	plug-and-play functionality through just an A-to-mini B USB cable and compatibility of external JTAG emulation interface		
	Stereo codec	TLV320AIC3204 or TLV320AIC23B		
	OLED color LCD display	128x128 pixels		
	Flash and mobile SDRAM	Integrated		
	EEPROMs	I2C and SPI protocols		
	USB slave port	>=2.0version		
	Interface	RS232,MMC/SD slot, CE-ATA connector		
	User defined push button switches	>=10nos		
	Analog connectors	front end		
	Connectors for memory cards	Two expansion		
	Oscillator socket	External		
	Battery Holder	include		
	Dial	Jog dial		
	Universal power supply	+5V		
	Module should include	DSP Evaluation Board		
		Code Composer Studio™ IDE Rev. 4.0		
		Technical Reference Manual with Schematics		
		USB Cable		
		AC Power Cord(s) for this module		
	Software	Included		
	Software	Should enable designer to readily target the DSP board(DSP Evaluation Board) provided		
		A complete Integrated Development Environment (IDE), an efficient		



		optimizing C/C++ compiler assembler, linker, debugger, integrated Code Wright editor with Code Sense technology for faster code creation, data visualization, a profiler and a flexible project manager		
		DSP/BIOS real-time kernel		
		Chip Support Library		
		Software IDE should support windows7 to latest version of windows		
		Board Test Package		
	Warranty	Minimum one year		
	User manual and product documentation	Required		
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents		
<b>2.78</b>	<b>DSP Starter Kit (DSK)</b>		<b>20</b>	
	Model	Specify		
	Country of Origin	Specify		
	Kit	DSP Development Board with 512K Flash and 16MB SDRAM		
		Software IDE including the Fast Simulators and access to Analysis Toolkit on Update Advisor		
		Software IDE should support windows7 to latest version of windows		
		Quick Start Guide		
		Technical Reference		
		Customer Support Guide		
		USB Cable		
		Universal Power Supply		
		AC Power Cord(s)		
		DSP Development Board's DSP platform	TMS320C6000	
	On board embedded (Standard IEEE) JTAG emulation	plug-and-play functionality through just an A-to-mini B USB cable and compatibility of external JTAG emulation interface		
	Stereo codec	24-bit		
	3.5mm audio jacks	4(microphone, line in, speaker and line out)		
	Memory	512K words of Flash and 16 MB SDRAM		
	Plug-in modules	Expansion port connector		
	Universal power supply	+5V		
	Software	Included		
	Software:	Should enable designer to readily target the DSP Starter Kit(DSK) provided.		

		A complete Integrated Development Environment (IDE), an efficient optimizing C/C++ compiler assembler, linker, debugger, integrated Code Wright editor with Code Sense technology for faster code creation, data visualization, a profiler and a flexible project manager		
		DSP/BIOS real-time kernel		
		Chip Support Library		
		Software IDE should support windows7 to latest version of windows		
		Plug-in ability for third-party software for additional functionality		
		DSK diagnostic tool		
		Target error recovery software		
	Warranty	Minimum one year		
	User manual and product documentation	Required		
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents		
<b>2.79</b>	<b>Proteous</b>		<b>01</b>	
	Model	Specify		
	Country of Origin	Specify		
	Full package	Required		
	It should include	Proteus PCB Design Level 3		
		Advanced Simulation Features		
		Proteus VSM for AVR		
		Proteus VSM for 8051/52		
		Proteus VSM for HC11		
		Proteus VSM for BASIC Stamp		
		Proteus VSM for 8086		
		Proteus VSM for MSP430		
		Proteus VSM for PICCOLO		
		Proteus VSM for PIC Bundle 8/16bit		
		Proteus VSM for ARM Bundle		
		Proteus USB Transaction Analyser		
		Extension to 1 years USC		
	version	latest		
	windows support	Windows 7 to latest		
	Usage	all academic purposes		
	Warranty	Minimum one year		
	User manual and product documentation	Required		
	Additional Requirement	All relevant technical brochures should be		

		forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents		
<b>2.80</b>	<b>4DOF Robot Arm Kit</b>		<b>05</b>	
	Model	Specify		
	Country of Origin	Specify		
	Description	4 Degrees of freedom aluminium Robotic Arm which delivers fast, accurate, and repeatable movement.		
	Electric-gripper at the free-end	required		
	No of axis	5 + Gripper (wrist rotate)		
	Servo motion control	Local closed loop		
	Range of motion per axis	>=180 degrees		
	Accuracy of motion per axis	<= 0.09 degrees		
	Servo Voltage	6 V DC		
	Control Software	Required (at least for Windows 7 and above)		
	Software requirement	Graphical interface software which can create reusable patterns quickly and enables variable playback time		
	Load bearing with arm extended	up to 300g		
	Gripper opening	>=30 mm		
	Gripping position	Two sided		
	Controller	Servo motor (only)		
	Power supply connection	DC adapter from mains (230 V/ 50 HZ)		
	Warranty	Minimum one year		
	User manual and product documentation	Required		
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents		
<b>2.81</b>	<b>6DOF Robot Arm</b>		<b>01</b>	
	Model	Specify		
	Country of Origin	Specify		
	Construction	Standard six axis kinematic four servo joints with gear motor, encoder and $\mu$ C per joint. Two smart servos.		
	Electric-gripper at the free-end	required		

	Load bearing capacity	~400g						
	Gripper	Digital two finger gripper						
	Reach	>= 600mm (including gripper)						
	Communication	USB, internally CAN at 20 Hz						
	Power supply	DC supply via mains(230V/50Hz) adapter,						
	Digital Inputs	>= 3x24 V						
	Digital Outputs Base	>= 4 relay outputs						
	Digital Outputs Flange	Typical: 2 digital Outputs, CAN, 5V,+12V and GND for Gripper						
	Control Software	Required ( for at least Windows 7 and above)						
	Software requirement	-3D programming environment which allows to move and program the robot in an intuitive way. -Graphical and textual program editors should allow creating or adapting programs with ease. Ability to simulate all motions						
	Warranty	Minimum one year						
	User manual and product documentation	Required						
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents						
<b>2.82</b>	<b>Dual Measurement Multimeter digital</b>						<b>10</b>	
	Model	Specify						
	Country of Origin	Specify						
	Counts	>=50000						
	Dual measurement/Dual Display	Required						
	Selectable measurement speed	Required; Max. >=40 Readings/s for DC V						
	Basic DC precision	<= 0.02%						
	Auto/Manual Ranging	Required						
	True RMS measurement(AC, AC+DC)	Required						
	No. of measurement functions	>= 11						
	Temperature measurement	Required						
	<b>DC Voltage</b>							
	Range	500mV	5V	50 V	500 V	1000V		
	Resolution	10uV	100uV	1mV	10mV	100mV		
	<b>Resistance</b>							
	Range	500	5k	50k	500k	5M	50M	
	Resolution	10m	100m	1	10	100	1k	
	<b>DC Current</b>							
	Range	500uA	5mA	50mA	500mA	5A	10A	
	Resolution	10nA	100n	1uA	10uA	100u	1mA	

			A			A			
	<b>Continuity</b>								
	Range: 5000.0 $\Omega$				Resolution: 100m $\Omega$				
	<b>Diode Test</b>								
	Range: 5.0000 V				Resolution: 100 $\mu$ V				
	<b>Capacitance</b>								
	Range	5nF(0.5~1nF)/5nF(1~5nF)/ 50nF(5~10nF)/ 50nF(10~50nF)/500nF/5uF/50uF							
	Resolution	0.001nF/0.001nF/0.01nF/0.01nF/0.1nF/1nF/10nF							
	<b>Temperature</b>								
	Range: <=-200 deg C to >=+ 300 deg C				Resolution: <= 0.1 deg. C				
	Display	VFD, TowColors Display							
	Interface	USB Device, USB Host, GPIB							
	Power Source	AC 230V/ 50Hz							
	Power Consumption	Max. 15VA							
	Accessories Required	Power cord, Test lead, Temperature probe adaptor with thermocouple, USB Cable, GPIB Cable, GPIB-USB-HS							
	Warranty	Minimum one year							
	User manual and product documentation	Required							
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents							

### 3. Bidders Response

Item No	Name and Minimum Specifications		Bidder's Response		If "No" indicate the specification Offered
			Yes	No	
<b>2.1</b>	<b>Raspberry Pi Single board Linux platform</b>				
	Model	Specify			
	Country of Origin	Specify			
	Architecture	Raspberry Pi 2(B)			
	CPU	A 900MHz quad-core ARM Cortex-A7			
	RAM	1GB			
	No. of USB 2.0 ports	4			
	No. of GPIO pins	40 pins with 2 EEPROM Plate identification pins			
	Full HDMI port	required (on-board)			
	Ethernet port	required (on-board)			
	Camera interface (CSI)	required (on-board)			
	Display interface (DSI)	required (on-board)			
	Micro SD card slot	required (on-board)			
	Video core	video core IV with 3D graphics core			
	Power supply	5V			
	Supply protection	polarity protection			
		2A fuse			
		hot-swap protection			
	Warranty	Specify			
	User manual and product documentation	Required			
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents			
<b>2.2</b>	<b>Beagle Bone Single board Linux platform</b>				
	Model	Specify			
	Country of Origin	Specify			
	CPU	AM3358BZCZ100			
	Architecture	BeagleBone			
	Clock speed	1GHz			
	DRAM	512MB DDR3L 800MHZ			
	JTAG	onboard 20-pin CTI			
	Serial debug interface	Header (UART0 access via 6-pin 3.3V			

		TTL header)			
	on-board flash storage	4GB 8-bit eMMC			
	floating-point accelerator	NEON			
	32-bit microcontrollers	2 x PRU type			
	USB client for power & communication	required			
	USB host	required (2.0)			
	10/100 RJ45 Ethernet port	required			
	HDMI port	required (on-board)			
	Pin Header	92-pin header with cape compatibility			
	Power supply	5V			
	Warranty	Specify			
	User manual and product documentation	Required			
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents			
<b>2.3</b>	<b>Banana Pi Single board Linux platform</b>				
	Model	Specify			
	Country of Origin	Specify			
	SoC	ARM Cortex-A7 dual-core, 1GHz, Mali400MP2 GPU			
	Architecture	Banana Pi			
	System Memory	1GB DDR3 DRAM			
	Video output	HDMI			
		Composite			
		Extensible with on-board LVDS			
	Audio output	3.5mm stereo jack output			
		On-board microphone input			
	Connectivity	Gigabit Ethernet			
	USB	2 x USB 2.0 ports			
		1 x OTG micro USB port			
		1 x micro USB for power supply			
	Expansion	Extensible 26-pin headers			
		Camera connector,			
		Display connector for LVDS and touch screen			
	Misc.	3 x on-board buttons, (Power, Reset, Uboot key)			
		IR receiver			
	Warranty	Specify			

	User manual and product documentation	Required			
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents			
<b>2.4</b>	<b>Programmable microcontroller development board</b>				
	Model	Specify			
	Country of Origin	Specify			
	Microcontrollers	Microchip PIC16F & 18F (40 pin)			
	Dual layered PCB with SMD components	required			
	40 Pin ZIF socket(for microcontroller insertion)	required			
	LEDs (SMD)	8 (on-board)			
	Keypad	4 x 4 model			
	Real time clock	DS1307 (with battery holder)			
	Temperature sensor	DS18B20 (on-board)			
	Buzzer	required (on-board)			
	EEPROM	required (on-board)			
	IR sensor	required (on-board)			
	Seven segment display	4			
	MicroSD card slot	required			
	Potentiometer	2 x variable (0 - 5 V)			
	on-board LCD display module	16x2 Blue Character with separate brightness control			
	RS232 Connectivity	required			
	USB connectivity	required			
	On-board 5V voltage regulator	required (LM2596)			
	On board socket to insert variable Oscillator	required			
	audio output	required			
	Accessories	Crystal oscillators(4MHz,8MHz, 20MHz)			
		Micro jumpers for configuration			
		User manual/ documentation			
	Warranty	Specify			
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents.			



		Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents			
<b>2.5</b>	<b>Micro controller programmer with universal programming adapter seat, USB cable and 6 pin cable</b>				
	Model	Specify			
	Country of Origin	Specify			
	Supported microcontrollers (for both programmer and adapter seat)	Microship PIC16/18XX 40PIN Series devices (except 16F59)			
		Microship PIC16/18XX 28PIN Series devices (except 16F57)			
		Microship PIC16/18XX 18PIN Series devices			
		Microship PIC 8PIN/14PIN/20PIN family of devices (except 10FXX)			
	Real-time clock execution	Required			
	MPLAB IDE compatible	Required			
	Built-in over-voltage/short circuit monitor	required			
	Firmware upgradeable from PC/web download	required			
	Supply voltage	2 - 6 V			
	Diagnostic LED	required			
	Required functionalities	Read/Write program in data memory of microcontroller.			
		Erase the program memory and verify it.			
	Accessories	USB cable (Full speed 12 Mbits/s interface to host PC)			
		6 pin cable (connects the programmer and adapter seat)			
		User manual/documentation			

	Warranty	Specify			
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents			
<b>2.6</b>	<b>Programmable microcontroller development board with bread board included</b>				
	Model	Specify			
	Country of Origin	Specify			
	Compatible microcontroller	Microchip PIC18F4550			
	In-built power supply components	Required (on-board)			
	Internal Flash Program Memory	32 kb			
	Direct USB in-circuit programming interface	Required			
	On-board push buttons	4			
	Adjustable analog inputs	4			
	Test LEDs	4			
	Bread board (on-board)	required			
	Connectivity	RS232 and USB			
	In-circuit debugger	required with Microchip ICD2 Unit			
	Warranty	Specify			
	User manual/documentation	Required			
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures'			

		authorization should be submitted with the tender documents			
<b>2.7</b>	<b>Microcontroller starter kit with necessary software tools (builder, simulator ,emulator) and ISP programmer(USB)</b>				
	Model	Specify			
	Country of Origin	Specify			
	Device support	ATtiny series (13, 26, 2313, 45, 261, 461, 85, 861, 24, 44, 84-ISP only)			
		ATmega series (48, 8, 88, 16, 161, 162, 163, 164P, 165, 168, 169, 32, 325, 324P, 329, 644, 644P, 645, 649, 8515, 8535)			
		AT90CAN series (32, 64, 128)			
		AT90PWM series (2/3, 31)			
	Required sockets	1 x 8			
		2 x 20			
		1 x 28			
		2 x 40			
	Port Headers	0.1” (2.54mm) DIL headers for all ports, including a Vcc and Ground pin for external circuitry			
	8-way bar LED	required			
	Switches (on-board)	>= 8			
	On-board RS232 port with DB9 connector	required			
	LCD Interface connector	14-way connector			
	Compatible supply voltages	3.3V and 5V			
	Brownout circuitry	required			
	ADC interface with reference pin	required			
	External Memory	74HC573 address latch and Flash RAM sockets			
	UART connectivity	required (for peripherals)			
	Accessories	Necessary AVR device			
		ISP Parallel Port Programmer (USB)			
		. Programming lead, LED and Socket leads			
		Software tools and manuals: - Programming software - Application Builder - User Manual - Code Examples - Board schematics - Device datasheets - Atmel AVR Studio3 and 4.			

		- AVREdit IDE/Editor with AVRGCC 3.2 C Compiler				
	Warranty	Specify				
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents				
<b>2.8</b>	<b>FPGA trainer board</b>					
	Model	Specify				
	Country of Origin	Specify				
	Device (IC)	Xilinx Artix-7 FPGA (XC7A35T-1CPG236C)				
	Connectivity	USB A				
		USB micro-B				
		Four 12-pin Pmod connectors				
		VGA				
	No. of logical cells	≥33,280				
	RAM	≥1800 kb				
	clock management tiles	5 (each with a PLL)				
	DSP slices	≥90				
	Internal clock speed	450 MHz				
	On-chip analog-to-digital converters	required				
	USB-JTAG port	required				
	Required on-board items.	Serial Flash				
		USB-UART Bridge				
		12-bit VGA output				
		USB HID Host for mice, keyboards and memory sticks				
		≥16 user switches				
		≥16 user LEDs				
		≥5 user pushbuttons				
		4-digit 7-segment display				
		4 Pmod connectors				
		3 Standard 12-pin Pmod connectors				
	Accessories	User manual/ documents	Required			
		Standard USB A to micro-B cable	2.0 and above			
			5ft (nearly)			
	Warranty	Minimum one year				
	Additional Requirement	All relevant technical brochures				

		should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents			
<b>2.9</b>	<b>Transistor based voltage regulator trainer kit</b>				
	Model	Specify			
	Country of Origin	Specify			
	Demonstration circuit for Zener voltage regulation circuit	required			
	Demonstration circuit for Zener voltage regulator with series and parallel transistor	required			
	Demonstration circuit for Voltage regulator with variable output	required			
	Demonstration circuit for voltage regulator with short-circuit protection and Darlington transistor	required			
	Training manual	required			
	Power supply	15 Vdc, 750 mA			
	Warranty	Minimum one year			
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents			
<b>2.10</b>	<b>Digital combinatory logic training kit</b>				
	Model	Specify			
	Country of Origin	Specify			
	Required operations (with isolated circuit for each	adders			
		subtractors			

	operation)	multipliers			
		code converters			
		Multiplexers			
		demultiplexers			
	Minimum no. Of logic gates	-4 AND (2-input) -3 AND (3-input) -12 NAND (2-input) -4 NAND (4-input) -2 NAND TRIGGER (4-input) -4 OR (2-input) -2 OR (3-input) -1 OR (4-input) -4 NOR (2-input) -2 NOR (4-input) -4 XOR (2-input) -6 inverters -2 AOI (2 and 3 input) -12 silicon diodes -1 dual-in-line 16-pin socket			
	Power supply	5Vdc, 5W			
	Accessories	Instruction manual/ teaching material			
	Warranty	Minimum one year			
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents			
<b>2.11</b>	<b>Digital sequential logic trainer kit</b>				
	Model	Specify			
	Country of Origin	Specify			
	Required operations (with isolated circuit for each operation)	MSI circuits in TTL logic			
		synchronous and asynchronous counters			
		shift registers			
		astable and monostablemultivibrators			
		seven segment displays			
	Minimum no. Of components (used in the circuits)	<ul style="list-style-type: none"> <li>• 4 JK/MS flip-flop</li> <li>• 2 D flip-flop</li> <li>• a BCD synchronous counter</li> </ul>			

		<ul style="list-style-type: none"> <li>• a binary 4-bit synchronous counter</li> <li>• a BCD asynchronous counter</li> <li>• a binary 4-bit asynchronous counter</li> <li>• 2 monostablemultivibrators</li> <li>• a shift register, 8-bit SI-SO</li> <li>• 2 BCD 7-segment decoders</li> <li>• 2 7-segment displays</li> <li>• 2 BCD rotating switches</li> <li>• 8 capacitors</li> <li>• 2 linear potentiometers</li> </ul>			
	Power supply	5Vdc, 5W			
	Accessories	Instruction manual/ teaching material			
	Warranty	Minimum one year			
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents			
<b>2.12</b>	<b>Digital Electronic trainer kit</b>				
	Model	Specify			
	Country of Origin	Specify			
	Required operations	Basic logic circuits			
		Schmitt triggers			
		Bistablemultivibrators			
		Monostablemultivibrators			
		Code converters, coders			
		Arithmetic circuits			
		Counting circuits			
		Register circuits			
		Multiplex mode Arithmetic Logic Unit			
		Memory circuits			
		Analog-Digital converters			
	Digital-Analog converters				
	Minimum no. Of components (used in the circuits)	-4-bit comparator -4 JK-flip flops / RS flip flops -4 D-flip flops -2 adders (4-bit), with input and output carry -Multiplexer (4 channels)			

		<ul style="list-style-type: none"> <li>-Demultiplexer (4 channels)</li> <li>-Shift register (4-bit, parallel and serial operation possible, bi-directional )</li> <li>-ALU (for conducting 16 arithmetic and 16 logical computing operations with 4-bit dual numbers)</li> <li>-Binary counter (4-bit, up/down counter)</li> <li>-2 inverters</li> <li>-2 Schmitt triggers( inverting )</li> <li>-Units complements for negating a 4-bit binary number</li> <li>-Antivalence and equivalence gates</li> <li>EEPROM</li> <li>-AD/DA converter 8-bit</li> </ul>			
	Auxiliary section (on board)	8 logic probes with led for high and low level			
		8 switches with led to generate logic level			
		B192 seven segment led displays with BCD decoder			
	Accessories	Instruction manual/ teaching material			
	Warranty	Minimum one year			
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents			
<b>2.13</b>	<b>Stepper Motor Control kit</b>				
	Model	Specify			
	Country of Origin	Specify			
	Required operations	Analysis of the operation of a stepper motor			
		Analysis of the control criteria and of the power modules			
		Full step or half step			
		Variable speed rotation control			
		Inversion of the rotation direction			
	Power supply	230 Vac, 50 Hz			



	Technical features	Step angle: 1.8°			
		Number of phases: 4			
		Max. power: 16 W			
		Sense of rotation: reversible			
		Current/phase max: 1.5 A			
		Variable frequency from 20 Hz to 500 Hz through potentiometer			
	Accessories	Instruction manual/ teaching material			
	Warranty	Minimum one year			
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents			
<b>2.14</b>	<b>Universal motor control board</b>		<b>03</b>		
	Model	Specify			
	Country of Origin	Specify			
	Required features (operational)	Integrated four-quadrant display			
		Variable centrifugal mass			
		Dual-channel encoder			
		Built-in four-quadrant amplifier			
	Technical features	Linear H bridge to have full motor control			
		Dual optical sensor for speed and direction			
		Main Motor/Generator 12 V (around), 3000 rpm (around), 1.2 A (around), 3.2 Ncm (around)			
		Load to be connected to the secondary Motor/Generator			
		Shunt to limit and measure the current			
	Accessories	Instruction manual/ teaching material			
	Warranty	Minimum one year			
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on			

		where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents				
<b>2.15</b>	<b>Digital Lux meter</b>			<b>01</b>		
	Model	Specify				
	Country of Origin	Specify				
	Classification	DIN 5032-7: 1985 class B JIS C 1609-1: 2006 general AA class				
	Light receiving element	Silicon photo diode				
	Display	Display: 4 digit, 2000 count LCD				
		Display unit: lx (lux) Display update rate: 500 ms $\pm$ 20 ms				
	Preferred measurement ranges	Range	Measurement range	Display step		
		20 lx	0.00 lx to 20.00 lx	1 count/step		
		200 lx	0.0 lx to 200.0 lx			
		2000 lx	0 lx to 2000 lx			
		20000 lx	00 lx to 20000 lx	10 count/step		
	200000 lx	000 lx to 200000 lx	100 count/step			
	Range selection	Auto/Manual				
	Linearity	$\leq \pm 2\%$ rdg				
	Temperature characteristics	$\leq \pm 3\%$ rdg				
	Humidity characteristics	$\leq \pm 3\%$ rdg				
	Response time	Auto range: within 5 seconds				
		Manual range: within 2 seconds				
	Power supply	AA/LR6 alkaline battery $\times$ 2				
		R6 Manganese battery $\times$ 2				
		USB bus power 5V DC				
	Operating temperature and humidity	-10°C to 40°C (14°F to 104°F), 80% RH or less (non-condensing)				
	Storage temperature and humidity	-20°C to 50°C (-4°F to 122°F), 80% RH or less (non-condensing)				
	Applicable standards	Safety: EN61010, EMC: EN61326				
	Dustproof and waterproof	IP40 (EN60529)				
	Accessories	Instruction Manual $\times$ 1				
		AA/LR6 alkaline battery $\times$ 2				
		Sensor cap (with strap) $\times$ 1				
		Carrying case (soft) $\times$ 1				
		Strap $\times$ 1, USB cable (0.9 m) $\times$ 1				
		CD-R (USB driver)				

		dedicated computer application software communications specifications) ×1			
	Warranty	Minimum one year			
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents			
<b>2.16</b>	<b>Power Pack</b>				
	Model	Specify			
	Country of Origin	Specify			
	Supply voltage	380-400/220-230V			
	Frequency	50Hz. 3-ph.			
	Output voltage	DC fixed	220 V 3.5 A		
		DC variable	0-220 V 16 A		
		AC fixed	230/133 V 10 A 3-ph		
		AC variable	3 x 0-230 V 10 A 3-ph		
	Standard Fixed AC	230 V 10 A			
	Physical requirements	Mobile unit			
	Warranty	Minimum one year			
	User manual and product documentation	Required			
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents			
<b>2.17</b>	<b>Power Factor Control Unit</b>				
	Model	Specify			
	Country of Origin	Specify			
	Number of 3-ph groups	>= 6			
	Power factor setting	0.7 inductive to 0.7 capacitive			
	Nominal voltage	3 x 400 V,50 Hz			
	Nominal power	0 – 2 kVAr cap.			
	PF-Controller	Automatic or manual			
		Adjustable delay times, switching sequences and strategies			
	Monitoring and Measurement on the controller	Voltage			
		Current			
		Power factor			

	Switching modes	Linear and circular			
	Indication lamps	Indication lamps for the capacitor groups which are connect			
	Power supply	1-ph 220 - 240 V, 50 Hz			
	Warranty	Minimum one year			
	User manual and product documentation	Required			
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents			
<b>2.18</b>	<b>Asynchronous Wind Mill System including HVDC Light Line</b>				
	Model	Specify			
	Country of Origin	Specify			
	Minimum/maximum power by design	$\leq 0.5$ and $\geq 2.0$ kVA input			
	Magnetising capacitors	3-step selector (switch)			
	Compensating inductors	3-step selector (switch)			
	Resistiveloadbank onDC-side	continuously controlled by PWM-unit			
	3-phase rectifier block	Required			
	V-meter for AC-input	250 V AC			
	V-meter for DC-output	400 V DC			
	A-meter for AC-input	6 A AC			
	A-meter for capacitive current	6 A AC			
	A-meter for inductive current	4 A AC			
	A-meter for DC-output	6 A DC			
	Short- and long HVDC cable model	Required			
	Suitable induction machine std	$\sim 0.75 - 1.5$ kW			
	Advanced 4Q-converter including software	$>1.5$ kW			
	External alternative inputs from	3x230 V generator, ind. or synchr.			
		3x230 V power supply max 300 V DC			
	Power supply	3x400V AC,16A,50Hz			
	Warranty	Minimum one year			
	User manual and product documentation	Required			
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where			

		the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents			
<b>2.19</b>	<b>Flex Stand</b>				
	Model	Specify			
	Country of Origin	Specify			
	Height	1 – 1.5 m			
	Weight	<= 10kg			
	No. of slots	>= 12			
	Warranty	Minimum one year			
	User manual and product documentation	Required			
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents			
<b>2.20</b>	<b>Flex set</b>				
	Model	Specify			
	Country of Origin	Specify			
	No. of Leads	100			
	Area	2.5 mm <sup>2</sup>			
	No. colours	5 (Red, Yellow, Blue, Black, Yellow/Green)			
	Required Lengths	25 cm			
		50 cm			
		100 cm			
		200 cm			
	Quantity	Red	5 in each length		
		Yellow	5 in each length		
		Blue	5 in each length		
		Black	5 in each length		
		Yellow/green	5 in each length		

