

**DR. SHAKUNTALA MISRA NATIONAL REHABILITATION
UNIVERSITY
MOHAAN ROAD, LUCKNOW,
UTTAR PRADESH – 226017**

**E-TENDER DOCUMENT
FOR
SUPPLY, INSTALLATION AND COMMISSIONING IN
ELECTRICAL ENGINEERING DEPARTMENT.**

1. NOTICE INVITING E-TENDER

Dr. Shakuntala Misra National Rehabilitation University (DSMNRU), Lucknow intends to float open E-Tender for the supply of following item(s) as per the details given below:

Name of Work	Supply, Installation and Commissioning Of Electrical Engineering Laboratory Instruments For Engineering and Technology, DSMNRU, Lucknow.
Estimated Value of the Tender (approx.)	Rs. 9,00,000.00
Currency in which payment shall be made	Indian Rupees (INR)
Date of Publishing	15/02 /2021
Document Download Starting Date	15/02/2021
Pre-bid Meeting Date	To be informed, if required. Venue: IV th Floor, Administrative Block, DSMNRU, Lucknow.
Start Date for uploading of Bids	08/03 /2021
Last Date for uploading of Bids	08/03/2021 Time 1:00 PM
Date of Opening of Technical Bids	08/03/2021 Time 2:00 PM
Date of Opening of Financial Bids	To be informed later to the technically qualified bidders.
Cost of Tender Document/ Bid Document Fee	Rs. 2200.00

Earnest Money Deposit	Rs. 9,500.00
Bid Validity Days	90 days
Period of Supply	30 days
On-site Warranty (including annual maintenance)	Three years comprehensive warranty followed by two years comprehensive annual maintenance from the date of successful installation of Instrument.
Performance Security	5% of the total work order value of the successful bidder. Performance security is required to be submitted within 15 days from the date of issue of Letter of Approval (LoA)
Purchaser	Dr. Shakuntala Misra National Rehabilitation University, Mohaan Road, Lucknow (Uttar Pradesh) – 226017
Place of Delivery	Engineering and Technology, Dr. Shakuntala Misra National Rehabilitation University, Lucknow (Uttar Pradesh)
e-mail address	registrar@dsmnru.ac.in

- 1) For participating in the above e-tendering process, the bidder shall have to get them registered in <https://etender.up.nic.in/> and get User I.D. and password.
- 2) All bids (both Technical Bid and Financial Bid) should be uploaded in the e-procurement portal <https://etender.up.nic.in/>. No manual bids will be accepted.
- 3) Bidders are advised to visit Dr. Shakuntala Misra National Rehabilitation University website <http://dsmru.up.nic.in/> for getting the updated information on this tender.

Registrar
DSMNRU,
LUCKNOW

2. ONLINE SUBMISSION

The online bids (complete in all respect) must be uploaded online as mentioned below-:

mentioned below

TECHNICAL BID			
(Following documents to be provided as single PDF file)			
Sl. No.	Documents	Content	File format
1.	Technical Bid	Technical Specification Compliance sheet as per	PDF
2.		Organisation Declaration sheet as per	PDF
3.		List of organisations/ clients where the same products have been supplied (in the last three financial years) along with their contact number(s).	PDF
4.		Supporting documents in support of all claims made in Annexure	PDF
FINANCIAL BID			
1.	Financial Bid	Price bid should be submitted only in standard Bill of Quantity (BOQ) file provided in the e-tender portal.	.xls

3. INSTRUCTIONS FOR E-TENDERING

1. Instructions for online Bid Submission

- Bidders are to free to bid for any equipment/item.
- Bid for the product is to be uploaded in two parts i.e. Technical Bid and Financial Bid
- Technical Bids should not contain any commercial/price details. Failure would result in rejection of the bid.
- Only authorized person should sign the tender. Name, designation and address of the authorized person should be mentioned. University may not consider the tender unless and until all the documents are properly signed by the authorized signatory.
- Copy of Power of Attorney for the authorized person shall be uploaded along with the bid.
- All the columns of the tenders shall be duly, properly and exhaustively filled in.
- The tenders will be regarded as constituting an offer or offers open to acceptance in whole or in part or parts at the discretion of Dr. Shakuntala Misra National Rehabilitation University, Lucknow (Uttar Pradesh).

- h) The scanned copies of all the Annexures and required documents must be uploaded with the bids.
- i) All pages of the tender must be duly signed, stamped and submitted. The Tender fee along with DD as EMD drawn in favour of Finance Officer, Dr. Shakuntala Misra National Rehabilitation University, Lucknow in an envelope superscribed as "EMD for Electrictrical Engineering Department" along with technical bid in another sealed envelope superscribed as "Technical Bid for Electrical Engineering Department" together sealed in an envelope superscribed with-Tender for Electrical Engineering Department in DSMNRU should be sent to the Registrar, Dr. Shakuntala Misra National Rehabilitation University, Mohaan Road, Lucknow-226017 or dropped in the box kept in the Nazarat Section of Admin Block. The bids received after the closing date will not be entertained.

2. Minimum Eligibility Criteria/Qualification for Bidding

Following are the minimum criteria/requirements for the bidders participating in the bidding process. (Documents must be provided in support of the following otherwise university may not consider the tender.)

Sl. No.	Criteria	Supporting Documents Required
1.	The bidder must be Proprietorship/ Company / Limited Liability Partnership (LLP) registered with statutory authorities for the last three years.	Copy of registration certificate
2. (a)	Only Original Equipment Manufacturer (OEM)/ agency of OEM/ authorized dealer having minimum 3 years of experience in execution of laboratory equipments/ instruments supplies should apply against this invitation for bid. In the case of the bidder offering to supply equipments/ instruments under the bid, which the bidder does not manufacture or otherwise produce, the bidder has to provide manufacturer's authorization certificate. Bids submitted without valid authorization certificate will be summarily rejected. Authorization certificate from OEM is essential for all the items of supply under scope of work.	Latest authorization letter from OEM to the bidder authorizing him to do business on OEM's behalf, as associate or authorized business partner for OEM's manufactured items. In case of OEM participating as a bidder, power of attorney by the company's Director to the authorized signatory to be submitted along with the technical bid. Copies of work orders and completion certificates/ satisfactory certificates by various clients in last 3 years.

2. (b)	Any undertaking from the OEM is required stating that they would facilitate the bidder on a regular basis with technology/product updates and extend support for spares and maintenance facilities during warranty and Annual Maintenance Contract (AMC). The bid shall not be considered responsive in absence of the certificate from the OEM	Undertaking by the authorized signatory of OEM in favor of the bidder agency.
3.	The average annual turnover of the bidder from the laboratory equipment supply quoting for the bid should be Rs. 9,00,000/- (Rupees Nine Lakhs only) during the last last three financial years (2017-2018, 2018-2019, 2019-2020). In this regard, the bidder should submit copies of audited balance sheets including profit and loss accounts for the last three financial years as above. The agency should have profit for all three financial years as above. A registered Chartered Accountant's (CA) certificate indicating laboratory equipment supply turn over amount for the relevant period should also be accompanied.	Certificate from the Chartered Accountant (CA) and copy of audited balance sheets/ profit and loss accounts.
4.	The bidder must have successfully executed at least one order of supply of laboratory equipment to Govt./PSU's/Autonomous bodies / Govt. institutions such as IIT's/NIT's/ Central Universities/ State Universities/ Rajkiya Engineering Colleges of Uttar Pradesh, etc. during last three financial years for which necessary supporting documents have to be enclosed.	Copies of work order and completion certificates/satisfactory certificates issued by Govt./PSU's/Autonomous bodies / Govt. institutions such as IIT's/NIT's/ Central Universities/ State Universities/ Rajkiya Engineering Colleges of Uttar Pradesh, etc. in last three financial years.
5	The bidder should indicate at least four numbers of technically qualified professionals having experience for not less than three years for installation and maintenance support.	List of technically qualified professionals duly self-certificated by the bidder along with the professional certificate.

Notwithstanding anything stated above, the consignee reserves the right to assess bidder's capability and capacity to perform the contract, should circumstances warrant such an assessment in the overall interest of Dr. Shakuntala Misra National Rehabilitation University, Lucknow (Uttar Pradesh).

3. Digital Signature Certificates

For integrity of data and authenticity/ non-repudiation of electronic records, and to be compliant with IT Act 2000, it is necessary for each user to have a Digital Signature Certificate (DSC) issued by competent certifying authority.

4. Registration

For participating in the above e-tendering process, the bidder shall have to get themselves registered on <https://etender.up.nic.in/> and get User ID and password.

5. Preparation/Submission of Bids

- a) Bidders are requested to go through the tender advertisement and the tender document carefully to understand the documents required to be submitted as part of the bid. Do note the number of covers in which the bid documents have to be submitted, the number of documents-including the names and content of each of the document that need to be submitted. Any deviations from these may lead to rejection of the bid.
- b) Bidder, in advance, should get ready the bid documents to be submitted as indicated in the tender document/ schedule and generally. Documents can only be in PDF or .xls format as required.
- c) Bidder should log on to the site well in advance for bid submission and complete all formalities of registration so that the bidder uploads the bid on time i.e. on or before the bid submission time.
- d) Bidder should take into account any corrigendum published on the tender document before submitting their bids.
- e) Bidder will be responsible for any delay due to any reason.

6. Instruction for Financial Bid/BOQ

- a) Price to be quoted in the Bill of Quantities (BOQ) according to instructions provided.
- b) The bidder can quote for all or any of the laboratory equipments/items listed in this document.
- c) The rate shall be inclusive of all taxes, octroi, transportation (as per the location), packing, loading and unloading (at designated location), insurance, etc. and nothing shall be paid extra except GST as mentioned in BOQ.
- d) The prices quoted by the bidder shall be fixed for the quantity mentioned for the duration of the contract and shall not be subject to adjustment on any account/circumstances. University reserves the right to increase/decrease the quantity.

The changes displayed in the corrigendum/addendum to the bid documents, particularly with the BOQ should be applicable to the bid submission.

7. Evaluation of Bids

- a) A committee of Dr. Shakuntala Misra National Rehabilitation University, Lucknow (Uttar Pradesh) will evaluate the bids of all the bidders, both technically and financially.
- b) Conditional bids shall be summarily rejected.
- c) The technical bids shall be evaluated as per the following:
 - i. Compliance to eligibility criteria: Compliance to the eligibility criteria specified in section “Minimum Eligibility Criteria/Qualification for bidding” of this tender document. Non-compliance of **any** eligibility criteria would result into disqualification of the bid.
 - ii. Compliance to the equipment specifications specified in this tender: The bids found eligible according to the eligibility criteria would then be checked for compliance to the equipment specifications mentioned in the tender document. Non-compliance of any required specifications would result in disqualification of the bid.
- d) The Financial Bids of only the technically qualified bidders would be opened. The date and time of the opening of the financial bids are mentioned in and if there is any change of date and time, the same shall be uploaded on <https://etender.up.nic.in/> and/or <http://dsmru.up.nic.in/>. The bid shall be evaluated on the total value (inclusive of GST and AMC) of the independent item/equipment. The bidder of the lowest commercial bid would be awarded the contract.