	Warranty	Minimum one year			
	User manual and product documentation	Required			
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents			
<b>2.21</b>	<b>Flywheel</b>				
	Model	Specify			
	Country of Origin	Specify			
	Moment of inertia	~0.4kgm <sup>2</sup>			
	Dimensions	400*300*300mm (Aprox.)			
	Weight	50 - 60kg			
	Balancing	Dynamic			
	protective casing	Required			
	Couplings	2			
	Required foundation material	Aluminium			
	Warranty	Minimum one year			
	User manual and product documentation	Required			
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents			
<b>2.22</b>	<b>TECNEL. Unit</b>				
	Model	Specify			
	Country of Origin	Specify			
	Diagram in the front panel with similar distribution of elements like in the real unit.	Required			
	Enclosure	Steel Box			
	Front panel contents:	Diode modules	>= 6 diodes		
		Thyristors module	>= 6 thyristors		
		IGBTS Module	>= 6 IGBTS		

		Snubber net	Required			
		Sensors module:	Voltage sensors $\geq 4$			
			Current sensors $\geq 2$			
		Power supply connections :	For Vr, Vs, Vt, Neutral and Ground			
		Practice schemes	Required			
	Back panel contents:	Data Acquisition Board Connector (SCSI connector)	Required			
		Tachodynamo connector	Required			
		Main fuses (Vr, Vs, Vt) and LEDs	Required			
		Circuit breaker (main switch)	Required			
	Single-phase driver and Three-phase driver	Required				
	IGBT driver	Required				
	TSI board	Required				
	PIC board	Required				
	SKHI61 board	Required				
	Relays board	$\geq 4$				
	Three-phase relays	$\geq 2$				
	Commutated power supply	Required				
	Three-phase magnetothermal	Required				
	Control Interface	Required				
	DAB(Data Acquisition Board) Requirements:	<p>-PCI Data acquisition board (National Instruments) to be placed in a computer slot</p> <p>-Bus PCI</p> <p><b>Analog input:</b></p> <p>- Number of channels <math>\geq 16</math> single-ended or <math>\geq 8</math> differential.</p> <p>-Resolution =16 bits, 1 in 65536.</p> <p>- Sampling rate up to: 250 KSPS (Kilo samples per second).</p> <p>- Input range (V) = <math>\pm 10V</math></p> <p>-Data transfers=DMA, interrupts, programmed I/O</p> <p>Number of DMA channels <math>\geq 6</math>.</p> <p><b>Analog output:</b></p> <p>-Number of channels <math>\geq 2</math></p> <p>-Resolution =16 bits, 1 in 65536</p> <p>-Maximum output rate up to: 833</p>				

		<p>KS/s -Output range (V) = <math>\pm 10V</math></p> <p>-Data transfers=DMA, interrupts, programmed I/O</p> <p><b>Digital Input/Output:</b></p> <p>-Number of channels <math>\geq 24</math> inputs/outputs.</p> <p>-DO or DI Sample Clock frequency: 0 to 1 MHz</p> <p>- Timing: Counter/timers = 2</p> <p>-Resolution <math>\geq 32</math> bits</p>			
	TECNEL/CCSOF.ComputerControl+DataAcquisition+Data Management Software:	<ul style="list-style-type: none"> <li>- Compatible with Windows operating system. Graphic and intuitive simulation of the process in screen. Compatible with the industry standards.</li> <li>- Registration and visualization of all process variables in an automatic and simultaneous way.</li> <li>- Flexible, open and multicontrol software developed with actual windows graphic systems, acting simultaneously on all process parameters.</li> <li>- Management, processing, comparison and storage of data.</li> <li>- Sampling rate up to 250,000 data per second.</li> <li>- Comparative analysis of the obtained data, after the process and modification of the conditions during the process.</li> </ul>			
	Cables and Accessories	Required (for normal operation)			
	Warranty	Minimum one year			
	Set of manuals should include:	Required Services, Assembly and Installation, Interface and Control Software, Starting-up, Safety, Maintenance, Calibration & Practices Manuals			
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents			



2.23 Pulse Generator (1)				
Model	Specify			
Country of Origin	Specify			
Frequency range	1mHz to 150 MHz			
Timing resolution	4digits ,10ps best case			
RMS jitter(period, width, delay)	0.003%+20ps			
Period range	6.65ns to 999s			
	Accuracy	±0.1%		
Variable Transitions	<= 2 ns			
Output	10 Vpp (20 Vpp) into 50 Ω			
Resolution	<= 10 ps			
Frequency Accuracy	<= 0.1%			
Pattern per Channel	4 kbit			
3 and 4 Level Signals	Required			
Output Channels	2			
Programming Commands	SCPI			
Graphic Display	Required			
Warranty	Minimum one year			
User manual and product documentation	Required			
Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents			
2.24 Power factor meter				
Model	Specify			
Country of Origin	Specify			
Three-phase instrument, symmetric load.	Required			
Measuring range	cap. 0.5 ... 1 ... 0.5 ind.			
Current range	0-5 A			
Voltage range	380 V ± 20 % 3-phase			
Frequency range	40-65 Hz			
Accuracy class	1.5			
Warranty	Minimum one year			
User manual and product documentation	Required			
Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier			

		has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents			
<b>2.25</b>	<b>Frequency meter</b>				
	Model	Specify			
	Country of Origin	Specify			
	Measuring range	~46-54 Hz			
	Accuracy class	0.5			
	Warranty	Minimum one year			
	User manual and product documentation	Required			
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents			
<b>2.26</b>	<b>Current Transformer</b>				
	Model	Specify			
	Country of Origin	Specify			
	Primary	20-10-5 A			
	Secondary	1 A			
	Accuracy class	1			
	Warranty	Minimum one year			
	User manual and product documentation	Required			
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the			

		tender documents			
<b>2.27</b>	<b>PWM DC-Machine Control Module</b>				
	Model	Specify			
	Country of Origin	Specify			
	Functional principle	1-quadrant			
	max current	6A			
	Terminal for excitation	190V/2A			
	Duty cycle	0-100%			
	Frequency	~200-1300Hz			
	Current limit	0-100%			
	Loads	R/L active and passive			
	Control signal	0-10V			
	Power supply	220-240V 1-phase AC,50Hz 3*230V 3-phase AC,50HZ			
	Warranty	Minimum one year			
	User manual and product documentation	Required			
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents			
<b>2.28</b>	<b>Drill Bench</b>				
	Model	Specify			
	Country of Origin	Specify			
	Power source:	Electrical			
	Control type	manually-controlled			
	Structure	column type			
	bench-top model	Required			
	Diameter:	Min.<= 0.8 mm Max.>= 3.2 mm			
	Voltage	230 V AC 50 Hz			
	Rotational speed	Min<=11000 rpm (69115.04 rad/min) Max>=33000 rpm (207345.12 rad/min)			
	Drilling depth	>=260 mm			
	Accessories	Set of drill bits – 3 Sets			
	Warranty	Minimum one year			
	User manual and product documentation	Required			

	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents				
<b>2.29</b>	<b>PCB shears</b>					
	Model	Specify				
	Country of Origin	Specify				
	Cutting Capacity	Max >= 305mm				
	Aluminium Cutting Capacity:	>= 1.5mm				
	External Depth:	~440mm				
	External Width:	>= 245mm				
	Cut Width Max:	>= 305mm				
	Cut Thickness for Aluminium	Max >= 1.5mm				
	Cut Thickness for PCBs	Max >= 2mm				
	Warranty	Minimum one year				
	User manual and product documentation	Required				
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents				
<b>2.30</b>	<b>Electric hand driller</b>					
	Model	Specify				
	Country of Origin	Specify				
	Input voltage	230V AC 50 Hz				
	Power input	500W				
	No load speed	~0-2800 rpm				
	Max drilling capacity:	Steel/concrete	>=12 mm			
		Wood	>=20 mm			
	Weight	~2kg				
	Accessories	3 sets of drill bits suitable for Steel (1), Concrete(1) and Wood(1) containing at least				

		50 bits each.			
	Warranty	Specify			
	User manual and product documentation	Required			
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents			
<b>2.31</b>	<b>Rheostat (4)</b>				
	Model	Specify			
	Country of Origin	Specify			
	Rating	5 kOhms, 10A			
	Tolerance	10%			
	Temperature	70 deg C maximum			
	Type	Linear or Rotary			
	Warranty	Specify			
	User manual and product documentation	Required			
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents			
<b>2.32</b>	<b>Rheostat</b>				
	Model	Specify			
	Country of Origin	Specify			
	Resistance	1000 Ohms			
	Current Rating	1 or 2 A			
	Adjustable Type	Screwdriver slot			
	Resistive Element	Wire Wound			
	Warranty	Specify			
	User manual and product documentation	Required			
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product.			

		Manufactures' authorization should be submitted with the tender documents			
<b>2.33</b>	<b>Rheostat</b>				
	Model	Specify			
	Country of Origin	Specify			
	Value	1 ohm			
	Current Rating	10 A			
	Adjustable Type	Screwdriver slot			
	Resistive Element	Wire Wound			
	Warranty	Specify			
	User manual and product documentation	Required			
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents			
<b>2.34</b>	<b>Digital and Analog Communication Trainer kit with jumper wire</b>				
	Model	Specify			
	Country of Origin	Specify			
	Experiments covered with the trainer:	RF Oscillator Circuits Design			
		Second Order Filter Circuits Design			
		AM, FM modulation and Demodulation Circuit Design			
		A/D, D/A converter circuit design			
		Pulse Width Modulation/ Demodulation Circuit Design			
		ASK, FSK, PSK QPSK modulation and demodulation circuit design			
		ASK Coherent Detection Circuit			
	Accessories	Cables: Signal Cables – 200 Nos. , Power Cables -100 Nos., Jumper cables – 40 Nos.			
	Warranty	Minimum one year			
	User manual and product documentation	Required			
	Additional Requirement	All relevant technical brochures should be forwarded with Tender			

		Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents						
<b>2.35</b>	<b>Digital Storage Oscilloscope</b>							
	Model	Specify						
	Country of Origin	Specify						
	<b>Quantity</b>	<b>1</b>	<b>4</b>	<b>5</b>				
	<b>Vertical</b>							
	Channels	2	2	2				
	Bandwidth	DC-500MHz (- 3dB)	DC-70MHz (- 3dB)	DC-150MHz (- 3dB)				
	Rise time	<= 700ps Approx.	<= 5ns Approx.	<=2.5 ns Approx.				
	Input coupling	AC, DC & Ground						
	Input Impedance	1MΩ±2%, -15pF						
	Polarity	Normal & Invert						
	Maximum Input	>= 300V (DC+AC peak), CATI						
	Waveform Signal Process	+, -, FFT						
	<b>EXT Trigger</b>							
	Range	±15V						
	Input Impedance	1MΩ±2%, ~16pF						
	<b>Signal Aquisition</b>							
	Sampling rate	Real-Time	>= 4GSa/s	>= 2GSa/s	>= 1GSa/s			
		Equivalent-Time	>= 100GSa/s	>= 100GSa/s	>= 25GSa/s			
	Vertical Resolution	8 Bits						
	Memory Length per Channel	>= 25k points	>= 2M points					
	Acquisition Mode	Normal, Peak Detect, Average						
	Peak Detect	<= 2ns			<=10ns			
	Voltage Measurement	V pp , V amp , V avg , V rms , V hi , V lo , V max , V min , Rise-Preshoot/Overshoot, Fall-Preshoot/Overshoot						
	Time Measurement	Freq, Period, Rise Time, Fall Time, Positive, Width, Negative, Width, Duty Cycle, delay measurements						
	Cursors Measurement	Voltage difference between cursors (ΔV) Time difference between cursors (ΔT)						
	Control Panel Functions							
	Save Setup	Up to 20 sets of measurement			Up to 15			

		conditions	sets.			
	Save Waveform	24 sets of waveform	15 sets.			
	USB Port for PC Connection	Required				
	Data Logger	Required				
	GPIB	Required	No			
	Power Source	240 V/ 50 Hz				
	Warranty	Minimum one year				
	User manual and product documentation	Required				
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents				
<b>2.36</b>	<b>Inductor bank</b>					
	Model	Specify				
	Country of Origin	Specify				
	Description	This is a (300j) Inductive Load Module fitted with 9 inductors in three identical groups to realise balanced or unbalanced 3-phase loads (star and delta) and single phase loads. Each phase shall be independently changed in 7 uniform steps from 0 to max current value of full load. Single phase connection provides 21 regulation steps.				
	Power variation:	0-100%				
	Duty cycle:	100%				
	Input/Outputs:	4 mm CE safety sockets				
	Unit type	Table top / frame unit				
	Warranty	Minimum one year				
	User manual and product documentation	Required				
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents				
<b>2.37</b>	<b>Resistor bank</b>					
	Model	Specify				