Note:

The bid shall be typed in English and signed by the bidder or a person duly authorized to bind the bidder to the contract. The person(s) signing the bids shall initial all pages of the bids.

Wherever any document has been issued in vernacular language, its translated copy (except for Hindi language) in English from the competent authority is also required to be uploaded.

4. INSTRUCTIONS TO BIDDERS

1. Due date

The e-tender bid have to be uploaded by the due date. The offers received after the due date and time will not be considered.

2. Earnest Money Deposit (EMD)

Details in annexure

3. Fee

The Tenderer should submit the cost of tender document, processing fee and EMD separately through D.D./Banker's Cheque in favour of Finance Officer, DSMNRU, Lucknow.

4. Refund of EMD

- a) No interest will be paid on EMD amount.
- b) EMD will be returned to unsuccessful Tenderer only after the tender is finalized.
- c) Earnest money will be forfeited if the bidder unilaterally withdraws the offer, or unilaterally amends, impairs or rescinds the offer within the period of its validity.
- d) In case of successful bidder, the EMD shall be refunded after submission of Performance Security from the scheduled bank operating in India.

5. Acceptance/ Rejection of bids

DSMNRU reserves the right to reject any or all offers without assigning any reason.

DSMNRU based on the requirement without assigning any reason to the bidder may split work/ scope/ bid offer in stages or in parts according to the need of work for ease of execution of work.

DSMNRU reserves the right to take decision according to requirement and no claim on whatsoever ground shall be entertained from the bidder.

6. Performance Security

The successful bidder should be required to deposit **Performance Security** equivalent to 5% cost of the estimated cost of the e-tender to Dr. Shakuntala Misra National Rehabilitation University, Lucknow (Uttar Pradesh) within 15 days from the date of receipt of Purchase/ Supply Order. The **Performance Security** should be issued by a nationalized/ scheduled bank in favour of "Finance Officer, Dr. Shakuntala Misra National Rehabilitation University, Lucknow" to be valid for a period of 90 days beyond the date of completion of warranty period.

7. Risk Purchase Clause

In the event of failure of supply of the item(s)/ equipment(s)/ apparatus(s)/ instrument(s) within the stipulated delivery schedule, the consignee has all the right to purchase the item(s)/ equipment(s)/ apparatus(s)/ instrument(s) from the other source on the risk of the supplier under risk purchase.

8. Packing Instructions

Each package will be marked on three sides with proper paint/ indelible ink, the following:

- a) Item nomenclature
- b) Supply order/contract no.
- c) Suppliers Name and Address
- d) Consignee/ Purchaser details
- e) Packing list reference number

All the packing should be strong enough to withstand rough handling during loading unloading and transporting. Fragile articles should be packed with precaution and should bear the marking like 'Fragile/ Handle with care/this side up, etc.' All delicate surfaces of item(s)/ equipment(s)/ apparatus(s)/ instrument(s) should be carefully protected and painted with protective paint/ compound and wrapped to prevent rusting and damage.

Attachments and spare parts/ goods and small pieces should be packed with adequate protections and wherever possible should send along with the major items. Each item should be tagged so as to identify it with the main equipment and part number and reference number should be indicated.

All protections and threaded fittings should be suitably protected and covers should block the openings.

9. Unloading and Unpacking

Unless specified otherwise in the purchase order, unloading and storage of the same at the designated place should be undertaken by the supplier. The unpacking of the materials should also be arranged by the supplier.

10. Delivery and Documents

Delivery of the goods/ item(s)/ equipment(s)/ apparatus(s)/ instrument(s) should be made within maximum 45 days from the date of the placement of purchase/ supply order. The successful bidder to provide absolute supply schedule within 7days from the receipt of the purchase order. Within 24 hours of the dispatch, the supplier should notify the consignee and the insurance company cable/ telex/ fax/ email the full details of the shipment including contract number, railway receipt number, etc. and date, description of goods, quantity, name of the consignee, invoice, etc. Till the consignee/ purchaser takes over/ receives the goods/ item(s)/ equipment(s)/ apparatus(s)/ instrument(s), the supplier should be responsible to keep the same in safe custody and the charges (if any) to be borne by the supplier. The supplier should provide the following documents to the consignee with a copy to the insurance company:

- a) 4 copies of the supplier invoice contract number, goods description, quantity unit price, total amount;
- b) Acknowledgment of receipt of goods from the consignee(s) by the transporter;
- c) Insurance Certificate (if applicable);
- d) Manufacturer's/Supplier's warranty certificate;
- e) Inspection Certificate issued by the nominated inspection agency, if any;
- f) Supplier's factory inspection report;
- g) Certificate of Origin (if possible by the beneficiary);
- h) Two copies of the packing list identifying the contents of each package.

The above documents should be received by the Consignee before arrival of the Goods (except where the Goods have been delivered

directly to the Consignee with all documents) and, if not received, the Supplier will be responsible for any consequent expenses.

11. Delayed Delivery

If the delivery is not made within the due date for any reason, the Consignee will have the right to impose penalty @ 1% per week and the maximum deduction is 10% of the contract value / price. Once the maximum is reached DSMNRU has the right to terminate the contract/ cancellation of purchase order without any liability to cancellation charges and encash the submitted performance security.

12. Prices

- a) Prices should be inclusive of charges for delivery of equipment at the sites specified in the scope of work section of this tender document, and are to be quoted in Indian Rupees only.
- b) The prices should be inclusive of current GST, excise duty, freight, insurance, etc. Further if there is any change in the GST by Govt. of India then the same shall be applicable on presentation of the proof. No change due to devaluation of Rupee shall be entertained.
- c) The prices must be quoted in the standard Performa (BOQ) given in Financial Bid failing which the Bid would be treated as unresponsive.

13. Progress of Supply

Wherever applicable, supplier should regularly intimate progress of supply, in writing, to the consignee as under:

- a) Quantity offered for inspection and date;
- b) Quantity accepted/rejected by inspecting agency and date;
- c) Quantity dispatched/delivered to consignees and date;
- d) Quantity where incidental services have been satisfactorily completed with date;
- e) Quantity where rectification/ repair/ replacement effected/ completed on receipt of any communication from consignee/Consignee with date;
- f) Date of completion of entire Contract including incidental services, if any; and
- g) Date of receipt of entire payments under the Contract (In case of stage-wise inspection, details required should also be specified).

14. Inspection and Tests

Inspection and tests prior to shipment of Goods and at final acceptance are as follows:

- a) After the goods are manufactured and assembled, inspection and testing of the goods should be carried out at the supplier's plant by the supplier, prior to shipment to check whether the goods are in conformity with the technical specifications attached to the purchase order. Manufacturer's test certificate with data sheet should be issued to this effect and submitted along with the delivery documents. Officer/faculty from the university may inspect the material and testing if required at vendor's

premise. The location where the inspection is required to be conducted should be clearly indicated by the bidder after confirmation of the order.

- b) The acceptance test will be conducted by the Consignee/Purchaser, or other such person nominated by the Consignee/Purchaser at its option after the equipment is installed at Purchaser's site in the presence of supplier's representatives. The acceptance will involve trouble free operation and ascertaining conformity with the ordered specifications and quality. There should not be any additional charges for carrying out acceptance test. No malfunction, partial or complete failure of any part of the equipment is expected to occur. The Supplier should maintain necessary log in respect of the result of the test to establish to the entire satisfaction of the Consignee, the successful completion of the test specified.
- c) In the event of the ordered item failing to pass the acceptance test, a period not exceeding one weeks will be given to rectify the defects and clear the acceptance test, failing which the Consignee reserve the right to get the equipment replaced by the Supplier at no extra cost to the Consignee.
- d) Successful conduct and conclusion of the acceptance test for the installed goods and equipment should also be the responsibility and at the cost of the Supplier.
- e) The time taken for pre-dispatch inspection is inclusive of the scheduled completion time of the delivery & installation of the equipment. Only the equipment certified by the Consignee/Purchaser should be dispatched to the consignee.
- f) The Supplier/manufacturer should display sample Item for verification of the equipment by Consignee/ purchaser before technical committee (if required)/ production of the same in bulk if required.

15. Defective Equipment

- a) If any of the equipment supplied by the Tenderer is found to be substandard, refurbished, un-merchantable or not in accordance with the description/specification or otherwise faulty, the committee will have the right to reject the equipment or its part. The prices of such equipment should be refunded by the Tenderer with 18% interest if such payments for such equipment have already been made.
- b) All damaged or unapproved goods should be returned at suppliers cost and risk and the incidental expenses incurred thereon should be recovered from the supplier. Defective part in equipment, if found before installation and/or during warranty period, should be replaced within 45 days on receipt of the intimation from this office at the cost and risk of supplier including all other charges. In case supplier fails to replace above item as per above terms & conditions Dr. Shakuntala Misra National Rehabilitation University, Lucknow (Uttar Pradesh) should consider "Banning" the supplier.

16. Right to Use Defective Goods

- a) If after delivery, acceptance and installation and within the guarantee and warranty period, the operation or use of the goods proves to be unsatisfactory, the Consignee should have the right to continue to operate or use such goods until rectifications of defects, errors or omissions by repair or by partial or complete replacement is made without interfering with the Consignee's operation.
- b) Replacement of Goods broke, damaged or short: In the event of any material or part thereof found broken or damaged or received short during transit or during installation or Commissioning or testing at site, before commissioning in service the suppliers should replace the same free of cost. However, Dr. Shakuntala Misra National Rehabilitation University, Lucknow (Uttar Pradesh) will recover amount equivalent to the cost of such damaged / broken / short supplied materials and will repay when actual replacement is given.
- c) Substitution and Wrong Supplies: Unauthorized substitution or materials delivered in error of wrong description or quality or supplied in excess quantity or rejected goods should be returned to the supplier at their own cost and risk.

17. Supplier Integrity

The Supplier is responsible for and obliged to conduct all contracted activities in accordance with the Contract using state of the art methods and economic principles and exercising all means available to achieve the performance specified in the contract.

18. Installation and Demonstration

The supplier is required to undertake the installation and demonstration of the equipment within 30 days of the arrival of materials at Dr. Shakuntala Misra National Rehabilitation University, Lucknow (Uttar Pradesh) and site of installation; otherwise the penalty clause will be the same as per the supply of materials. The successful agency has to arrange for technician, other manpower, tools etc for installation and commissioning of the goods supplied by the agency.