	Country of Origin	Specify			
	Description	This is a (300, 600,1200 ohms) Resistive Load Module fitted with 9 resistors in three identical groups to realise balanced or unbalanced 3-phase loads (star and delta) and single phase loads. Each phase can be independently varied in 7 uniform steps from 0 to max current value for full power. Single phase connection provides 21 regulation steps.			
	Power variation:	0-100%			
	Duty cycle:	100%			
	Input/Outputs:	4 mm CE safety sockets			
	Unit type:	Table top / frame unit			
	Warranty	Minimum one year			
	User manual and product documentation	Required			
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents			
<b>2.38</b>	<b>Capacitor bank</b>				
	Model	Specify			
	Country of Origin	Specify			
	Bank	Capacitor 30 P.F 300j 50V plate			
	Capacitance	0.8 ~ 1.2 uF. +/-3%			
	Rated Voltage	2,100 VAC			
	Frequency	50/60 Hz.			
	Dissipation Factor	0.0035 maximum			
	Operating Temperature	-10 to +85 degC			
	Insulation Resistance : T- C	1,000 MOhms			
	Test Voltage: T – T	T – T: 9,030 VDC for 60 seconds			
	Test Voltage: T – C	T – C: 9000 VAC 10seconds			
	Warranty	Minimum one year			
	User manual and product documentation	Required			
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the			

		supplier has supplied the product. Manufacturers' authorization should be submitted with the tender documents				
<b>2.39</b>	<b>Glue gun and sticks</b>			<b>10</b>		
	Model	Specify				
	Country of Origin	Specify				
	Description	Uses standard hot melt glue sticks				
	Power Supply	230V 50 Hz				
	Fold out stand for safety	Required				
	Trigger feed mechanism	Required				
	Compatible glue sticks	GS20DT/25DT, GS260/500				
	Included glue stick sizes	GS20DT	20			
		GS25DT	20			
		GS260	20			
		GS500	20			
	Warranty	Specify				
	User manual and product documentation	Required				
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufacturers' authorization should be submitted with the tender documents				
<b>2.40</b>	<b>Wireless Microphone set</b>					
	Model	Specify				
	Country of Origin	Specify				
	Features	Automatic frequency and interference management Secure 256 bit AES encryption				
		Speech optimized condenser microphone capsule (MME 865)				
		Remote controllable Long operation time (more than 10 hours)				
		AF frequency response	20 to 20,000 Hz			
		Signal-to-noise ratio	> 90 dB(A)			
		Modulation	GFSK with back channel			
		Transmission method	TDMA, space diversity			
	Handheld	RF output power	adaptive, up to 250 mW			
		AF frequency response	50 to 20,000 Hz			
		Mute switch	available			

Receiver	RF sensitivity	< -90 dBm			
	RF output power back channel	adaptive, up to 250 mW			
	Network socket	available			
Accessories	Handheld transmitter	3			
	MME 865 microphone capsule	3			
	BA 10 accupack	3			
	Rack Receiver (including power supply)	1			
	Rack mount kit	available			
Warranty	Minimum one year				
User manual and product documentation	Required				
Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents				

#### 2.41 Wheatstone Bridge

Model	Specify					
Country of Origin	Specify					
Description	Each set consists of a resistance bridge, three resistance decades, two precision resistors and a zero point Galvanometer					
Resistance Bridge	Scale	0-1000mm				
	Scale divisions	mm				
	Resistance wire	Length	~1m			
		Material	NiCr			
	Connection	4mm safety jacks				
	Maximum voltage	~8V				
	Maximum Current	~1.5A				
Resistance decade -1	Measurement Range	0.1 $\Omega$ to 1 $\Omega$				
	Step Size	0.1 $\Omega$				
	Max. Current	~1A				
	Accuracy	<= 1%				
Resistance decade - 2	Measurement Range	1 $\Omega$ to 10 $\Omega$				
	Step Size	1 $\Omega$				
	Max. Current	~750 mA				
	Accuracy	<= 1%				
Resistance decade -3	Measurement	10 $\Omega$ to 100 $\Omega$				

		Range			
		Step Size	10 $\Omega$		
		Max. Current	~250 mA		
		Accuracy	$\leq 0.5\%$		
	Precision resistor-1	Resistance	10 $\Omega$		
		Tolerance	$\leq 1\%$		
		Load rating	~4W		
	Precision resistor-2	Resistance	1 $\Omega$		
		Tolerance	$\leq 1\%$		
		Load rating	~4W		
	Zero Point Galvanometer	Measurement ranges	100mV DC, 30 $\mu$ A DC, 3 mA DC		
		Integrated resistance	3333 Ohm, 460 Ohm, 500 Ohm		
		Accuracy	$\pm 1.5\%$		
		Zero point	center		
		Mirrored scale	yes		
		Connection	4-mm-security sockets		
		Fuse	0.315 A HBC 380 V 50 kA		
	Accessories	Connecting leads			
	Warranty	Minimum one year			
	User manual and product documentation	Required			
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents			
<b>2.42</b>	<b>NI ELVIS II+ for LabView</b>				
	Model	Specify			
	Country of Origin	Specify			
	Included items in system configuration	<b>NI ELVIS II+</b> Workstation NI ELVISmx driver software Detachable protoboard USB cable and connection			
	NI ELVIS II+ Oscilloscope	Maximum sampling rate	100 MS/s		
	Accessories- Optional	Oscilloscope Probes (2), Courseware (Electronics and Circuits)			
	Warranty	Minimum one year			
	User manual and product	Required			

	documentation				
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents			
<b>2.43</b>	<b>Multisim Education 25 User</b>				
	Model	Specify			
	Country of Origin	Specify			
	License Type	25 Users			
	Warranty	Specify			
	User manual and product documentation	Required			
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents			
<b>2.44</b>	<b>Duplo machine</b>				
	Model	Specify			
	Country of Origin	Specify			
	Resolution	600 X 600 dpi			
	Document Size	4" x 6" (100 mm x 148 mm) to 11" x 17" (297 mm x 432 mm)			
	Image Mode	Text, Photo, Text/Photo, Pencil, Screen			
	Paper Weight	46gsm - 210 gsm			
	Colour duplication	available			
	LAN network interface	Available to print directly from computers			
	Paper supply capacity	Minimum 1000 sheets (64g/m <sup>2</sup> )			
	Print speed	60ppm – 150ppm			
		Five steps variable from the control panel (60, 80, 100, 110, 120ppm), 150ppm: Selectable from the touch panel			
	User interface	LCD Touch Panel with Progress Arrow indicators			
	Input port	USB2.0, 3.0 , Ethernet			
	Sound level (100ppm at operating position)	Less than 65dB			

	Power source	220V – 240V AC, 50Hz			
	duplex	available			
	Warranty	Minimum one year			
	User manual and product documentation	Required			
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents			
<b>2.45</b>	<b>Colour Laser Printer</b>				
	Model	Specify			
	Country of Origin	Specify			
	Processor speed	minimum 800 MHz			
	Print Speed Black	Minimum 14 ppm			
	Print Speed Colour	Minimum 14 ppm			
	Print Resolution, Black	Minimum to 600 x 600 dpi			
	Print Resolution, Colour	Minimum to 600 x 600 dpi			
	Maximum Number Of Copies	Up to 99 copies			
	Connectivity, Standard	Wireless, Ethernet direct printing USB printing			
	Compatible Operating Systems	Full software installs supported on: Microsoft Windows 7 32 bit and 64 bit or above and Windows server 2008 or above			
	Power Supply	Input voltage: 220 to 240 VAC (+/- 10%), 50 Hz (+/- 2 Hz)			
	Warranty	Minimum one year			
	User manual and product documentation	Required			
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents			
<b>2.46</b>	<b>Hot air station</b>				
	Model	Specify			
	Country of Origin	Specify			
	Description	Includes soldering iron, desoldering gun and hot air with mechanical arm			
	Power	230 V 50 Hz			

	Hot air gun	Power Consumption	Up to 500 watts			
		Temperature Range	100 deg to 480 deg C			
		Heating Element	Metal Heating Core			
	Soldering iron	Power Consumption	60 watts max			
		Heating Element	Ceramic			
		Temp Range	200 deg-480 deg C			
	Desoldering gun	Power Consumption	70 watts max			
		Temp Range	200-480 deg C			
		Number of nozzles	3 (1.2mm, 1.5mm, 1.8mm)			
	accessories	Replacement heating element for hot air gun				
		Six nozzles for hot air gun				
		Cleaning pin				
		3 nozzles for de-soldering pistol				
		And necessary items				
	Warranty	Minimum one year				
	User manual and product documentation	Required				
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents				
<b>2.47</b>	<b>Quadcopter for developers</b>					
	Model	Specify				
	Country of Origin	Specify				
	Features	Universal power and communication ports				
		Expansion bays				
		Customizable mounting and balancing				
		Adjustable arm angle for greater torque				
		50% less vibrations, rigid, strong system				
		Responsive, quick release landing pads				
		Dedicated remote controller 3.1 miles range(5km)				
		Full mobile app support				
	Performance	Enhanced GPS				
		Hovering	Vertical: 0.5 m, Horizontal:			

		Accuracy	2.5 m				
		Tilt Angle	~ 35°				
		Speed	20 m/s				
	Remote controller	Transmission Distance	~ 5km				
		Video Output	USB, Mini-HDMI				
		Power Supply	Built-in battery				
		Output Power	9 W				
	Battery	Capacity	~ 4500 mAh				
		Voltage	~ 20 V				
	Guidance	sensors	ultrasonic sensors, images and IMU readings.				
		Velocity Detection Range	0~16 m/s				
		Velocity Detection Accuracy	0.04 m/s				
		Effective Sensor Range	0.20 m ~ 20 m				
	Warranty	Minimum one year					
	User manual and product documentation	Required					
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents					
<b>2.48</b>	<b>humanoid robot</b>						
	Model	Specify					
	Country of Origin	Specify					
	<b>Description</b>	It has a humanoid shape that enables it to move and adapt to the world around it. It has at least 7 sensors for natural interaction. It is designed to be personalised.					
	Motherboard	CPU	ATOM Z350 1.6 GHz or better				
		RAM	>= 1GB				



		Flash memory	>= 2GB			
		Micro SDHC	>=8GB			
	Sensors	Force Sensitive Resistors, Inertial unit (3-axis Gyrometers with an angular speed of ~500°/s), Sonars, Joint position sensors				
	Contact and tactile sensors	Tactile Head, Chest Button, Tactile Hands, Feet Bumpers etc				
	Connectivity	at least two cameras with high resolution to recognise shapes and objects				
	Connecting	Ethernet, WiFi, USB				
	Interactions	Loudspeakers, microphones, video cameras, LEDs				
	Battery	Nominal voltage/capacity	21.6 V / 2.25 Ah			
		Charging duration	<= 3 hrs			
		Autonomy	~ 1hr use			
	Warranty	5 Years				
	User manual and product documentation	Required				
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents				
<b>2.49</b>	<b>Three phase synchronous generator</b>					
	Model	Specify				
	Country of Origin	Specify				
	salient pole rotor	Required				
	Motor/ Generator dual mode	Required				
	Nominal voltage	230 V (phase)				
	Nominal frequency	50 Hz				
	Excitation voltage	220 V DC				
	Nominal speed	~ 3000 rpm				
	Nominal power	~ 2kW (generator) / 1 kW (motor)				
	Parallel operation	The same size or a different size of this series alternator can be operated in parallel, reactive power sharing conform the standards and technical conditions				
	Excitation System	Load depended excitation with thyristor voltage regulator				
	Required Accessories	Direct coupling of motor and generator				

		shafts			
	Warranty	Minimum one year			
	User manual and product documentation	Required			
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents			
<b>2.50</b>	<b>Three phase induction motor</b>				
	Model	Specify			
	Country of Origin	Specify			
	Output Power	175 W			
	Stator Voltage (3 phase)	240/415 V – 50 Hz			
	Rotor Voltage (3 phase)	120/208 V – 50 Hz			
	Full Load Speed	1315 rpm			
	Full load current	0.48 A			
	Faceplate	Should permit delta or star configuration  Rotor winding terminals should be brought out to the faceplate			
	Possible Operations	Wound rotor induction motor, phase shifter, Single phase variable coupling motor, Asynchronous generator, frequency converter			
	Warranty	Minimum one year			
	User manual and product documentation	Required			
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents			
<b>2.51</b>	<b>Single phase motor</b>				
	Model	Specify			
	Country of Origin	Specify			
	Motor/ Generator dual mode	Required			
	Nominal voltage	220 V			
	Excitation voltage	220 V DC			
	Nominal speed	3000 rpm			