In case of any mishappening/ damage to equipment and supplies during the carriage of supplies from the origin of equipment to the installation site, the supplier has to replace it with new equipment/supplies immediately at his own risk. Supplier will settle his claim with the insurance company as per his convenience. Dr. Shakuntala Misra National Rehabilitation University, Lucknow (Uttar Pradesh) will not be liable to any type of losses in any form.

19. Training of Personnel

- a) The Supplier is required to provide training to the designated Consignee's/Purchaser's technical and end user personnel to enable them to effectively operate the total equipment.
- b) The supplier should be required to undertake to provide the technical training to the personnel involved in the use of the equipment at Dr. Shakuntala Misra National Rehabilitation University, Lucknow (Uttar

Pradesh) premises, immediately after completing the installation of the equipment for a minimum period of one week at the supplier's cost.

Insurance

- a) For delivery of goods at the Purchaser/Consignee premises, the insurance should be obtained by the Supplier in an amount equal to 105% of the value of the goods from "warehouse to warehouse" (final destinations) on "All Risks" basis including War Risks and Strikes. The insurance should be valid for a period of not less than 3 months after installation and commissioning. If orders placed on CIF/CIP basis, the insurance should be upto DSMNRU, Lucknow accordingly.
- b) The Supplier should make all arrangements towards safe and complete delivery at DSMNRU, Lucknow. Such responsibility on part of the supplier will include taking care of insurance, freight, octroi, state level permits etc. as applicable.
- c) The supplier should also take care of transit insurance, comprehensive insurance or any other insurance which have direct bearing on the delivery of the items / equipment at DSMNRU, Lucknow.
- d) It is the total responsibility of supplier to complete all formalities to transit of goods from the place of dispatch to DSMNRU, Lucknow..
- e) The bidder should ensure that no person can engage in the business of a common carrier unless he has granted a certificate of registration to do so for supply of items at DSMNRU, Lucknow.
- f) The transportation of goods through unregistered common carrier is illegal. The bidder should ensure to comply the carriage by latest Road Act and any other relevant.
- g) The supplier will keep DSMNRU, Lucknow informed about various stages of deliveries & installation.

20. Incidental Services

The incidental services also include:

- a) Furnishing of 01 set of detailed operations & maintenance manual
- b) Arranging the shifting/ moving of the item to their location of final installation within DSMNRU, Lucknow premises at the cost of supplier through their representatives.

21. Warranty and Maintenance

- a) Comprehensive Warranty should be for a minimum period of three (03) years from date of successful installation of goods/ item(s)/ equipment(s)/ apparatus(s)/ instrument(s) at the DSMNRU, Lucknow. The Supplier should, in addition, comply with the performance and/or consumption guarantees specified under the contract. If for reasons attributable to the Supplier, these guarantees are not attained in whole or in part, the Supplier should at its discretion make such changes, modifications, and/or additions to the goods/ item(s)/ equipment(s)/ apparatus(s)/ instrument(s), or any part thereof as shall be necessary in order to attain the contractual guarantees specified in the Contract at its

own cost and expense and to carry out further performance tests. The warranty should be comprehensive on site/ DSMNRU, Lucknow. Supplier should give a written information (about the Engineers/technical representative name and cell numbers) before handing over of the goods/ item(s)/ equipment(s)/ apparatus(s)/ instrument(s), to the Consignee and to the end client's nominated representative/s to attend the issues related to the warranty of the goods/ item(s)/ equipment(s)/ apparatus(s)/ instrument(s), supplied under the contract.

- b) The Consignee/Purchaser should promptly notify the Supplier in writing of any claims arising under this warranty. Upon receipt of such notice, the supplier should within 02 days arrange to repair or replace the defective goods or parts thereof free of cost at the ultimate destination. The Supplier should take over the replaced parts/ goods/ item(s)/ equipment(s)/ apparatus(s)/ instrument(s) at the time of their replacement. No claim whatsoever should lie on the Consignee for the replaced parts/ goods/ item(s)/ equipment(s)/ apparatus(s)/ instrument(s) thereafter. The period for correction of defects in the warranty period is 02 days. If the supplier having been notified fails to remedy the defects within 02 days, the consignee/purchaser should proceed to take such remedial action as should be necessary, at the supplier's risk and expenses and without prejudice to any other rights, which the consignee should have against the supplier under the contract.

22. Notices

- a) Any notice given by one party to the other pursuant to this contract/order should be sent to the other party in writing or e mail and confirmed in writing to the other party's address.
- b) A notice should be effective when delivered or on the notice's effective date, whichever is later.
- c) For the purpose of all notices, the following should be the address:
Registrar, Dr. Shakuntala Misra National Rehabilitation University,
Mohaana Road, Lucknow, Uttar Pradesh- 226017
Email: registrar@dsmnru.ac.in

23. Taxes

Suppliers should be entirely responsible for all taxes, duties, license fees, octroi, road permits, etc., incurred until delivery of the contracted Goods to the Consignee.

24. Payment

- a) Payment of Laboratory equipment:
- i. 80% payment shall be made against delivery of Laboratory equipment in good conditions at consignee/purchaser place and to the entire satisfaction of the consignee.
 - ii. 10% on successful installation and commissioning of equipment.
 - iii. 10% after one month of successful handing over of Laboratory equipment

25. User List

Brochure detailing technical specifications and performance, list of industrial and educational establishments where the items have been supplied must be provided.

26. Manuals and Drawings

- a) Before the goods/ item(s)/ equipment(s)/ apparatus(s)/ instrument(s) are taken over by the Consignee, the Supplier should supply operation and maintenance manuals. These should be in such details as will enable the Consignee to operate, maintain, adjust and repair all parts of the works as stated in the specifications.
- b) The Manuals should be in the ruling language (English) in such form and numbers as stated in the contract.
- c) Unless and otherwise agreed, the goods equipment should not be considered to be completed for the purpose of taking over until such manuals and drawing have been supplied to the Consignee.

27. Site Preparation

- a) The supplier should inform to the Consignee about the site preparation, if any, needed for the installation of equipment, immediately after the receipt of the purchase order. The supplier must provide complete details regarding space and all the other infrastructural requirements needed for the equipment, which the Dr. Shakuntala Misra National Rehabilitation University, Lucknow (Uttar Pradesh) should arrange before the arrival of the equipment to ensure its timely installation and smooth operation thereafter.
- b) The supplier should visit Dr. Shakuntala Misra National Rehabilitation University, Lucknow (Uttar Pradesh) and see the site where the equipment is to be installed and should offer his advice and render assistance to Dr. Shakuntala Misra National Rehabilitation University, Lucknow (Uttar Pradesh) in the preparation of the site and other pre-installation requirements.
- c) Dr. Shakuntala Misra National Rehabilitation University, Lucknow (Uttar Pradesh) may provide electricity and water for installation of equipment.

Spare Parts

The Supplier should be required to provide any or all of the following materials, notifications, and information pertaining to spare parts manufactured or distributed by the Supplier:

- a) Such spare parts as the Consignee should elect to purchase from the Supplier, providing that this selection should not relieve the Supplier of any warranty obligations under the Contract;
- b) In the event of termination of production of the spare parts: Advance notification to the Consignee of the pending termination, in sufficient time to permit the Consignee to procure needed requirements; and following such termination, furnishing at no cost to the Consignee, the blueprints, drawings and specifications of the spare parts, if requested.

- c) Supplier should carry sufficient inventories to assure ex-stock supply of consumable spares for the Goods, such as gaskets, plugs, washers, belts, connectors, terminals, cables, wires, etc. Other spare parts and components should be supplied as promptly as possible but in any case within six months of placement of order.

28. Product Life

The supplied model of the equipment offered should strictly confirm to the specifications given in the product literature and these models should be supported for a minimum period of 5 years including warranty period. The Models proposed/ marked for withdrawal from the market and the models under quality testing should not be offered. In addition to the above, if any additional/ enhanced configuration is suggested in view of technological changes, it may be furnished as optional feature with/without cost duly explaining the additional utility of the offered model in both the technical offer document as well as Commercial Offer document. However, the basic quote should be confined only to the configuration/ model offered for.

29. Termination for Default

The Consignee should, without prejudice to any other remedy for breach of contract, by written notice of default sent to the Supplier, terminate the Contract in whole or part:

- a) If the Supplier fails to deliver any or all of the Goods within the period(s) specified in the order, or within any extension thereof granted by the Consignee; or
- b) If the Supplier fails to perform any other obligation(s) under the Contract.
- c) If the Supplier, in the judgment of the Consignee has engaged in corrupt or fraudulent practices etc. in competing for or in executing the Contract.
- d) For the purpose of this Clause:
- **“Corrupt practice”** means the offering, giving, receiving or soliciting of anything of value to influence the action of a public official in the procurement process or in contract execution.
 - **“Fraudulent practice”** means a misrepresentation of facts in order to influence a procurement process or the execution of a contract to the detriment of the Borrower, and includes collusive practice among Bidders (prior to or after bid submission) designed to establish bid prices at artificial non-competitive levels and to deprive the Borrower of the benefits of free and open competition.
 - In the event the Consignee terminates the Contract in whole or in part, the Consignee should procure, upon such terms and in such manner, as it deems appropriate, Goods or Services similar to those undelivered, and the Supplier should be liable to the Consignee for any excess costs for such similar Goods or Services. However, the Supplier should continue the performance of the Contract to the extent not terminated.

Disputes and Jurisdiction

Resolution of Disputes: The dispute resolution mechanism to be applied pursuant should be as follows:

- a) In case of Dispute or difference arising between the Consignee/purchaser and a bidder /supplier relating to any matter arising out of or connected with this agreement, such disputes or difference should be settled in accordance with the Indian Arbitration & Conciliation Act, 1996, the rules there under and any statutory modifications or re-enactments thereof should apply to the arbitration proceedings.
- b) The dispute should be referred to the Competent Authority, Dr. Shakuntala Misra National Rehabilitation University, Lucknow (Uttar Pradesh) and if he/she is unable or unwilling to act, to the sole arbitration of some other person appointed by him willing to act as such Arbitrator. The award of the arbitrator so appointed should be final, conclusive and binding on all parties to this order.
- c) The venue of the arbitration should be the place from where the order is issued.

30. Applicable Law

The Contract should be interpreted in accordance with the laws of the Union of India. Any legal dispute arising out of any breach of contract pertaining to this tender should be settled in the court of competent jurisdiction located at Lucknow (Uttar Pradesh).

31. Compliancy Certificate

This certificate must be provided indicating conformity to the technical specifications.

32. Award of Contract

- a) DSMNRU, Lucknow reserves the right to accept or reject any proposal and to annul the bidding process and reject all proposals at any time prior to award of contract, without thereby incurring any liability to the Bidders. In case of annulment, all proposals submitted and specifically, proposal securities shall be promptly returned to the Bidder.
- b) DSMNRU, Lucknow has the right to review at any time prior to award of contract that the qualification criteria, as specified in tender document are still being met by the Bidder whose offer has been determined as first rank. A proposal shall be rejected if the qualification criteria, as specified in tender document are no longer met by the Bidder whose offer has been determined as first rank.

33. Negotiations

Normally Negotiations are not allowed. However, if required, negotiations will be held at DSMNRU, Lucknow. Representatives conducting negotiations on behalf of the Bidder must have written authority to negotiate technical, financial and other terms and conclude a legally binding agreement.

34. Rates in figures

- a) Rates Quoted by the Bidder in tender in figures shall be accurately filled.
- b) In the case of any tender where unit rate of any item/items appear unrealistic, such tender will be considered as unbalanced and in case the tender is unable to provide satisfactory explanation such a tender is liable to be disqualified and rejected.

35. Any other terms and conditions shall be as per Uttar Pradesh Procurement Manual-2016

36. Acknowledgement

It is hereby acknowledged that we have gone through all the conditions mentioned above and we agree to abide by them.

Annexure-I

**TECHNICAL SPECIFICATIONS FOR LABORATORY IN ELECTRICAL
ENGINEERING DEPARTMENT**

LIST OF EXPERIMENTS, EQUIPMENTS & MAKE						
SI N O.	ITEM DESCRIPTION	Qty	Unit	Basic rate in figures to be entered by Bidders	Total amou nt includ ive of all GST & Taxes	Total amount in words
1	2	3	4	5	6	7
1	Control Trainer with Process Simulator Panel Determine the Transient Response of a 2nd Order System with step square input SALIENT FEATURES Learn how an Analog as well as Digital PID works. Facility to monitor behavior of the controller output (Un) & process variable (MV) either on PC screen or on CRO. Settable time constants. P4/XP or latest version window based PID controller (DDC) software package with P, PI & PID control, Ratio & cascade control, three operating modes, Online graph drawing & data acquisition modes (SCADA). Can learn about different processes using simulated building blocks as well as real life processes using replaceable experiment panels/processes & built in square / triangle / sin function generator as disturbance. Graph printing facility for laboratory journal entries. Aesthetically designed injection molded electronic desk (master unit) carrying useful experiment resources like Power supplies, DPMs, Computer Interface, Analog PID controller with central slot to hold various replaceable experiment panels / processes. Connection through sturdy 4mm Banana sockets & Patch cords, Students workbook & Instructor's Guide provided. Useful for Post Graduate projects & research purpose. Basic Resources on Top board Built in power supply DC supply +12V, 500mA. 1phase sine reference for cosine firing 30Vpp max. 17Vdc, 500mA unregulated for driving pulse X'mer Variable DC power supply : 7 to 14V/3A	1	Each			

	Display A) DPM - 2Nos. i) For Temp. upto 1000C & intensity in Lux (2000) ii) For speed 2000 rpm & voltage upto 20V. B) Analog Meter - 2Nos. i) Centre zero for display of process error (+9V) ii) For MV/SP (0-2.5V) Operating voltage Switch selectable 220-240Vac, $\pm 10\%$, 50Hz, 75VA PC (WIN7/8/10) based PID controller Online monitoring / Data acquisition / PID Software : on Installable (CD) works under XP, WIN7/8/10 PC with parallel port / USB needed. Operating modes a) Simulator Mode Tests data already stored in files (*.txt) & Drawing graph for all P,PI,PD & PID modes. b) Process Monitoring Mode Drawing graphs of analog data resented at CH 0 & CH of Computer Interface. Cursors for X & Y axis for measurement & online graphs savings for reproduction c) PID controller Mode PID controller with parameters like Integral Time Ti (0.01-64000), Sampling Time Ts (0.1- 99.9), Derivative Time Td (0.1-99.9), Proportional Band Pb(1-999), Derivative Gain Kd(1-999), Set Value Rn (0- 99.9), PID output Upper Limit Uh(0-99.9), PID output Lower Limit Ul (0- 99.9).Facility to set units for output viz. Percentage (%), oC, RPM, Voltage(V), mm, LPH, kg/cm2, si/cm, degree. Supports experiments with advance process control scheme viz; Ratio, ascade, feed forward with user selectable Aux PID, Ratio station & programmable FF transfer function calculator, selective & split control strategies, Multi DPM Screen. Computer Interface Adapter Optoisolated Adaptor to prevent damage to PC parallel port (25 pin LPT) due to wrong connections. 1Interfaces through 25 pin M to F cable 1mtr Length. PC/WINXP/7/8/10 not in scope of supply. 4 ADC channels : 0 to 2.5V full scale. 1 DAC channel : O/P 2.5 V FS. V to I Function block : Input : 0-2.5Vdc O/p: 0-20 or 4-20mA, in 100E load Max USB IO module to interface 25 pin D connector on CIA panel to USB PC port enclosed in 25 Pin D shell using Type A to mini B cable. V to PWM function block : I/P -0-2.5V, O/P-1KHz PWM O/P $\pm 9V$. Analog PID (APID) controller with built in low freq. function generator Controller selection P,PI,PD,PID with slide switch Parameter settings : Integral Time Ti (0.5-25Sec) : Derivative Time Td (0-2Sec) : Proportional Band Pb (5- 200%): Set point (-9V- +9V) Operating modes : Fast (X 100/10mSec) for oscilloscope, Slow (X						
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	0.1/1Sec) for PC interface. 2 No. Level shifter converting process O/p (+9V) to 0-2.5V for PC interface & Actuator panel Test points for Process Error, Set Point (Rn), Measured Value (Cn), Controller output (Un). Built in function generator O/p waveform selectable sine, triangular & square. O/p freq. range from 0.016Hz to 166Hz, 4 steps & fine control pot. Variable amplitude control 0 to +9V. Process Simulator Panel Functional blocks for Lag (3 No.), Integrator (3 No.), Transport Lag (1 No.), Summer (2 No.), Gain (1 No.), Inverter (2 No.) for constructing simulated Type 0,1,2,3 & 1st,2nd,3rd Order processes to work under PID. Experiments with Lead / Lag / Lead - Lag compensators to control behaviour of matching processes using above function blocks. Open loop & close loop response of processes under different P, PI, PID - Analog or Digital controllers. Experimental varification of PID Controller settings (Pb, Ti, Td) Auto Tuning explained using Ziegler Nicolas I & II. Fast (10mS) & slow (1sec) mode selection for all processes to observe response on either CRO or PC using CIA. Drawing Bode plot & Nyquist plots, transfer function determination. Advance process control scheme viz; Ratio, Cascade, feed forward. Level shifters (2No) +9V to 0-2.5V & 0-2.5V to +9V to match voltage levels of PC (2.5V) & opamp (+9V).					
2	Control Trainer with Thyristor Actuator Panel To Study P,PI & PID Temperature Controller for an Oven and Compare their results SALIENT FEATURES Learn how an Analog as well as Digital PID works. Facility to monitor behavior of the controller output (Un) & process variable (MV) either on PC screen or on CRO. Settable time constants. P4/XP or latest version window based PID controller (DDC) software package with P, PI & PID control, Ratio & cascade control, three operating modes, Online graph drawing & data acquisition modes (SCADA). Can learn about different processes using simulated building blocks as well as real life processes using replaceable experiment panels/processes & built in square / triangle / sin function generator as disturbance. Graph printing facility for laboratory journal entries. Aesthetically designed injection molded electronic desk (master unit) carrying useful experiment resources like Power supplies, DPMs, Computer Interface, Analog PID controller with central slot to hold various replaceable experiment panels / processes. Connection through sturdy 4mm Banana sockets & Patch cords, Students workbook & Instructor's Guide provided. Useful for Post Graduate projects & research purpose.	1	Each			