	Nominal power	2 kW			
	Warranty	Minimum one year			
	User manual and product documentation	Required			
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents			
<b>2.52</b>	<b>Synchronizing module</b>				
	Model	Specify			
	Country of Origin	Specify			
	Power supply	12/24Vdc (9.5 to 32 Vdc)			
	Consumption	max. 20W			
	Ambient temperature (storage)	~20 to 80 °C			
	Ambient temperature (operation)	~20 to 70 °C			
	Ambient humidity	RH 95 %, non-condensing			
	Voltage AC input	480Vac true RMS			
	Accuracy	Class 1			
	Current AC input	1A or 5A true RMS, isolated			
	Accuracy Iac	Class 1			
	Discrete inputs (isolated)	Range: 12/24Vdc (6 to 32Vdc)			
	Relay outputs	Relays, dry contacts			
	Load (resistive)	2A @24Vdc and 250Vac			
	Analog inputs	0/4 to 20mA			
	Analog outputs (isolated)	0/4 to 20 mA (freely scalable)			
	<b>Housing</b>				
	Front panel mounting	Plastic housing			
	Sealing (front/back)	IP42/IP21			
	Warranty	Minimum one year			
	User manual and product documentation	Required			
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents			

2.53 Optical fibre training kit				
Model	Specify			
Country of Origin	Specify			
<b>Fibre cleaver</b>				
Cladding diameter	125µm			
Fiber count/Size	Single fiber (for fiber coating ø0.25~ø0.9mm)			
Cleave length	5~20mm (for fiber coating ø0.25mm)			
	10~20mm (for fiber coating ø0.9mm)			
Off-cut collector	Required			
Automatic blade rotation	Required			
Blade life	>= 60,000fibers			
<b>Fusion splicer</b>				
Material	Silica glass			
Fiber count / Profile types	Single/SMF(G.652), MMF(G.651), DSF(G.653), NZDSF(G.655), BIF(G.657), EDF			
Fiber diameter	Cladding diameter: ~80 - 150um, Coating diameter : ~100 - 1,000um			
Cleave length	5 - 16mm with coating clamp			
Splice loss (typical)	SMF : ~0.01dB, MMF : ~0.01dB, DSF : ~0.05dB, NZDSF : ~0.03dB			
Return loss (typical)	60dB or greater			
Splice time (typical)	6sec(SM G652), 7sec(SM G652 Std. Mode)			
Heating time (typical)	14sec ( Slim 60mm - Quick Mode )			
Splice & Heat cycles per battery full charge"	Approx. 250			
Fiber view & magnification	2 CMOS cameras preferred, ~ 520X (zoom : 700X) for X or Y single axis view, ~88X for both X & Y dual axis view			
Splice programs	Max. >= 300			
Heating programs	Max. >= 100			
Splice image capture / splice data storage	>= 200 images / 10,000 splice data internal memory, >= 50,200/20,000 (with 8GB SD card)			
Attenuation splicing	0.1dB to 15dB in 0.1dB increments			
Universal clamps	Required,( 250um, 900um tight & loose buffer fiber)			
Reversible coating clamps	Required			
Automatic fiber identification	Required			
USB port	Required			
Battery pack and charger	Required			
Power Supply	230V, 50 Hz			
Required Accessories	AC adapter (1), AC power cord(1), Cooling tray(1), Spare electrode(1), Carrying case with worktable(1), Hand strap (1), USB Cable (1), V-groove cleaning brush (1), Loose tube cutter (1), Alcohol dispenser (1), Fibre			

		protection sleeve(60mm,40mm,61mm) (100 each), Jacket Remover(1), Hot Jacket Remover(1), Handheld fiber cleaver (1), Cable stripper(1), Fiber Holders(For 0.25mm single fiber, 0.9mmsingle fiber, 0.9mm loose buffered single fiber, fro drop/indoor cable-typ.2.0x3.1 or 2.6mm, indoor cable-typ.1.6x2.0mm , 3mm cable)			
	Warranty	Minimum one year			
	User manual and product documentation	Required			
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents			
<b>2.54</b>	<b>UV Laser based PCB machine</b>				
	<b>Purpose</b>	Multipurpose rapid prototyping (ex: structuring, engraving, and depaneling in one pass)			
	<b>Technical specifications</b>				
	Model	Specify			
	Country of Origin	Specify			
	Laser	Ultraviolet			
	accuracy	2 um			
	Laser power	~5W			
	diameter of focused LASER beam	~20 um			
	LASER wavelength	355 nm			
	LASER pulse frequency	~25 - 200 kHz			
	allowable PCB board size	L 230 mm W 300 mm H 10 mm			
	Software	Required (at least compatible with Windows 7 and above)			
		Efficient CAM software which can import existing CAD data and converts them into laser process.			
	<b>Additional tools</b>				
	Dust extraction unit	Required (compatible unit)			
	Compressor system compressed air supply	Required (compatible unit)			
	Adjustment tool	Required (compatible unit)			
	Measuring microscope	Required (~x60)			
	Warranty	Minimum three year			
	User manual and product documentation	Required			
	Additional Requirement	All relevant technical brochures should			

		be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents			
<b>2.55</b>	<b>Reflow oven</b>				
	Purpose	RoHS compliant lead-free reflow soldering			
	<b>Technical specifications</b>				
	Model	Specify			
	Country of Origin	Specify			
	allowable PCB board size	~ L 230mm W 300mm			
	maximum preheat temperature/time	220 deg. C / ~999 s			
	maximum reflow temperature/time	320 deg. C/ ~600 s			
	Long thermal treatment: temperature/time	220 deg. C/ ~64 hours			
	temperature stabilizing time	less than 5 min.			
	PCB cooling method	Required: Two fans with adjustable speed			
	Power Supply	230V, 50Hz			
	Max. Power consumption	<= 3.2 kW			
	Operating conditions	Temp ~15-30 deg.C, Humidity:~ 30-80%			
	Software	Required (at least compatible with Windows 7 and above)			
		-Process control and analysis			
	USB interface	Required			
	Required accessories	Temperature indicating device			
	Warranty	Minimum one year			
	User manual and product documentation	Required			
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents			
<b>2.56</b>	<b>Altera FPGA Starter Development Kit</b>				
	Model	Specify			

	Country of Origin	Specify			
	<b>Configuration</b>	USB-Blaster™ download cable (embedded)			
		EPCS4 serial configuration device			
	<b>Memory</b>	8-Mbyte SDRAM			
		512-Kb SRAM			
		1- to 4-Mbyte flash			
	Clocking	SMA connector (external clock input)			
	Audio	24-bit coder/decoder (CODEC)			
	<b>Switches and indicators</b>	Ten switch and four push buttons			
		Four, 7-segment displays			
		Ten red and eight green LEDs			
	<b>Connectors</b>	VGA, RS-232, and PS/2 ports			
		Two 40-pin expansion ports			
		SD/MMC socket			
	Cables/power	USB cable			
		External power supply			
	HDL design software	Quartus II			
	Other required accessories	Reference guide, User manual, Reference designs and demo for FPGA Starter Kit			
	Warranty	Minimum one year			
	User manual and product documentation	Required			
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents			
<b>2.57</b>	<b>Signal Generators</b>				
	Model	Specify			
	Country of Origin	Specify			
	Frequency Range	0.5Hz ~ 5MHz			
	Amplitude	>10Vpp (into 50Ω load)			
	Impedance	50Ω±10%			
	Attenuator	-20dB±1dBx2			
	DC Offset	<-5V ~ >5V (into 50Ω load)			
	Duty Control	80% ~ 20%, maximum 1MHz (continuously adjustable)			
	<b>Sine wave</b>				
	Distortion	< 1%, 0.5Hz ~ 100kHz			
	THD (Total Harmonic Distortion)	< 30dB, below fundamental in all ranges, from Max to 1/10 level			
	Flatness	< 0.3dB, below 500kHz < 1dB, below 5MHz			

<b>Triangle Wave</b>				
Linear	> 98%, 0.5Hz ~ 100kHz > 95%, 100kHz ~ 5MHz			
<b>SQUARE WAVE</b>				
Symmetry	±2%, 1Hz ~ 100kHz			
Rise or Fall Time	< 50nS at maximum output (into 50Ω load)			
<b>CMOS OUTPUT</b>				
Level	4Vpp±1Vpp ~ 14.5Vpp±0.5Vpp adjustable			
Rise or Fall Time	< 120nS			
<b>TTL OUTPUT</b>				
Level	> 3Vpp			
Fan Out	20 TTL load			
Rise or Fall Time	< 25nS			
<b>VCF (Voltage Controlled Frequency)</b>				
Input Voltage	0V ~ 10V±1V (100 : 1)			
Input Impedance	10kΩ±10%			
<b>GCV (Generator Controlled Voltage)</b>				
Output Voltage	Sets the voltage between 0V ~ 2V according to the frequency			
<b>SWEEP OPERATION</b>				
Sweep Selection	Switch selector			
Sweep Rate	Maximum 100 : 1, adjustable			
Sweep Time	0.5sec ~ 30sec, adjustable			
Sweep Mode	Lin/Log switch selector			
<b>AMPLITUDE MODULATION</b>				
Depth	0 ~ 100%			
MOD. Frequency	400Hz (INT), DC ~ 1MHz(EXT)			
Carrier Bandwidth	100Hz ~ 5MHz (-3dB)			
EXT Sensitivity	< 10Vpp for 100% modulation			
<b>FREQUENCY COUNTER</b>				
INT/EXT	Switch selector			
Range	0.5Hz ~ 5MHz (5Hz ~ 150MHz EXT)			
Accuracy	Time base accuracy±1 count			
Time Base	±20ppm(23° C ± 5° C)after 30 minutes warm up OR better			
Resolution	100nHz for 1Hz, 1Hz for 100MHz OR better			
Input Impedance	1MΩ // 150pF			
Sensitivity	< 35mVrms (5Hz ~ 100MHz) < 45mVrms (100MHz ~ 150MHz)			
<b>POWER SOURCE</b>				
Warranty	Minimum one year			
User manual and product documentation	Required			
Additional Requirement	All relevant technical brochures should			



		be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents			
<b>2.58</b>	<b>Spectrum Analyzer</b>				
	Model	Specify			
	Country of Origin	Specify			
	Frequency Range	9 kHz to 3.0 GHz			
	Resolution	1 Hz			
	<b>Frequency Reference:</b>				
	Aging Rate	$\leq \pm 2$ ppm max.			
	Frequency Stability over Temperature	$\leq \pm 0.025$ ppm (0 to 50 °C )			
	Supply Voltage Stability	$\leq \pm 0.02$ ppm			
	<b>Frequency Readout Accuracy :</b>				
	Sweep points	Span $\geq 100$ Hz (601) Span = 0 Hz (6 to 601)			
	<b>Marker Frequency Counter :</b>				
	Resolution	1 Hz, 10 Hz, 100 Hz, 1 kHz			
	Accuracy related	RBW/Span $\geq 0.02$ Mkr level to DNL $> 30$ dB			
	<b>Frequency Span :</b>				
	Range	0 Hz (zero span), 100 Hz to 3 GHz			
	Resolution	1 Hz			
	<b>Phase Noise :</b>				
	Offset from Carrier	Fc = 1 GHz; RBW = 1 kHz, VBW = 10 Hz; Average $\geq 40$			
	10 kHz	$< -88$ dBc/Hz			
	100 kHz	$< -95$ dBc/Hz			
	1 MHz	$< -113$ dBc/Hz			
	<b>Resolution Bandwidth (RBW) Filter :</b>				
	Filter Bandwidth	1 Hz to 1 MHz in 1-3-10 sequence (-3dB bandwidth ) 200 Hz, 9 kHz, 120 kHz, 1 MHz (-6dB bandwidth )			
	Accuracy:	$\leq \pm 8\%$ , RBW = 1 MHz $\leq \pm 5\%$ , RBW $< 1$ MHz			
	Shape Factor	$< 4.5:1$			
	Video Bandwidth (VBW) Filter	1 Hz to 1 MHz in 1-3-10 sequence (-3dB bandwidth )			
	<b>Amplitude Range:</b>				
	100 kHz to 1 MHz	Displayed Average Noise Level (DANL) to 18 dBm			
	1 MHz to 10 MHz	DANL to 21 dBm			

	10 MHz to 3 GHz	DANL to 30 dBm			
	Input Attenuator Range :	0 to 50 dB, in 1 dB step (Auto or manual setup)			
	<b>Maximum Safe Input Level :</b>				
	Average Total Power	$\geq 33$ dBm			
	DC Voltage	$\pm 50$ V			
	<b>1 dB Gain Compression :</b>				
	Total Power at 1st Mixer	$> 0$ dBm			
	Total Power at the Preamp	$> -22$ dBm			
	<b>Displayed Average Noise Level (DANL) :</b>				
	Preamp off	(@Setting: 0 dB attenuation; RF Input is terminated with a 50 Ohm load. RBW 10 Hz; VBW 10 Hz; span 500 Hz; reference level = -60dBm; trace average $\geq 40$ )  9 kHz to 100 kHz, $< -93$ dBm  100 kHz to 1 MHz, $< -90$ dBm - 3 x (f/100 kHz) dB  1 MHz to 10 MHz, $< -122$ dBm  10 MHz to 3 GHz, $< -122$ dBm			
	Preamp on	(@Setting: 0 dB attenuation; RF Input is terminated with a 50 Ohm load. RBW 10 Hz; VBW 10Hz; span 500 Hz; reference level = -60dBm; trace average $\geq 40$ )  100 kHz to 1 MHz, $< -108$ dBm - 3 x (f/100 kHz) dB  1 MHz to 10 MHz, $< -142$ dBm  10 MHz to 3 GHz, $< -142$ dBm + 3 x (f/1 GHz) dB			
	<b>Internal Data storage</b>	$\geq 16$ MB nominal			
	<b>Warm-up Time</b>	$< 30$ minutes			
	<b>Temperature Range</b>	+5 °C to +45 °C (Operating) or better -20 °C to + 70 °C (Storage ) or better			
	<b>Tracking Generator:</b>				
	Frequency Range	100 kHz to 3 GHz			
	Output Power	-50 dBm to 0 dBm in 0.5 dB steps			
	Absolute Accuracy	$\pm 0.5$ dB			
	Output Flatness	Referenced to 160 MHz, -10 dBm 100 kHz to 2 GHz : $\pm 1.5$ dB 2 GHz to 3 GHz: $\pm 2.0$ dB			
	Output Level Switching Uncertainty	$\pm 0.8$ dB			
	Harmonics	$< -30$ dBc			
	Reverse Power	+30 dBm max.			