Basic Resources on Top board Built in power supply DC supply +12V,500mA. 1phase sine reference for cosine firing 30Vpp max. 17Vdc, 500mA unregulated for driving pulse X'mer Variable DC power supply : 7 to 14V/3A Display A) DPM - 2Nos. i) For Temp. upto 1000C & intensity in Lux (2000) ii) For speed 2000 rpm & voltage upto 20V. B) Analog Meter - 2Nos. i) Centre zero for display of process error (+9V) ii) For MV/SP (0-2.5V) Operating voltage Switch selectable 220-240Vac, $\pm 10\%$, 50Hz, 75VA PC (WIN7/8/10) based PID controller Online monitoring / Data acquisition / PID Software : on Installable (CD) works under XP, WIN7/8/10 PC with parallel port / USB needed. Operating modes a) Simulator Mode Tests data already stored in files (*.txt) & Drawing graph for all P,PI,PD & PID modes. b) Process Monitoring Mode Drawing graphs of analog data presented at CH 0 & CH of Computer Interface. Cursors for X & Y axis for measurement & online graphs savings for reproduction c) PID controller Mode PID controller with parameters like Integral Time Ti (0.01-64000), Sampling Time Ts (0.1- 99.9), Derivative Time Td (0.1-99.9), Proportional Band Pb(1-999), Derivative Gain Kd(1-999), Set Value Rn (0- 99.9), PID output Upper Limit Uh(0-99.9), PID output Lower Limit Ul (0- 99.9). Facility to set units for output viz. Percentage (%), oC, RPM, Voltage(V), mm, LPH, kg/cm², si/cm, degree. Supports experiments with advance process control scheme viz; Ratio, Cascade, feed forward with user selectable Aux PID, Ratio station & programmable FF transfer function calculator, selective & split control strategies, Multi DPM Screen.					
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Computer Interface Adapter Optoisolated Adaptor to prevent damage to PC parallel port (25 pin LPT) due to wrong connections. Interfaces through 25 pin M to F cable 1mtr Length. PC/WINXP/7/8/10 not in scope of supply. 4 ADC channels: 0 to 2.5V full scale. 1 DAC channel : O/P 2.5 V FS. V to I Function block : Input : 0-2.5VDCO/p: 0-20 or 4-20mA, in 100E load Max USB IO module to interface 25 pin D connector on CIA panel to USB PC port enclosed in 25 Pin D shell using Type A to mini B cable. V to PWM function block : I/P -0-2.5V, O/P-1KHz PWM O/P $\pm 9V$. Analog PID (APID) controller with built in low freq. function generator Controller selection P, PI, PD, PID with slide switch Parameter settings : Integral Time T_i (0.5-25Sec) : Derivative Time T_d (0-2Sec) : Proportional Band P_b (5- 200%) : Set point (-9V- +9V) Operating modes : Fast (X 100/10mSec) for oscilloscope, Slow (X 0.1/1Sec) for PC interface. 2 No. Level shifter converting process O/p (+9V) to 0-2.5V for PC interface & Actuator panel Test points for Process Error, Set Point (R_n), Measured Value (C_n), Controller output (U_n). Built in function generator O/p waveform selectable sine, triangular & square. O/p freq. range from 0.016Hz to 166Hz, 4 steps & fine control pot. Variable amplitude control 0 to +9V. A) Thyristor Actuator panel Thyristor bridge based 0-200V/3A cosine firing circuit. Supports signal conditioning of RTD (PT100), Thermocouple K type & Photodiode to output 0-2.5Vdc (FS). Should facilitates closed loop control experiments based on temperature, light intensity, speed measurement using built in P/PI controller as well as external Analog / Digital PID controller. Should have following real life process High Temperature Table Top assembly / accessories: Electric Bunsen Burner (300W) with 50cc heating volume. (Works with DPID only as large transport lag) Sensor K type stainless tube encapsulated TC for temp control upto 550°C List of Experiments PID tuning by Ziegler - Nichols Transfer function determination Operation under various P/I/D Open loop response to step I/P transfer function determination) Close loop control with Digital PID Close loop control with set point change Close loop control with process disturbance					
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3	Control Trainer with Real life Process Control Panel To Study and Calibrate the temperature using resistance temperature detector (RTD) On/Off Temperature Controller (Indicator Cum Controller) SALIENT FEATURES Learn how an Analog as well as Digital PID works. Facility to monitor behavior of the controller output (Un) & process variable (MV) either on PC screen or on CRO. Settable time constants. P4/XP or latest version window based PID controller (DDC) software package with P, PI & PID control, Ratio & cascade control, three operating modes, Online graph drawing & data acquisition modes (SCADA). should learn about different processes using simulated building blocks as well as real life processes using replaceable experiment panels/processes & built in square / triangle / sin function generator as disturbance. Graph printing facility for laboratory journal entries. Aesthetically designed injection molded electronic desk (master unit) carrying useful experiment resources like Power supplies, DPMs, Computer Interface, Analog PID controller with central slot to hold various replaceable experiment panels / processes. Connection through sturdy 4mm Banana sockets & Patch cords, Students workbook & Instructor's Guide provided. Useful for Post Graduate projects & research purpose. Basic Resources on Top board Built in power supply	1	Each			
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	DC supply +12V,500mA.1 1phase sine reference for cosine firing 30Vpp max. 17Vdc, 500mA unregulated for driving pulse X'mer Variable DC power supply : 7 to 14V/3A Display A) DPM - 2Nos. i) For Temp. upto 1000C & intensity in Lux (2000) ii) For speed 2000 rpm & voltage upto 20V. B) Analog Meter - 2Nos. i) Centre zero for display of process error (+9V) ii) For MV/SP (0-2.5V) Operating voltage Switch selectable 220-240Vac, $\pm 10\%$, 50Hz, 75VA PC (WIN7/8/10) based PID controller Online monitoring / Data acquisition / PID Software : on Installable (CD) works under XP, WIN7/8/10 PC with parallel port / USB needed. Operating modes a) Simulator Mode Tests data already stored in files (*.txt) & Drawing graph for all P,PI,PID & PID modes. b) Process Monitoring Mode Drawing graphs of analog data presented at CH 0 & CH of Computer Interface. Cursors for X & Y axis for measurement & online graphs savings for reproduction c) PID controller Mode PID controller with parameters like Integral Time Ti (0.01-64000), Sampling Time Ts (0.1- 99.9), Derivative Time Td (0.1-99.9), Proportional Band Pb(1-999), Derivative Gain Kd(1-999), Set Value Rn (0- 99.9), PID output Upper Limit Uh(0-99.9), PID output Lower Limit Ul (0- 99.9). Facility to set units for output viz. Percentage (%), oC, RPM, Voltage(V), mm, LPH, kg/cm2, si/cm, degree. Supports experiments with advance process control scheme viz; Ratio, Cascade, feed forward with user selectable Aux PID, Ratio station & programmable FF transfer function calculator, selective & split control strategies, Multi DPM Screen. Computer Interface Adapter Optoisolated Adaptor to prevent damage to PC parallel port (25 pin LPT) due to wrong connections. Interfaces through 25 pin M to F cable 1mtr Length. PC/WINXP/7/8/10 not in scope of supply. 4 ADC channels : 0 to 2.5V full scale. 1 DAC channel : O/P 2.5 V FS. V to I Function block : Input : 0-2.5Vdc O/p: 0-20 or 4-20mA, in 100E load Max USB IO module to interface 25 pin D connector on CIA panel to				
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	USB PC port enclosed in 25 Pin D shell using Type A to mini B cable. V to PWM function block : I/P -0-2.5V, O/P-1KHz PWM O/P $\pm 9V$. Analog PID (APID) controller with built in low freq. function generator Controller selection P,PI,PD,PID with slide switch Parameter settings : Integral Time T_i (0.5-25Sec) : Derivative Time T_d (0-2Sec) : Proportional Band P_b (5- 200%) : Set point (-9V- +9V) Operating modes : Fast (X 100/10mSec) for oscilloscope, Slow (X 0.1/1Sec) for PC interface. 2 No. Level shifter converting process O/p (+9V) to 0-2.5V for PC interface & Actuator panel Test points for Process Error, Set Point (R_n), Measured Value (C_n), Controller output (U_n). Built in function generator O/p waveform selectable sine, triangular & square. O/p freq. range from 0.016Hz to 166Hz, 4 steps & fine control pot. Variable amplitude control 0 to +9V. Real life process control panel B) Thyristor Actuator panel Thyristor bridge based 0-200V/3A cosine firing circuit. Supports signal conditioning of RTD (PT100), Thermocouple K type & Photodiode to output 0-2.5Vdc (FS). Should facilitates closed loop control experiments based on temperature, light intensity, speed measurement using built in P/PI controller as well as external Analog / Digital PID controller.					
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	Should have following real life process i) Process Temp/Light Process box contains 3 high wattage (60W) bulbs under aluminum plate heater. Built in fan, lamp as disturbance generator. Sensor RTD for temperature control upto 100 degree C with built in CAL facility, Photodiode for light intensity control upto 2000lux List of Experiments : PID tuning by Ziegler - Nichols Transfer function determination Operation under various P/I/D Open loop response to step input (transfer function determination) Close loop control with Analog PID Close loop control with Digital PID Close loop control with built in Proportional controller / lag compensator (PI controller) PID control with PWM O/P					
4	Control Trainer with Servo Interface Panel DC Position Servomechanism Demonstration					

	SALIENT FEATURES Learn how an Analog as well as Digital PID works. Facility to monitor behavior of the controller output (Un) & process variable (MV) either on PC screen or on CRO. Settable time constants. P4/XP or latest version window based PID controller (DDC) software package with P, PI & PID control, Ratio & cascade control, three operating modes, Online graph drawing & data acquisition modes (SCADA). Should learn about different processes using simulated building blocks as well as real life processes using replaceable experiment panels/processes & built in square / triangle / sin function generator as disturbance. Graph printing facility for laboratory journal entries. Aesthetically designed injection molded electronic desk (master unit) carrying useful experiment resources like Power supplies, DPMs, Computer Interface, Analog PID controller with central slot to hold various replaceable experiment panels / processes. Connection through sturdy 4mm Banana sockets & Patch cords, Students workbook & Instructor's Guide provided. Useful for Post Graduate projects & research purpose. Basic Resources on Top board Built in power supply DC supply +12V,500mA. 1phase sine reference for cosine firing 30Vpp max. 17Vdc, 500mA unregulated for driving pulse X'mer Variable DC power supply : 7 to 14V/3A Display A) DPM - 2Nos. i) For Temp. upto 1000C & intensity in Lux (2000) ii) For speed 2000 rpm & voltage upto 20V. B) Analog Meter - 2Nos. i) Centre zero for display of process error (+9V) ii) For MV/SP (0-2.5V) Operating voltage Switch selectable 220-240Vac, $\pm 10\%$, 50Hz, 75VA PC (WIN7/8/10) based PID controller Online monitoring / Data acquisition / PID Software : on Installable (CD) works under XP, WIN7/8/10 PC with parallel port / USB needed. Operating modes a) Simulator Mode Tests data already stored in files (*.txt) & Drawing graph for all P,PI,PD & PID modes. b) Process Monitoring Mode Drawing graphs of analog data presented at CH 0 & CH of					
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Computer Interface. Cursors for X & Y axis for measurement & online graphs savings for reproduction 1 c) PID controller Mode PID controller with parameters like Integral Time T_i (0.01-64000), Sampling Time T_s (0.1- 99.9), Derivative Time T_d (0.1-99.9), Proportional Band P_b(1-999), Derivative Gain K_d(1-999), Set Value R_n (0- 99.9), PID output Upper Limit U_h(0-99.9), PID output Lower Limit U_l (0- 99.9). Facility to set units for output viz. Percentage (%), oC, RPM, Voltage(V), mm, LPH, kg/cm², si/cm, degree. Supports experiments with advance process control scheme viz; Ratio, Cascade, feed forward with user selectable Aux PID, Ratio station & programmable FF transfer function calculator, selective & split control strategies, Multi DPM Screen. Computer Interface Adapter Optoisolated Adaptor to prevent damage to PC parallel port (25 pin LPT) due to wrong connections. Interfaces through 25 pin M to F cable 1mtr Length. PC/WINXP/7/8/10 not in scope of supply. 4 ADC channels : 0 to 2.5V full scale. 1 DAC channel : O/P 2.5 V FS. V to I Function block : Input : 0-2.5Vdc O/p: 0-20 or 4-20mA, in 100E load Max USB IO module to interface 25 pin D connector on CIA panel to USB PC port enclosed in 25 Pin D shell using Type A to mini B cable. V to PWM function block : I/P -0-2.5V, O/P-1KHz PWM O/P $\pm 9V$. Analog PID (APID) controller with built in low freq. function generator Controller selection P,PI,PD,PID with slide switch Parameter settings : Integral Time T_i (0.5-25Sec) : Derivative Time T_d (0-2Sec) : Proportional Band P_b (5- 200%) : Set point (-9V- +9V) Operating modes : Fast (X 100/10mSec) for oscilloscope, Slow (X 0.1/1Sec) for PC interface. 2 No. Level shifter converting process O/p (+9V) to 0-2.5V for PC interface & Actuator panel Test points for Process Error, Set Point (R_n), Measured Value (C_n), Controller output (U_n). Built in function generator O/p waveform selectable sine, triangular & square. O/p freq. range from 0.016Hz to 166Hz, 4 steps & fine control pot. Variable amplitude control 0 to +9V. Servo Interface panel Control Interface circuit for AC & DC servo motor, signal conditioning circuit for speed sensor to output 0 - 2.5V dc (2500RPM) with speed direction. Level shifter 0 - 2.5V to + 9V (2nos). Hysteresis, Dead band & Relay control circuit (2term & 3 term), process block for 2Nos. of 1st order lag / integral + transport lag, error & gain block for process simulation. Should have following real life process i) DC servo position Control					
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	PMDC motor 12Vdc, 40W, ND RPM 2000RPM with gear box (Ratio 30:1) Loading:. Servo amplifier with built in 12V / 3A Power Supply. Sensor: Photo reflective speed sensor with dir detects using 2 nos. of photodiodes. Servo pot as position feedback, position, speed, cascade control. List of Experiments - PID tuning by Ziegler Nichols Motor Process parameter study torque speed Dynamics measurements & transfer function determination. - Close loop position control using 2/3 step controller. - Close loop using 2/3 step controller with simulated processes. - Open loop speed control of DC servo motor process III. - Speed/Velocity control of DC motor - Close loop control with analog PID - Close loop control with digital PID - Position control of DC motor - Cascade control of speed & position feedback					
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5	DC Motor Coupled to DC Motor Trainer (To Obtain a Frequency of a DC Shunt Machine using Swinburne's Test) Salient Features • Facilitates easy & safe wiring by students due to use of 4mm sturdy shrouded banana patch cords & 1 shrouded socket arrangements. • All machines are mounted on finely painted sturdy base frame with easy machine interchangeability Use of gear coupling facilitates screw less coupling. • With due emphasis on student safety machines operate upto 300W power levels & upto 1500 RPM, without compromising didactic use Able to draw all graphs. • Trunnion mounted DC Integrated machine is used as Dynamometer for loading other machines (Motors / generators both); unlike magnetic powder brake or eddy current brake which can load only coupled Motors & not generators, with facility to measure shaft power using electronic torque / speed measurement • Set of Students Workbook & Instructors Guide. Motor Specifications DC integrated motor coupled to DC integrated motor setup (Motor-Generator setup): 1) DC Integrated motor with following specs: Voltage: $V_{arm} = 180V$, $V_{field} = 180V$, Capacity: 300W/2 pole/ 1500RPM/6 terminals, Rotor construction: Standard commutator / brush arrangement with laminated stack, brought out on 2 terminals, Stator construction: Separately excited field winding with laminated solid yoke 2 pole & series winding brought out on 4 terminals, Frame/mounting: 100 frame, chassis mounted, 19mm shaft dia, with easily swappable gear coupling. 2) DC Integrated motor with following specs: Voltage: $V_{arm} = 180V$, $V_{field} = 180V$, Capacity: 300W/2 pole/ 1500RPM/6 terminals, Rotor construction: Standard commutator / brush arrangement with laminated stack, brought out on 2 terminals, Stator construction: Separately excited field winding with laminated solid yoke 2 pole & series winding brought out on 4 terminals, Frame/mounting: 100 frame, chassis mounted, 19mm shaft dia, trunnion mounted m/c for use as dynamometer with torque & speed sensors. Technical Specifications Aluminum profile Sturdy Modular Flat (4x2) panel (table top) system, carrying various high voltage components housed in plastic enclosures (panel) to minimise shock possibility. Instrumentation Power supply cum Multichannel DPM panel (a) $\pm 12V$, 500 mA, (b) $+5V$, 300mA, (c) Unregulated 17V dc/750 mA (d) line synchronizing signal, (e)						
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	13V / 3 Amp. (f) Multi channel DPM for digital display of torque, speed etc. SCR Actuator (variable DC) cum sensor signal conditioning panel • Full bridge SCR based 0V-195V / 3 Amp cosine firing with linear characteristics. • Supports signal conditioning circuit for speed, torque in kg to give output 0-2.5Vdc (FS). • 2 Nos. of these supplies required for DC Armature, DC motor field & AC generator excitation. DC voltmeter & DC ammeter panel a) DC voltmeter (0-300V), b) DC Ammeter (0-5A) with polarity protection diode c) Field failure relay to control Armature supply. Resistor Load Panel DC Resistors = 750E / 600E / 300E / 212E / 162E / 125E / 112E/100E/400W / 6 taps+OFF+ separate 60E tap for DC series Gen. List of Experiments 1) DC motor:- Speed torque curve & efficiency of i) Shunt motor ii) DC series motor, iii) Separately excited DC motor, iv) DC compound motor. 2) DC generator: i) Output volt-amp characteristics of DC shunt generator. ii) Efficiency of DC shunt generator iii) Output volt-amp characteristics of DC separately excited generator. iv) Efficiency of DC separately excited generator. v) Output volt-amp characteristics of D C series generator.					
6	Transformer Trainer Salient Features: • Facilitates study of transformer operation, determine its equivalent circuit, use of tertiary winding to suppress harmonics etc. • Facilitates easy & safe wiring by students due to 4mm sturdy shrouded banana patch cords & shrouded socket arrangement for high voltage circuits. 1 • Each of following standalone Electrical trainers may need a set of associated panels which are mounted in a light weight sturdy aluminium flat demo panel system. • Each panel has ABS molded plastic sturdy enclosure, & colorful screw less overlays showing circuit diagram & its connection tag numbers for easy understanding & connections. • Set of Instructor Guide & Student Workbook. Technical Specifications Aluminum profile Sturdy Modular Flat Panel system, carrying various high voltage components housed in plastic enclosures (panel) to minimize shock possibility. Input 3 phase DOL Starter panel	1	Each			

• 4 pole MCB of 415 V/4A . • DOL 9A Contactor with 230V / 50 Hz / 11VA COIL . • Bimetallic thermal O/L relay with range 1.4A - 2.3A for 300VA or 3A -5A for 1KVA/3kVA. 3 Phase Bidirectional power cum Energy meter panel x 3 nos. • Bidirectional Multifunction Meter • 3 Phase 3/4 wire, 415V CT Input 5A • LCD/LED display, Aux supply 230V, 45-65 Hz, 5W • V.I., Hz, Pf, KVA, KW,KWH • Modbus RTU RS 485 (optional) FWD-OFF-REV switch panel • FWD/REV, 3 pole 3 way switch with centre OFF, 6A/440V. 1 phase AC Input supply panel • 1 phase MCBs of 4A/1.6A - 2nos. • Bulb Load. AC voltmeter panel • Voltage range : 500V. • 1 pole 4 way switch to select line voltage for three phase Dual range AC ammeter panel • Current range:2A/6A selectable . • 1 pole 7 way switch to select phase current for three phase Milliohm (V-I method) / Rect/ CAP Load Panel • Transformer : 230V/14V/3A. • DC Voltmeter : (0 –10Vdc). • DC Ammeter : (0 –10A). • Diode bridge rectifier with Rectifying capacitor Resistive Load • AC Resistors 10K/5K/3.5K/2.5K/2K/1.5K/OFF (6 taps+1 OFF) 200W x 3 phase • DC Resistors 750E/600E/300E/212E/162E/ 125E/112E/100E/400W /8 taps + OFF + separate 60E tap for DC series Gen. Lamp Load • 230V/100W X3 bulbs with individual ON/OFF using 6A toggle. Parameters : • VA rating : 300VA • X mer type: 1 Phase/ 3 Phase • Construction : Double wound iron core EL STEP DOWN xmer/ Iron core strip lamination type step down Delta primary / Star secondary design. • Primary :3 Nos. Isolated primaries 0-415/0.24A at 50Hz brought out on 3 x 4 sockets • Secondary : 3 Nos. Isolated windings groups main 110V/0.5A, zigzag 110V/0.5A, Tertiary 220V/0.25A brought out on 4 x 3 x 3 sockets. • Accessories: 3 Phase / 3 Amp. Variac (table top) List of experiments : 1. Study of Manufacturing Quality Tests. 2. Study of Insulation resistance test. 3. Study of Turns ratio test 4. Study of Polarity test. 5. Study of Performance tests. 6. Study of Open circuit test					
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	7. Scott connection : Using 2 nos. of 1 phase Transformer 8. Study of Load regulation test. 9. Study of Back to back test (sumpner test) 10. Study of Winding temperature rise test. 11. Measurement of winding resistance by DC V–I method. 12. Study of effect of type of load on transformer output waveform 13. Study of Parallel operation of single-phase transformers 14. Study of Scott connection for 3phase to 2 phase conversion 15. Three phase transformers - basic configurations – their effect on capacity utilization regulation. 16. Study of Phasor Groups in 3 Phase Transformer connections 17. Study of Phasor Group1 connections in 3 phase Transformer. 18. Study of Phasor Group2 connections in 3 phase Transformer. 19. Study of Phasor Group3 connections in 3 phase Transformer. 20. Study of Phasor Group4 connections in 3 phase Transformer. 21. Study of using Tertiary winding on 3 phase transformers for suppressing harmonics. 22. Study of Load regulation, efficiency & Temp. rise test on 3 phase Transformers 23. Study of Manufacturing Quality Tests on 3 phase transformers 24. Study of Short circuit test 25. Determination of zero sequence reactance of 3 phase transformer. 26. Determination of equivalent circuit of 3 phase transformer 27. Self & mutual inductance measurement of 1 phase transformer 28. Determination of equivalent circuit of 3 phase transformer.					
7	1 Phase AC Induction Motor Trainer FEATURES: • Facilitates easy & safe wiring by students due to use of 4mm sturdy shrouded banana patch cords & shrouded socket arrangements. • Machines should be mounted on finely painted sturdy base frame • With due emphasis on student safety machines should operate upto 300W power levels & upto 1500 RPM, without compromising didactic use Able to draw all graphs. • Break pulley arrangement for variable loading of motor should be provided. MOTOR SPECIFICATIONS 1Ph AC Integrated motor Voltage: 230VAC, 50Hz, Capacity: 300W/4 pole/ 1500RPM/ 10 terminals, Rotor construction: Diecast squirrel cage Rotor, Stator construction: Two windings should be brought out on 4 terminals for main & auxiliary, these will be used to configure different motors split phase, CSCR, CSIR, Frame/mounting: 100 frame, chassis mounted, 19 mm shaft dia.Loading arrangement: Friction break pulley (60.5mm dia) for loading arrangement with 20Kg spring balance for torque measurement. Speed Measurement: Using hand held tachometer. CONTROL PANEL SPECIFICATIONS A] Aluminum profile sturdy flat panel (table top) system, carrying various high voltage components housed in plastic enclosures (panel) to minimize shock possibility. 1 Ph. Motor, Alternator & Sync. Motor Panel • 1 ph. MCBs of 4A/1.6A 1 each. • Bulb Load.	1	Each			