	Connector type	N-type female			
	Impedance	50 ohm			
	Output VSWR	< 1.6:1 (when source attenuation is 12dB)			
	<b>Front Panel Input/output</b>	RF Input Power for Option USB Host MicroSD Socket			
	<b>Rear Panel Input/output</b>	Reference Output Reference Input Alarm Output Trigger Input/ Gated Sweep Input LAN TCP/IP Interface USB Device IF Output Earphone Output RS232 Interface GPIB Interface AC Power Input Battery Pack (Optional)			
	Warranty	Minimum one year			
	User manual and product documentation	Required			
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents			
<b>2.59</b>	<b>Arbitrary Waveform Generator</b>		<b>02</b>		
	Model	Specify			
	Country of Origin	Specify			
	Maximum frequency	120MHz			
	Channels	2			
	Memory	Volatile: >=64 MSa/Channel, Non-Volatile: >=950 MB in file system			
	Waveforms	Standard(Sine, Square, Ramp, Pulse, Triangle, Gaussian Noise, PRBS (Pseudorandom Binary Sequence), DC), Built-in arbitrary(Cardiac, Exponential Fall, Exponential Rise, Gaussian Pulse, Haversine, Lorentz, D-Lorentz, Negative Ramp, Sinc), User-defined arbitrary (with muti-segment sequencing)			
	Operating Modes	Continuous, Modulate, Frequency Sweep, Counted Burst, Gated Burst			

	Modulation Types	AM, FM, PM, FSK, BPSK, PWM, Sum (carrier + modulation)				
	Interfaces	10/100Base-T (Sockets & VXI-11 protocols), USB 2.0 (USB-TMC488 protocol), GPIB/IEEE-488.1, IEEE-488.2				
	Web user interface for remote operation and monitoring	Required				
	Display	Color TFT, at least WQVGA (480x272) with LED backlight				
	Waveform Characteristics (Sine)	Resolution: 1- $\mu$ Hz				
		Harmonic distortion( for freq>10MHz and Vout=10Vpp): $\leq$ -39dBc				
		Phase Noise (@100kHz offset and freq 120MHz): $\leq$ -125 dBc				
	Waveform Characteristics (Square and pulse)	Duty cycle: 0.01% to 99.99%, resolution: 0.01%				
	Waveform output characteristics	Connector: Front-panel BNC, shell and pin isolated from chassis ( $\pm$ 42 V maximum); Function: On, Off, or Inverted; Output impedance (nom:) 50 $\Omega$ ; Overload protection: required				
	<b>Two channel characteristics</b>	Operating modes	Independent, Coupled parameter(s), Combined (Ch 1 + Ch 2), Equal (Ch 1 = Ch 2), or Differential (Ch 1 = -Ch 2)			
		IQ Player	Required			
	Output characteristics	Connector: Rear-panel BNC, chassis-referenced ; Frequency (nom): 10 MHz ; Level (nom) 0 dBm (632 mVpp) into 50 $\Omega$ ; Impedance(nom): 50 $\Omega$				
	Power source	230 V AC, 50 Hz				
	Warranty	Minimum one year				
	User manual and product documentation	Required				
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents				
<b>2.60</b>	<b>Transmission Line trainer</b>					
	Model	Specify				
	Country of Origin	Specify				
	Display	LED columns indicating positive and negative voltages at 13 positions.				

	Propagation time	Switch 0.25, 0.5, 2 s at zero attenuation, representing line lengths L, 2L, 8L respectively.			
	Attenuation	Simulates attenuation due to the lines series resistance. Continuously variable.			
	Step input	A centre-stable 2-way switch applies a signal to either end of the line.			
	Line impedance	~600Ω			
	Plug-in terminations	short-circuit link (2)			
	Matched load :				
		Resistive loads (unmatched: low ~50Ω, medium ~200Ω, high ~1.8kΩ, large ~100kΩ)			
		Capacitive Load ~100μF nominal (reversible electrolytic)			
	Hold	Signals on the line are held at the instant of switching			
	Power supply	240V 50Hz			
		Fuse : Required			
	Additional materials	Manual of practical demonstrations and assignments, covering all the important aspects of these characteristics			
	Warranty	Minimum one year			
	User manual and product documentation	Required			
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents			
<b>2.61</b>	<b>Analog Multimeter</b>				
	Model	Specify			
	Country of Origin	Specify			
	DCV (Range selection)	0.1/0.5/2.5/10/50/250/1000V			
	ACV(Range selection)	10/50/250/1000V			
	DCA(Range selection)	50μ/ 2.5m/ 25m/250mA			
	Ω(Range selection)	2k/20k/200k/2M(×1/ ×10/ ×1k)/200M (x100k)			
	LI- Load Current(Range selection)	1.5μ/150μ/1.5m/15m/150mA			
	Decibel (Range)	<=-10dB to >=+22dB for 10VAC upto>= +62dB			
	DC high voltage	>=25kV			

	hFE	1000 at x10 range or better			
	Fuse	Required (250V/0.5A)			
	Operating conditions	0deg C-40 deg C, 25%-80%RH			
	Power source	R6(IEC) or UM-3 (1.5V)x2			
	Drop shock proof	Required			
	Protective body cover	Required			
	Required Accessories	High voltage probe, hFE probe, Clip adapters			
	Warranty	Specify			
	User manual and product documentation	Required			
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents			
<b>2.62</b>	<b>Genuino Starter Kit (Original)</b>				
	Model	Specify			
	Country of Origin	Specify			
	Each Kit should include	<ul style="list-style-type: none"> <li>- Arduino Projects Book (170 pages) (1 No)</li> <li>- Arduino / GenuinoUnoboard(latest version)(1 No)</li> <li>- USB cable (1 No)</li> <li>- Breadboard 400 points (1 No)</li> <li>- Easy-to-assemble wooden base (1 No)</li> <li>- 9v battery snap (1 No)</li> <li>- Solid core jumper wires (70 Nos)</li> <li>- Stranded jumper wires (2 Nos)</li> <li>- Photoresistor [VT90N2 LDR] (6 Nos)</li> <li>- Potentiometer 10kilohm (3 Nos)</li> <li>- Pushbuttons (10 Nos)</li> <li>- Temperature sensor [TMP36] (1 No)</li> <li>- Tilt sensor (1 No)</li> <li>- alphanumeric LCD (16x2 characters) (1 No)</li> <li>- LED (bright white) (1 No)</li> <li>- LED (RGB) (1 No)</li> <li>- LEDs (red) (8 Nos)</li> <li>- LEDs (green) (8 Nos)</li> <li>- LEDs (yellow) (8 Nos)</li> </ul>			

		<ul style="list-style-type: none"> <li>- LEDs (blue) (3 Nos)</li> <li>- Small DC motor 6/9V (1 No)</li> <li>- Small servo motor (1 No)</li> <li>- Piezo capsule [PKM17EPP-4001-B0] (1 No)</li> <li>- H-bridge motor driver [L293D] (1 No)</li> <li>- Optocouplers [4N35] (2 Nos)</li> <li>- Transistor [BC547] (5 Nos)</li> <li>- Mosfet transistors [IRF520] (2 Nos)</li> <li>- Capacitors 100nF (5 Nos)</li> <li>- Capacitors 100uF (3 Nos)</li> <li>- Capacitor 100pF (5 Nos)</li> <li>- Diodes [1N4007] (5 Nos)</li> <li>- Transparent gels (red, green, blue) 3 Nos)</li> <li>- Male pins strip (40x1) (1 No)</li> <li>- Resistors 220 ohm (20 Nos)</li> <li>- Resistors 560 ohm (5 Nos)</li> <li>- Resistors 1 kilohm (5 Nos)</li> <li>- Resistors 4.7 kilohm (5 Nos)</li> <li>- Resistors 10 kilohm (20 Nos)</li> <li>- Resistors 1 megohm (5 Nos)</li> <li>- Resistors 10 megohm (5 Nos)</li> <li>- 9V Rechargeable battery (1 No)</li> </ul>			
	User manual and product documentation	Required			
	Warranty	Specify			
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents			
<b>2.63</b>	<b>Arduino MEGA 2560 / Genuino MEGA 2560 (Original)</b>				
	Model	Specify			
	Country of Origin	Specify			
	Version	Latest			
	Microcontroller	ATmega2560			
	Operating Voltage	5V			
	Input Voltage (recommended)	7-12V			
	Input Voltage (limit)	6-20V			
	Digital I/O Pins	54 (of which 15 provide PWM output)			
	Analog Input Pins	16			

	DC Current per I/O Pin	20 mA			
	DC Current for 3.3V Pin	50 mA			
	Flash Memory	256 KB of which 8 KB used by bootloader			
	SRAM	8 KB			
	EEPROM	4 KB			
	Clock Speed	16 MHz			
	Warranty	Specify			
	User manual and product documentation	Required			
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents			
<b>2.64</b>	<b>Arduino Due(Original)</b>				
	Model	Specify			
	Country of Origin	Specify			
	Version	Latest			
	Microcontroller	AT91SAM3X8E			
	Operating Voltage	3.3V			
	Input Voltage	7-12V			
	Input Voltage (limits)	6-16V			
	Digital I/O Pins	54 (of which 12 provide PWM output)			
	Analog Input Pins	12			
	Analog Output Pins	2 (DAC)			
	Total DC Output Current on all I/O lines	130 mA			
	DC Current for 3.3V Pin	800 mA			
	DC Current for 5V Pin	800 mA			
	Flash Memory	512 KB all available for the user applications			
	SRAM	96 KB (two banks: 64KB and 32KB)			
	Clock Speed	84 MHz			
	Length	~100 mm			
	Width	~55 mm			
	Weight	<40 g			
	Warranty	Specify			
	User manual and product documentation	Required			
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the			



		supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents			
<b>2.65</b>	<b>Arduino ZERO/ Genuino ZERO(Original)</b>				
	Model	Specify			
	Country of Origin	Specify			
	Version	Latest			
	Microcontroller	ATSAMD21G18, 32-Bit ARM Cortex M0+			
	Operating Voltage	3.3V			
	PWM Pins	All but pins 2 and 7			
	UART	2 (Native and Programming)			
	Digital I/O Pins	20			
	Analog Input Pins	6, 12- bit ADC channels			
	Analog Output Pins	1, 10-bit (DAC)			
	Flash Memory	256 kB			
	SRAM	32 kB			
	Clock Speed	48 MHz			
	Warranty	Specify			
	User manual and product documentation	Required			
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents			
<b>2.66</b>	<b>ArduinoYún(Original)</b>				
	Model	Specify			
	Country of Origin	Specify			
	Version	Latest			
	<b>AVR Arduino microcontroller</b>				
	Microcontroller	ATmega32U4			
	Operating Voltage	5V			
	Input Voltage	5			
	Digital I/O Pins	20			
	PWM Channels	7			
	Analog Input Pins	12			
	DC Current per I/O Pin	40 mA			
	DC Current for 3.3V Pin	50 mA			
	Flash Memory	32 KB (of which 4 KB used by			

		bootloader)			
	SRAM	2.5 KB			
	EEPROM	1 KB			
	Clock Speed	16 MHz			
	<b>Linux Microprocessor</b>				
	Processor	Atheros AR9331			
	Architecture	MIPS @400MHz			
	Operating Voltage	3.3V			
	Ethernet	IEEE 802.3 10/100Mbit/s			
	WiFi	IEEE 802.11b/g/n			
	USB Type-A	2.0 Host			
	Card Reader	Micro-SD only			
	RAM	64 MB DDR2			
	Flash Memory	16 MB			
	SRAM	2.5 KB			
	EEPROM	1 KB			
	Clock Speed	16 MHz			
	Warranty	Specify			
	User manual and product documentation	Required			
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents			
<b>2.67</b>	<b>ArduinoWiFi Shield(Original)</b>				
	Model	Specify			
	Country of Origin	Specify			
	Version	Latest			
	On board indicators	The shield contains a number of informational LEDs as stated below			
		LINK (green) : indicates a connection to a network			
		ERROR (red): indicates when there is a communication error			
		DATA (blue): indicates data being transmitted/received			
	Operating voltage	5V (supplied from the Arduino Board)			
	Compatibility	Arduino Due			
	Connection	802.11b/g networks			
	Encryption types	WEP and WPA2 Personal			
	Interface	SPI port			
	Additional memory slot	on-board micro SD slot			
	Programmer	ICSP headers			