	Integrated AC 1 phase multifunction measurement panel • Should Consist of 1 nos of (96X96mm) Digital meter for 1 Measures V, I, PF (0.2 lag - unity 0.2 lead), W, VA, VAR, Hz etc.) • Current specs for 1 meter = 5A. • Auxiliary supply = 170-250VAC 3 Phase wound Rotor & Sync. Motor panel • Rotor resistors of 30E/5A with 3 taps of 0E, 15E, 21E, 30E (each 3 nos.) • Rotor resistor selector switch, 3 pole 6 Way 6A/440 V. • DC Rotor excitation over current Circuit Breaker (3Amp) Phase Shift Lock Rotor Mechanism [PSLR] : I) Mounting Method: By mounting PSLR mechanism on C bracket, using 4 nuts & bolts, it can be directly inserted on to the shaft of diameter 19mm of 3Phase AC machine & to screw the C bracket securely to U shaped open slots of chassis. II) Block Rotor Test : Above mechanism is mounted on chassis as shown & coupled to 3 phase AC induction squirrel cage motor (0.5HP) to carry out block rotor test. Here the turning wheel or knob of PSLR mechanism has no role to play. Following List Of Experiments Should Be Performed With The Trainer : 1) Study of Speed-Torque Characteristics of 1 Phase induction motor (Split phase type). 2) Study of Efficiency & Input power factor of 1 Phase induction motor (Split phase type) for various loading conditions. 3) Study of Speed-Torque Characteristics of 1 Phase Induction Motor (Capacitor Start Type) 4) Study of Efficiency & Input Power factor of 1 Phase induction motor (Capacitor Start Type) for various loading conditions. 5) Study of Speed -Torque Characteristics of 1 Phase Induction Motor (Capacitor Start-Run Type). 6) Study of Efficiency & Input power factor of 1 Phase induction motor (Capacitor Start-Run Type) for various loading conditions. 7) Study NO LOAD TEST&BLOCKED ROTOR TESTon 1 Phase induction motor.					
8	DC Motor Coupled To 3 Ph AC Motor Trainer SALIENT FEATURES • Facilitates easy & safe wiring by students due to use of 4mm sturdy shrouded banana patch cords & shrouded socket arrangements. • All machines are mounted on finely painted sturdy base frame with easy machine interchangeability Use of gear coupling facilitates screw less coupling. • With due emphasis on student safety machines operate upto 300W power levels & upto 1500 RPM, without compromising didactic use Able to draw all graphs. • Trunnion mounted DC Integrated machine is used as Dynamometer for loading other machines (Motors / generators both); unlike magnetic powder brake or eddy current brake which can load only coupled Motors & not generators, with facility to measure shaft power using electronic torque / speed measurement • Set of Students Workbook & Instructors Guide. Motor Specifications	1	Each			

3 phase AC integrated motor coupled to DC integrated motor setup (Motor-Generator setup): 1) 3 phase AC Integrated motor with following specs: Voltage: 415VAC, 50Hz, Capacity: 300W/4 pole/ 1500RPM, Rotor construction: Star connected, four terminals including star point brought out on 4 slip rings mounted on shaft, Stator construction: Six terminal are brought out to start the machine using stardelta starter, Frame/mounting: 100 frame, chassis mounted, 19mm shaft dia with easily swappable gear coupling. 2) DC Integrated motor with following specs: Voltage: Varm = 180V, Vfield = 180V, Capacity: 300W/2 pole/ 1500RPM/6 terminals, Rotor construction: Standard commutator / brush arrangement with laminated stack, brought out on 2 terminals, Stator construction: Separately excited field winding with laminated solid yoke 2 pole & series winding brought out on 4 terminals, Frame/mounting: 100 frame, chassis mounted, 19mm shaft dia, trunnion mounted m/c for use as dynamometer with torque & speed sensors. Technical Specifications Aluminum profile Sturdy Modular Flat (5x4) panel (table top) system, carrying various high voltage components housed in plastic enclosures (panel) to minimise shock possibility. Input 3 phase DOL Starter panel • 4 pole MCB of 415 V/4A . • DOL 9A Contactor with 230V / 50 Hz / 11VA Coil . • Bimetallic thermal O/L relay with range 1.4A - 2.3A . 1 Phase Motor, Alternator & Sync. Motor Panel • 1 MCBs of 4A/1.6A 1 each. • 2no 2P2W selector switches to run as 1 alternator then as synchronous motor. • 8A pushbutton switch to simulate as centrifugal switch. 3 Phase Bidirectional power cum Energy meter panel • Bidirectional Multifunction • 3 Phase ¾ wire, 415V, CT Input 5A • LCD/LED display, Aux supply 230V, 45-65 Hz, 5W • V,I, Hz, Pf, KVA, KW, KWH • Modbus RTU RS 485 1 Integrated AC 1 phase multifunction measurement panel • Consist of 1 nos of (96X96mm) Digital meter for 1 F Measures V, I, PF (0.2 lag - unity 0.2 lead), W, VA, VAR, Hz etc. • Current Range = 5A. • Auxiliary supply = 170-250VAC FWD/REV, Star-Delta starter panel • FWD/REV, 3 pole 3 way switch with centre OFF, 6A/440V. • Star/Delta switch 3 pole, 3 way with centre OFF, 6A/440V. 3 Phase wound Rotor & Sync. Motor panel • Rotor resistors of 30E/5A with 3 taps of 0E, 15E, 21E, 30E(each 3 nos) • Rotor resistor selector switch, 3 pole. 6 Way. 6A/440 V. • DC Rotor excitation with over current Circuit Breaker (3Amp) DC voltmeter & DC ammeter panel a) DC voltmeter (0-300V), b) DC Ammeter (0-5A) with polarity						
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	protection diode c) Field failure relay to control Armature supply. SCR Actuator (variable DC) cum sensor signal conditioning panel • Full bridge SCR based 0V-195V / 3 Amp cosine firing with linear characteristics. • Supports signal conditioning circuit for speed, torque in kg to give output 0-2.5Vdc (FS). • 2 Nos. of these supplies required for DC Armature, DC motor field & AC generator excitation. Instrumentation Power supply cum Multichannel DPM panel (a) +/-12 V, 500 mA, (b) +5V, 300mA, (c) Unregulated 17V dc/750 mA (d) line synchronizing signal, (e) 13V / 3 Amp. (f) Multi channel DPM for digital display of torque, speed etc. Resistor Load Panel (1) AC Resistors = 10K/5K/3.5K/2.5K/2K/1.5K/200WX3 phases / 6 taps (2) DC Resistors = 750E / 600E / 300E / 212E / 162E / 125E / 112E/100E/400W / 6 taps+OFF+ separate 60E tap for DC series Gen. LC Load Panel (A) Inductive Load = 0.15H / 0.3H / 0.45H / 0.6H / 0.75H / 1.5H / 3H / 400mA X 3 Nos. (B) Capacitive Load = 1.25μF/ 2.5μF/5μF/415V x 3 Nos. Variable AC/DC power Supply Panel • AC output 0 to 270V / 3 Amp. • DC output 0 to 230V / 3 Amp. List of Experiments 1) DC motor: Speed torque curve of i) DC Shunt motor, ii) DC series motor, iii) separately excited DC motor, iv) DC compound motor. 2) DC generator: V-I, Efficiency curve for i) DC shunt generator, ii) DC series generator, iii) DC separately excited generator, iv) DC compound generator, v) OCC of shunt generator. 3) 3 Phase AC motor: i) speed torque curve of wound rotor I.M. with rotor shorted & with different rotor resistance, ii) DOL/Star-Delta starter, rotor resistance starter, iii) Application of sync. Motor as pf improvement device-V curves. 4) 3 Phase Generator: Synchronous generator V-I curves.					
9	DC Motor Coupled to 3 Phase Salient Motor Trainer SALIENT FEATURES • Facilitates easy & safe wiring by students due to use of 4mm sturdy shrouded banana patch cords & shrouded socket arrangements. • All machines are mounted on finely painted sturdy base frame with easy machine interchangeability Use of gear coupling facilitates screwless coupling. • With due emphasis on student safety machines operate upto 300W power levels & upto 1500 RPM, without compromising didactic use Able to draw all graphs. • Trunnion mounted DC Integrated machine is used as Dynamometer for loading other machines (Motors / generators both); unlike magnetic powder brake or eddy current brake which can load only coupled	1	Each			

Motors & not generators, with facility to measure shaft power using electronic torque / speed measurement • Set of Students Workbook & Instructors Guide. Motor Specifications 1) 3 phase Salient Pole Alternator coupled to DC integrated motor setup (Motor-Generator setup): 1) 3 Phase Salient pole alternator : Voltage: 415VAC, 50Hz, Capacity: 300W/4 pole/ 1500RPM, Rotor 1 construction: Star connected, four terminals including star point brought out on 4 slip rings mounted on shaft, Stator construction: Separately excited field winding with laminated solid yoke, 4 pole, brought out on Two terminal, Frame/mounting: 100 frame, chassis mounted, 19mm shaft dia with easily swappable gear coupling. 2) DC Integrated motor : Voltage: $V_{arm} = 180V$, $V_{field} = 180V$, Capacity: 300W/2 pole/ 1500RPM/6 terminals, Rotor construction: Standard commutator / brush arrangement with laminated stack, brought out on 2 terminals, Stator construction: Separately excited field winding with laminated solid yoke 2 pole & series winding brought out on 4 terminals, Frame/mounting: 100 frame, chassis mounted, 19mm shaft dia, trunnion mounted m/c for use as dynamometer with torque & speed sensors. Technical Specifications Aluminum profile Sturdy Modular Flat (5x4) panel (table top) system, carrying various high voltage components housed in plastic enclosures (panel) to minimise shock possibility. Input 3 phase DOL Starter panel • 4 pole MCB of 415 V/4A . • DOL 9A Contactor with 230V / 50 Hz / 11VA Coil. • Bimetallic thermal O/L relay with range 1.4A - 2.3A. 1 Phase Motor, Alternator & Sync. Motor Panel • 1 MCBs of 4A/1.6A 1 each. • 2no 2P2W selector switches to run as 1 alternator then as synchronous motor. • 8A pushbutton switch to simulate as centrifugal switch. 3 Ph. Bidirectional power cum Energy meter panel • Bidirectional Multifunction • 3 Phase $\frac{3}{4}$ wire, 415V, CT Input 5A • LCD/LED display, Aux supply 230V, 45-65 Hz, 5W • V, I, Hz, Pf, KVA, KW, KWH • Modbus RTU RS 485 Integrated AC 1 phase multifunction measurement panel • Consist of 1 nos. of (96X96mm) Digital meter for 1 F Measures V, I, PF (0.2 lag - unity 0.2 lead), W, VA, VAR, Hz etc. • Current Range = 5A. • Auxiliary supply = 170-250VAC FWD/REV, Star-Delta starter panel • FWD/REV, 3 pole 3 way switch with centre OFF, 6A/440V. • Star/Delta switch 3 pole, 3 way with centre OFF, 6A/440V. 3 Phase wound Rotor & Sync. Motor panel • Rotor resistors of 30E/5A with 3 taps of 0E, 15E, 21E, 30E(each 3 nos) • Rotor resistor selector switch, 3 pole. 6 Way. 6A/440 V.					
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	• DC Rotor excitation with over current Circuit Breaker (3Amp) - DC voltmeter & DC ammeter panel a) DC voltmeter (0-300V), b) DC Ammeter (0-5A) with polarity protection diode c) Field failure relay to control Armature supply. - SCR Actuator (variable DC) cum sensor signal conditioning panel • Full bridge SCR based 0V-195V / 3 Amp cosine firing with linear characteristics. • Supports signal conditioning circuit for speed, torque in kg to give output 0-2.5Vdc (FS). • 2 Nos. of these supplies required for DC Armature, DC motor field & AC generator excitation. - Instrumentation Power supply cum Multichannel DPM panel (a) +/-12 V, 500 mA, (b) +5V, 300mA, (c) Unregulated 17V dc/750 mA (d) line synchronizing signal, (e) 13V / 3 Amp. (f) Multi channel DPM for digital display of torque, speed etc. - Resistor Load Panel (1) AC Resistors = 10K/5K/3.5K/2.5K/2K/1.5K/200WX3 phases / 6 taps (2) DC Resistors = 750E / 600E / 300E / 212E / 162E / 125E / 112E/100E/400W / 6 taps+OFF+ separate 60E tap for DC series Gen. - LC Load Panel (A) Inductive Load = 0.15H / 0.3H / 0.45H / 0.6H / 0.75H / 1.5H / 3H / 400mA X 3 Nos. (B) Capacitive Load = 1.25μF/ 2.5μF/5μF/415V x 3 Nos. - Variable AC/DC power Supply Panel • AC output 0 to 270V / 3 Amp. • DC output 0 to 230V / 3 Amp. - List of Experiments 1) DC motor: Speed torque curve of i) DC Shunt motor, ii) DC series motor, iii) separately excited DC motor, iv) DC compound motor. 2) DC generator: V-I, Efficiency curve for i) DC shunt generator, ii) DC series generator, iii) DC separately excited generator, iv) DC compound generator, v) OCC of shunt generator. 3) 3Ø Synchronous motor: i) Speed torque curve of synchronous motor ii) Efficiency & input power factor measurement, iii) Study of V-curve & inverted 'V' curve. 4) Synchronous Generator : i) Output volt-amp characteristics, ii) Efficiency of Synchronous generator, iii) Performance with R, L, C load 5) 3 Phase Auto Transformer: 0-440V/5 i) Voltage: 0-440V ii) Current : 5A					
10	Electrical & Electronic Trainer with AVO Meter , 100nA MC meter Lamp, Relays, 4 Cells Panel • Aesthetically designed injection molded electronic desk carrying useful experiment resources Variable Power supplies / Status / Pulsar / Function Generator, DPMs etc. while the central slot will carry replaceable experiment panel secured in an ABS molded plastic	1	Each			