	serial debugging	FTDI connection for serial debugging of WiFi shield			
	Update	Mini-USB for updating WiFi shield firmware			
	Warranty	Specify			
	User manual and product documentation	Required			
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents			
<b>2.68</b>	<b>Arduino Ethernet Shield WITH PoE Module(Original)</b>				
	Model	Specify			
	Country of Origin	Specify			
	Version	Latest			
	<b>Technical specifications</b>				
	Length	~70 mm			
	Width	~55 mm			
	Operating voltage	5V (supplied from the ArduinoBoard)			
	Ethernet Controller	W5100 with internal 16K buffer			
	Connection speed	10/100Mb			
	communicate with controller	SPI port			
	<b>Power over Ethernet (PoE) module should have been designed to extract power from a conventional twisted pair Category 5 Ethernet cable</b>				
	IEEE802.3af compliance	Required			
	Maximum output ripple and noise	100mVpp			
	Input voltage range	36V to 57V			
	protection	Overload and short-circuit			
	Output	9V			
	Efficiency of DC/DC converter	Typ 75% @ 50% load			
	Isolation (input to output)	>=1500V			
	Warranty	Specify			
	User manual and product documentation	Required			
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be			

		submitted with the tender documents			
<b>2.69</b>	<b>Arduino GSM Shield</b>				
	Model	Specify			
	Country of Origin	Specify			
	Version	Latest			
	Board support	Arduino Uno			
		ArduinoMega			
		Arduino Mega ADK			
		Leonardo.			
	Onboard Indicators				
	On	shows the Shield gets power			
	Status	Turns on to when the modem is powered and data is being transferred to/from the GSM/GPRS network.			
	Net	Blinks when the modem is communicating with the radio network.			
	Warranty	Specify			
	User manual and product documentation	Required			
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents			
<b>2.70</b>	<b>Arduino Motor Shield</b>				
	Model	Specify			
	Country of Origin	Specify			
	Version	Latest			
	Operating Voltage	5V to 12V			
	Motor controller	L298P, Drives 2 DC motors or 1 stepper motor			
	Max current	2A per channel or 4A max (with external power supply)			
	Current sensing	1.65V/A			
	Warranty	Specify			
	User manual and product documentation	Required			
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on wherethe supplier has supplied the product, Recommendation letter about the product from the institutions where the			

		supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents			
<b>2.71</b>	<b>Motor/Stepper/Servo Shield for Arduino Kit</b>				
	Model	Specify			
	Country of Origin	Specify			
	Version	Latest			
	Connections for high precision servo-motor	2 (5V)			
	H bridges	Nos	4		
		Current per bridge	1.2 A		
		Voltage range	4.5 V DC to 13.5 V DC		
	DC bidirectional motors velocity selection (Arduino PWM) with resolution	8 bit			
	stepper motors [unipolar or bipolar, Pulldown resistors to take the motors off at startup, Header for polar cables]	2			
	No of stackable shields	32			
	Dimensions	~70mm x 55mm x 10mm			
	Warranty	Specify			
	User manual and product documentation	Required			
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents			
<b>2.72</b>	<b>Assembled Data Logging shield for Arduino</b>				
	Model	Specify			
	Country of Origin	Specify			
	Version	Latest			
	<b>Features</b>				
	SD card interface should support	FAT16 formatted cards			
		FAT32 formatted cards			
	Real Time	Clock keeps the time going even when the Arduino is unplugged.			
		Battery backup should last for atleast a year			
	Prototyping area soldering connectors, circuitry or sensors.	Required			
	Onboard regulator	3.3 V			

	Support	Arduino UNO, Duemilanove, Diecimila, Leonardo or ADK/Mega R3 or higher.			
	Dimensions	~70mm x 55mm x 18mm			
	Weight	<=25g			
	This board/chip interface	I2C 7-bit			
	Warranty	Specify			
	User manual and product documentation	Required			
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents			
<b>2.73</b>	<b>Android Phone to generic shield converter for Arduino</b>				
	Model	Specify			
	Country of Origin	Specify			
	Version	Latest			
	Compatible	Arduino( 5V and 3.3V boards)			
	Bluetooth module	In built			
	No of shields	>=40			
	Application for smartphone	application( in Android) full version			
	Warranty	Specify			
	User manual and product documentation	Required			
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents			
<b>2.74</b>	<b>Music Shield</b>				
	Model	Specify			
	Country of Origin	Specify			
	Version	Latest			
	Compatible	Genuino/Arduino Uno, Genuino/Arduino Mega			
	multifunction button	1			
	Supported music formats	MP3, WMA, WAV, AAC, MIDI, OggVorbis			
	Supports memory reader	Micro SD card(minimum with 2GB)			
	Headphone jack	3.5mm			

	Interface breakout	MIDI			
	MIDI Latency	Low			
	Warranty	Specify			
	User manual and product documentation	Required			
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents			
<b>2.75</b>	<b>USB Stick DSP Development Tool</b>				
	Model	Specify			
	Country of Origin	Specify			
	Fixed point low power DSP	TMS320C5505			
	Embedded emulator	XDS100			
	EEPROM with protocol	I2C			
	32-bit programmable low power stereo codec	TLV320AIC3204			
	Connectors	Line In, Headphone Out Connectors			
		Expansion connector			
	Removable USB stick enclosure				
	Full documentation	CD-ROM			
	Software	Included			
	Software	Should enable designer to readily target the DSP board(USB Stick DSP Development Tool) provided			
		A complete Integrated Development Environment (IDE), an efficient optimizing C/C++ compiler assembler, linker, debugger, integrated Code Wright editor with Code Sense technology for faster code creation, data visualization, a profiler and a flexible project manager			
		Software IDE should support windows7 to latest version of windows			
		DSP/BIOS real-time kernel			
		Chip Support Library			
	Warranty	Specify			
	User manual and product documentation	Required			
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the			

		supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents			
<b>2.76</b>	<b>Advanced USB Stick DSP Development Tool</b>				
	Model	Specify			
	Country of Origin	Specify			
	Fixed point low power DSP	TMS320C5515			
	Embedded emulator	XDS100			
	EEPROM with protocol	I2C			
	32-bit programmable low power stereo codec	TLV320AIC3204			
	Connectors	Line In, Headphone Out Connectors			
		Expansion connector			
		USB and SD connectors			
	Flash memory	Required			
	Full documentation	CD-ROM			
	Software	Included			
	Software	Should enable designer to readily target the DSP board(Advanced USB Stick DSP Development Tool) provided			
		A complete Integrated Development Environment (IDE), an efficient optimizing C/C++ compiler assembler, linker, debugger, integrated Code Wright editor with Code Sense technology for faster code creation, data visualization, a profiler and a flexible project manager			
		Software IDE should support windows7 to newest version of windows			
		DSP/BIOS real-time kernel			
		Chip Support Library			
	Warranty	Specify			
	User manual and product documentation	Required			
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents			
<b>2.77</b>	<b>DSP Evaluation Module</b>				
	Model	Specify			
	Country of Origin	Specify			



	Fixed point low power DSP	TMS320C5515			
	On board embedded JTAG emulation	plug-and-play functionality through just an A-to-mini B USB cable and compatibility of external JTAG emulation interface			
	Stereo codec	TLV320AIC3204 or TLV320AIC23B			
	OLED color LCD display	128x128 pixels			
	Flash and mobile SDRAM	Integrated			
	EEPROMs	I2C and SPI protocols			
	USB slave port	>=2.0version			
	Interface	RS232,MMC/SD slot, CE-ATA connector			
	User defined push button switches	>=10nos			
	Analog connectors	front end			
	Connectors for memory cards	Two expansion			
	Oscillator socket	External			
	Battery Holder	include			
	Dial	Jog dial			
	Universal power supply	+5V			
	Module should include	DSP Evaluation Board			
		Code Composer Studio™ IDE Rev. 4.0			
		Technical Reference Manual with Schematics			
		USB Cable			
		AC Power Cord(s) for this module			
	Software	Included			
	Software	Should enable designer to readily target the DSP board(DSP Evaluation Board) provided			
		A complete Integrated Development Environment (IDE), an efficient optimizing C/C++ compiler assembler, linker, debugger, integrated CodeWright editor with CodeSense technology for faster code creation, data visualization, a profiler and a flexible project manager			
		DSP/BIOS real-time kernel			
		Chip Support Library			
		Software IDE should support windows7 to latest version of windows			
		Board Test Package			
	Warranty	Minimum one year			
	User manual and product documentation	Required			
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide,			

		Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents			
<b>2.78</b>	<b>DSP Starter Kit (DSK)</b>				
	Model	Specify			
	Country of Origin	Specify			
	Kit	DSP Development Board with 512K Flash and 16MB SDRAM			
		Software IDE including the Fast Simulators and access to Analysis Toolkit on Update Advisor			
		Software IDE should support windows7 to latest version of windows			
		Quick Start Guide			
		Technical Reference			
		Customer Support Guide			
		USB Cable			
		Universal Power Supply			
		AC Power Cord(s)			
		DSP Development Board's DSP platform	TMS320C6000		
	On board embedded (Standard IEEE) JTAG emulation	plug-and-play functionality through just an A-to-mini B USB cable and compatibility of external JTAG emulation interface			
	Stereo codec	24-bit			
	3.5mm audio jacks	4(microphone, line in, speaker and line out)			
	Memory	512K words of Flash and 16 MB SDRAM			
	Plug-in modules	Expansion port connector			
	Universal power supply	+5V			
	Software	Included			
	Software:	Should enable designer to readily target the DSPStarter Kit(DSK) provided.			
		A complete Integrated Development Environment (IDE), an efficient optimizing C/C++ compiler assembler, linker, debugger, integrated Code Wright editor with Code Sense technology for faster code creation, data visualization, a profiler and a flexible project manager			
		DSP/BIOS real-time kernel			
		Chip Support Library			
		Software IDE should support windows7 to latest version of windows			
		Plug-in ability for third-party software for additional functionality			
		DSK diagnostic tool			

		Target error recovery software			
	Warranty	Minimum one year			
	User manual and product documentation	Required			
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents			
<b>2.79</b>	<b>Proteous</b>				
	Model	Specify			
	Country of Origin	Specify			
	Full package	Required			
	It should include	Proteus PCB Design Level 3			
		Advanced Simulation Features			
		Proteus VSM for AVR			
		Proteus VSM for 8051/52			
		Proteus VSM for HC11			
		Proteus VSM for BASIC Stamp			
		Proteus VSM for 8086			
		Proteus VSM for MSP430			
		Proteus VSM for PICCOLO			
		Proteus VSM for PIC Bundle 8/16bit			
		Proteus VSM for ARM Bundle			
		Proteus USB Transaction Analyser			
		Extension to 1 years USC			
	version	latest			
	windows support	Windows 7 to latest			
	Usage	all academic purposes			
	Warranty	Minimum one year			
	User manual and product documentation	Required			
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents			
<b>2.80</b>	<b>4DOF Robot Arm Kit</b>				
	Model	Specify			
	Country of Origin	Specify			

	Description	4 Degrees of freedom aluminium Robotic Arm which delivers fast, accurate, and repeatable movement.			
	Electric-gripper at the free-end	required			
	No of axis	5 + Gripper (wrist rotate)			
	Servo motion control	Local closed loop			
	Range of motion per axis	>=180 degrees			
	Accuracy of motion per axis	<= 0.09 degrees			
	Servo Voltage	6 V DC			
	Control Software	Required (at least for Windows 7 and above)			
	Software requirement	Graphical interface software which can create reusable patterns quickly and enables variable playback time			
	Load bearing with arm extended	up to 300g			
	Gripper opening	>=30 mm			
	Gripping position	Two sided			
	Controller	Servo motor (only)			
	Power supply	DC adapter from mains (230 V/ 50 HZ)			
	connection	USB			
	Warranty	Minimum one year			
	User manual and product documentation	Required			
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents			
<b>2.81</b>	<b>6DOF Robot Arm</b>				
	Model	Specify			
	Country of Origin	Specify			
	Construction	Standard six axis kinematic four servo joints with gear motor, encoder and $\mu$ C per joint. Two smart servos.			
	Electric-gripper at the free-end	required			
	Load bearing capacity	~400g			
	Gripper	Digital two finger gripper			
	Reach	>= 600mm (including gripper)			
	Communication	USB, internally CAN at 20 Hz			
	Power supply	DC supply via mains(230V/50Hz) adapter,			
	Digital Inputs	>= 3x24 V			
	Digital Outputs Base	>= 4 relay outputs			
	Digital Outputs Flange	Typical: 2 digital Outputs, CAN, 5V,+12V and GND for Gripper			

	Control Software	Required ( for at least Windows 7 and above)							
	Software requirement	-3D programming environment which allows to move and program the robot in an intuitive way. -Graphical and textual program editors should allow creating or adapting programs with ease. Ability to simulate all motions							
	Warranty	Minimum one year							
	User manual and product documentation	Required							
	Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents							
<b>2.82</b>	<b>Dual Measurement Multimeter digital</b>								
	Model	Specify							
	Country of Origin	Specify							
	Counts	≥50000							
	Dual measurement/Dual Display	Required							
	Selectable measurement speed	Required; Max. ≥40 Readings/s for DC V							
	Basic DC precision	≤ 0.02%							
	Auto/Manual Ranging	Required							
	True RMS measurement(AC, AC+DC)	Required							
	No. of measurement functions	≥ 11							
	Temperature measurement	Required							
	<b>DC Voltage</b>								
	Range	500mV	5V	50 V	500 V	1000V			
	Resolution	10uV	100uV	1mV	10mV	100mV			
	<b>Resistance</b>								
	Range	500	5k	50k	500k	5M	50M		
	Resolution	10m	100m	1	10	100	1k		
	<b>DC Current</b>								
	Range	500uA	5mA	50mA	500mA	5A	10A		
	Resolution	10nA	100nA	1uA	10uA	100uA	1mA		
	<b>Continuity</b>								
	Range: 5000.0 Ω			Resolution: 100mΩ					

<b>Diode Test</b>				
Range: 5.0000 V	Resolution: 100μV			
<b>Capacitance</b>				
Range	5nF(0.5~1nF)/5nF(1~5nF)/ 50nF(5~10nF)/ 50nF(10~50nF)/500nF/5uF/50uF			
Resolution	0.001nF/0.001nF/0.01nF/0.01nF/0.1nF/1nF/10nF			
<b>Temperature</b>				
Range: <=-200 deg C to >=+ 300 deg C	Resolution: <= 0.1 deg. C			
Display	VFD, TowColors Display			
Interface	USB Device, USB Host, GPIB			
Power Source	AC 230V/ 50Hz			
Power Consumption	Max. 15VA			
Accessories Required	Power cord, Test lead, Temperature probe adaptor with thermocouple, USB Cable, GPIB Cable, GPIB-USB-HS			
Warranty	Minimum one year			
User manual and product documentation	Required			
Additional Requirement	All relevant technical brochures should be forwarded with Tender Documents. Comprehensive user guide, Complete track record on where the supplier has supplied the product, Recommendation letter about the product from the institutions where the supplier has supplied the product. Manufactures' authorization should be submitted with the tender documents			

## Section VII.

### Contract Data

The following Contract Data shall supplement and / or amend the Conditions of Contract (CC). Whenever there is a conflict, the provisions herein shall prevail over those in the CC.

<b>CC 1.1(i)</b>	The Purchaser is: University of Jaffna
<b>CC 1.1 (m)</b>	The Project Site(s)/Final Destination(s) is/are: University of Jaffna
<b>CC 8.1</b>	For notices, the Purchaser's address shall be: Bursar  Attention: Bursar  Address: University of Jaffna, P.O Box 57, Thirunelvely, Jaffna.  Telephone:021-2222644
<b>CC 11</b>	Goods shall be supplies in compliance with the quality and the specification given.
<b>CC 15.1</b>	CC 15.1—The method and conditions of payment to be made to the Supplier under this Contract shall be as follows:  A: For Goods offered within Sri Lanka  Payment shall be made in Sri Lanka Rupees within thirty (30) days of presentation of claim supported by a certificate from the Purchaser declaring that the Goods have been delivered and that all other contracted Services have been performed. i) On Delivery: up to a maximum of ninety (90) percentage of the Contract Price, shall be paid on receipt of the Goods. (ii) On Acceptance: the remaining ten (10) percentage of the Contract Price shall be paid to the Supplier within ninety (90) days. After the certification of acceptance.
<b>CC 17.1</b>	A Performance Security – 10%
<b>CC 26.1</b>	The liquidated damage shall be: 2%per week
<b>CC 26.1</b>	The maximum amount of liquidated damages shall be:10 %



UNIVERSITY OF JAFFNA  
**INVITATION FOR BIDS**  
**Supply of Computer, Electrical, Electronic & Lab Equipment**  
**to the Faculty of Engineering,**  
**University of Jaffna.**  
**UJ/F/PO/T/04/2016**

Chairperson, Department Procurement Committee, University of Jaffna, Jaffna, Sri Lanka, invites sealed bids from eligible bidders for supply of following items to the University of Jaffna.

1. Bidding will be conducted through the National Competitive Bidding (NCB) procedure.
2. Bidder should have at least three years experience in the relevant field in Sri Lanka.
3. Interested eligible bidders may obtain further information from the Senior Assistant Bursar / Supplies of the University of Jaffna, and inspect the bidding documents at the Supplies Branch of the University between 9.00 am to 3.00 pm from **10.06.2016 to 12.07.2016**.
4. A complete set of bidding documents in English may be purchased by interested bidders on submission of a written application to the Senior Assistant Bursar / Supplies, University of Jaffna and upon payment of a non-refundable fee of Rupees 2,000/=per package in cash at the Shroff Counter of the University of Jaffna. The bidder can also download the bidding documents from the University website [www.jfn.ac.lk](http://www.jfn.ac.lk). Those who are obtaining bidding documents from the University website should submit the complete documents along with a Bank Draft drawn in favour of the “Bursar, University of Jaffna, Sri Lanka” for Rs. 2,000/=per package as non-refundable fee or the payments could be made to Peoples Bank, Jaffna University Branch, account no: **162-1-001-6-0000880**, and the **cash receipt/deposit slip to be attached with the bidding documents**. The documents may be purchased until 2.30 p.m from **10.06.2016 to 12.07.2016**.
5. Bids must be delivered in duplicate to be addressed **Bursar, University of Jaffna, Thirunelvely**, on or before **2. 00p.m on 13.07.2016**. Please indicate the “**Supply of Computer, Electrical, Electronic & Lab Equipment- UJ/F/PO/T/04/2016 – 13.07.2016**” on the left hand corner of the envelope.
6. All bids must be accompanied by a Bid Security addressed to the **Chairperson, Department Procurement Committee, University of Jaffna**, valid for 120 days from the date of the bid opening as specified in the following Table.

Serial No	Description of Items	Quantity	Bid Security
<b>Package 1 – Supply of Computer Engineering Equipment</b>			<b>170,000.00</b>
1.1	Accelerometer	20	
1.2	Bluetooth Transceiver module	20	
1.3	Compass module	10	
1.4	12V Gear Motor	30	
1.5	6V gear motor	30	
1.6	GPS module	10	



1.7	GSM/GPRS Development boards	10	
1.8	Long Distance Ultrasonic module	10	
1.9	Short Distance Ultrasonic module	40	
1.10	Servo motor	20	
1.11	Arduino Nano / Genuino Nano(Original)	20	
1.12	Arduino MEGA / Genuino MEGA (Original)	20	
1.13	Motion sensors	40	
1.14	Motor driver kit	20	
1.15	Pulse sensors	5	
1.16	Relay module	20	
1.17	Tamiya Tracked Vehicle Chassis	10	
1.18	Robot chassis	10	
1.19	Robot wheel	25	
1.20	Rubber tire wheel	80	
1.21	Step motor	20	
1.22	Temperature and Humidity sensor	40	
1.23	Long Rang Video transmitter + receiver	5	
1.24	WiFi development kit	10	
1.25	WiFi module	10	
1.26	Wireless Transceiver module	20	
1.27	Long Rang Wireless module + Antenna	20	
1.28	High performance Computing node (Two processors each with16 core, 512 GB RAM, 3TB hard disk with multiple Ethernet interface.)	1	
1.29	High performance computing node(Two processors each with 8 core, 256 GB RAM, 3TB hard disk)	2	
1.30	Tower Model Computer	40	
1.31	Online UPS 6kVA	2	
1.32	Interactive Ultra Short Throw Multimedia Projector with Wall Mounting Accessory	2	
<b>Package 2 - Supply of Electrical &amp; Electronic Engineering Equipment</b>			<b>360,000.00</b>
2.1	Rasberry Pi Single board Linux platform	10	
2.2	Beagle Bone Single board Linux platform	4	
2.3	Banana Pi Single board Linux platform	5	
2.4	Programable microcontroller development board	15	
2.5	Micro controller programmer with universal programing adapter seat, USB cable and 6 pin cable	5	
2.6	Programmable microcontroller development board with bread board included	15	
2.7	Microcontroller starter kit with necessary software tools (builder, simulator ,emulator) and ISP programmer(USB).	15	
2.8	FPGA trainer board	15	
2.9	Transistor based voltage regulator trainer kit	4	

2.10	Digital combinatory logic training kit	4
2.11	Digital sequential logic trainer kit	2
2.12	Digital Electronic trainer kit	4
2.13	Step Motor Control kit	4
2.14	Universal motor control board	3
2.15	Digital Lux meter	1
2.16	3 Phase Power Pack	1
2.17	Power Factor Control Unit	1
2.18	Asynchronous Wind Mill System including HVDC Light Line	1
2.19	Flex Stand	6
2.20	Flex set	1
2.21	Flywheel	1
2.22	TECNEL. Unit	1
2.23	Pulse Generator	1
2.24	Power factor meter	2
2.25	Frequency meter	2
2.26	Current Transformer	3
2.27	PWM DC-Machine Control Module	2
2.28	Drill Bench	1
2.29	PCB shears	1
2.30	Electrical hand driller	1
2.31	Rheostat	4
2.32	Rheostat	4
2.33	Rheostat	4
2.34	Digital and Analog Communication Trainer kit with jumper wire	1
2.35	Digital Storage Oscilloscope	10
2.36	Inductor bank	2
2.37	Resistor bank	3
2.38	Capacitor bank	2
2.39	Glue gun and sticks	10
2.40	Wireless Microphone set	2
2.41	Wheatstone Bridge	5
2.42	NI ELVIS II+ for Labview	2
2.43	Multisim Education 25 user	1
2.44	Digital Duplicator Machine	1
2.45	Colour Laser Printer	1
2.46	Hot air gun	3
2.47	QUADCOPTER FOR DEVELOPERS	1
2.48	humanoid robot	1

2.49	Three phase synchronous generator	2	
2.50	Three phase induction motor	2	
2.51	Single phase motor	2	
2.52	Synchronizing module	3	
2.53	Optical fibre training kit	1	
2.54	UV Laser based PCB machine	1	
2.55	Reflow oven	1	
2.56	Altera FPGA Starter Development Kit	20	
2.57	Signal Generators	10	
2.58	Spectrum Analyzer	5	
2.59	Arbitrary Waveform Generator	2	
2.60	Transmission Line trainer	1	
2.61	Analog Multimeter	10	
2.62	Genuino Starter Kit (Original)	20	
2.63	Arduino MEGA 2560 / Genuino MEGA 2560 (Original)	20	
2.64	Arduino Due(Original)	20	
2.65	Arduino ZERO/ Genuino ZERO(Original)	10	
2.66	ArduinoYún(Original)	10	
2.67	ArduinoWiFi Shield(Original)	5	
2.68	Arduino Ethernet Shield WITH PoE Module(Original)	5	
2.69	Arduino GSM Shield (integrated antenna)(Original)	5	
2.70	Arduino Motor Shield (Original)	15	
2.71	Motor/Stepper/Servo Shield for Arduino Kit(Original)	20	
2.72	Assembled Data Logging shield for Arduino(Original)	20	
2.73	Android Phone to generic shield converter for Arduino(Original)	20	
2.74	Music Shield(Original)	20	
2.75	USB Stick DSP Development Tool(Original)	20	
2.76	Advanced USB Stick DSP Development Tool(Original)	20	
2.77	DSP Evaluation Module(Original)	15	
2.78	DSP Starter Kit (DSK)(Original)	20	
2.79	Proteous	1	
2.80	4DOF Robot Arm Kit	5	
2.81	6DOF Robot Arm	1	
2.82	Dual measurement multimeter digital	10	
<b>Package 3 – Supply of Lab Furniture</b>			<b>10,000.00</b>
3.1	Computer Table	40	
3.2	Computer Chair	60	
3.3	Laboratory Table	8	

➤ For Bid Documents & Details visit University website [www.jfn.ac.lk](http://www.jfn.ac.lk)

7. Pre Bid meeting will be held on **01<sup>st</sup> July at 10.00 a.m.** in the Board Room of University of Jaffna
8. The bids shall be deposited in the 'Tender Box' available in the Bursar's Office of the University, or sent under Registered Cover to be received before the deadline to the address given Clause No.5.
9. Late bids will be rejected.
10. The bids will be opened at **2. 00p.m on 13.07.2016**, in presence of the bidders or their authorized representatives who choose to attend the bid opening at the board room of the University.

The Chairperson,  
Department Procurement Committee,  
University of Jaffna,  
Jaffna.

**TP. / Fax No: 021-2220962, 021-2222644**

  
*M. G. L. Maveekumbura*  
Senior Assistant Bursar (Supplies)  
University of Jaffna  
Jaffna