	sturdy enclosure, & has colorful screw less overlay showing circuit & its connection tag numbers for easy connectivity. • Connection through Sturdy 4mm Banana Sockets & Patch Cords. • Hands on learning by constructing circuits using built in power bread board panel as well as using Discrete component panel. • Set of Users Guide provided with each Unit. Specifications • Built in Power Supply : DC Supply : 5V / 1A. & $\pm 12V$, 1A. 0 to 15V DC (Variable), 100 mA (Isolated), 0 to 30V DC (Variable), 100 mA (Isolated High Volt DC 15V to 110V, 100Ma, AC Supply : 12-0-12V AC, 150 mA. Short circuit Protected. • Built in Function Generator – O/p Waveform: Sine, Triangle & TTL O/Ps Output Frequency : 1 Hz to 1MHz in 6 ranges, with amplitude & frequency control pots. O/P Voltage 20Vp-p max. (Sin/TRG), Modulation I/P: AM : - I/P voltage + 5V (100% modulation) O/P - For 0V (min), + 5V (max.) - 5V (Phase reversal of O/P) FM : I/P voltage $\pm 400mV$ (+ 50% modulation) • Clock Generator : 10 MHz TTL clock. • Data Switches (10 No.) & bi-colour LED status indicators 10X2 Nos, for High / Low indication. • Pulsar switches (2 Nos.) with four debounced outputs - 2No. • BNC to 2 channel banana adapter - 2No. • Logic probe to detect High/Low level pulses upto 1MHz, with bi-colour LEDs to indicate status. • 2 / 4 digit 7 segment display with BCD to 7 segment decoder. • Onboard DPMs provided with mode/range selection. (A) DC volt : 2V/200V - 1No. (B) DC current : 2mA/200mA - 1No. (C) DC Volts/Current : 20V/200mA - 1No. • Onboard moving iron meters provided for (A) AC Current : 1 AMP - 1No. (B) AC Voltage : 15V - 1No. • Onboard speaker : 8 Ohms, 0.5 Watt (1No.) • Onboard POTS : 1K - 1No. 1M - 1No. • Operating Voltage: 220/240Vac switch settable $\pm 10\%$, 50Hz/60VA. AVO Meter, Lamp, Relays, Cells Expt. Panel: 1.5 x 4 No. cells for series parallel expts., moving coil meter (500 uA) to construct voltmeter, ammeter & ohmmeter, bulbs in series parallel relays characteristics staircase lamp logic.					
11	House/ Commercial wiring Installation Trainer Technical Specifications: The Trainer should have Aluminum profile sturdy Modular flat panel (table top) system, carrying various high voltage components housed in plastic enclosures (panel) to minimise shock possibility It should consists of : • 1 ph. AC input supply	1	Each			

• 1 ph. MCBs of 4A/1.6A - 2nos. Grounding & protection panel • Consists of a 2 pole Earth Leakage Circuit Breaker (ELCB) 25A with current imbalance of 30mA. • One NO push button to create Earth leakage fault. • One SPDT to select HI- leakage or LO-leakage fault. • One 15W bulb for Hi-Leakage fault & 22KW resistor for Lo leakage fault. Integrated AC (1 phase) measurement panel • 1 nos of Digital meter for 1 ph. parameters V, I, PF, W, Wh, VA, VAR, Hz, etc. • Current specs = 1A/5A for 1ph. meter (170-250V). AC Power supply panel • AC OSARAM power supply for metal halide lamp 70W (max. 5KV) • Input 230VAC/0.4A DC Power supply panel • SMPS power supply for LED • Input 230VAC, Output +12V/5A, 60W • DC supply for down lighter Switches panel • One way switch = 2 nos • Two way switch = 2 nos Buzzer/bell switch/ Neon panel • Buzzer/Bell, I/P 230VAC • Bell switch • Neon lamp indicator • Kitkat fuse Dimmer/Fault panel • Dimmer • fault = 2 nos Sockets panel • Three pin AC mains Sockets = 3 nos • 230V/10A rating DP switch panel • Double pole single through four terminal S/W= 2nos • Rating 32A/240VAC Lamp panel • Incandescent lamp = 1 no, CFL tube = 1 no Various Lamp/Tubes provided • Metal Halide lamp (70W) • Electronic tube • Point source LED • Strip LED Display panel showing various wiring accessories • Conduit, Elbow joints, casing taping, • Cleats, Batten with clips, cable/wires etc. Wiring practice board A replaceable 20mm particle board is mounted vertically on profiles in front of lower row of panel. The inclination of the board is settable from near vertical position to near horizontal position & it is used for wiring practice by students using self tapping screws & wiring accessories.					
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	Following accessories should be provided. Drill Machine, screw driver se, self tapping screws, drill bits. The Trainer should be capable of performing following experiments. 1. Electrical Safety Rules for working in laboratories 2. Variety of wiring experiments based on above operational panels 3. Study of Protective Devices Panel 4. Study & use of Measurement Devices 5. Understanding working of various types of lamps including tube, led & other high intensity lamps 6. Hands on wiring practice using cables, casing & hand tools					
12	Power Electronics Trainer with CON / INV Panel Features •Aesthetically designed injection molded electronic desk. •Master unit carrying useful experiment resources like line Synchronized firing circuits, Power supplies, lamp load, RLC loads, Battery Charging supply etc. while the central slot will hold replaceable experiment panels. • Each multi experiment panel is secured in an ABS molded plastic sturdy enclosure, & has colorful screw less overlay showing circuit & Connection through Sturdy 4mm Banana Sockets & Patch Chords. • Set of User Guide provided with each unit. • Power Scope • Accessory for any Lab CRO for off ground differential measurements upto 1000Vdc to facilitate checking inverter / converter waveform. Master Unit Built in power supply • DC supply : + 12V, 500mA, • Unregulated Power supply 17V / 750mA, • Regulated 7VDC to 14VDC/3A O/P is provided as 12V Battery charging supply. In absence of battery, same may be used as simulated battery source to run experiments on inverters etc. • Isolated DC supply +12V/ 300amA with isolated common. • On board Inverter transformer of Primary & Secondaries: 12-11-0-11-12/3A. • On board o/p to Isolated Drive Circuit AC supply • 230V AC line voltage is made available on two banana 4mm sockets as well as 1.5A fuse extender for variac if used. • Aux DC Power Supply : (Useful as field / armature supply for DC motor) • Variable upto 200Vdc/0.5Amp (Phase controlled Thyristor half bridge) • Field ON/OFF control with field failure relay & over current protection circuit. LSPT Panel consisting of • Two pulse transformers of 1:1:1 are provided for isolation & supplying firing pulses along with required DC Power supply to experiment panel under test through 15 pin female 'D' connector. • Selector switch of 2 pole 6 way for selecting different types of firing pulses like out of phase inverter firing using LM3525 with dead time, freq. Control in freq variation from 170 Hz to 250Hz, 12.5/25/6..25	1	Each			

Hz Frequency gated with High •Frequency (3KHz) for Cycloconverter, line Synchronized UJT firing for converter & pulse width R-L-C Load Panel • Load resistor of 10ohm/ 40W & 100ohm / 10W - 1No.each • Centre tapped 3A choke 4mH/ 16mH each -2Nos. • DC choke 0-100-200 mH/750mA- 1No. • Commutation capacitors of 10uF/100V - 4Nos. • AC Paper capacitor of 4uF/440V - 1No. • DC Cap 220uF / 63V- 1No. • Diode BYT 71 (5407)- 1 No. • On board Lamp load of 15W/ 230VAC provided Accessories: • 15 pin D connector cable assembly, • 4mm patchcords : 100mm X 10 Nos & 500mm X 20 Nos. List of experiments: Thyristor based - Converters, Inverters, Cycloconverters, Choppers etc. MOSFET/IGBT based - Choppers, Inverters etc. (All .Hex & C listing files are provided on a CD, you need to download them into kit by ISP method to perform experiments). CON / INV Panel • SCR Converters - Provided with sturdy 800V/12A SCRs (4nos) with uncommitted snubbers, 6A diodes (2nos) commutation switch, 47μF/450V cap, Ramp Cosine firing circuit. However actual working currents are limited to 3A (max) for safety. • Half Wave & Full Wave Fully Controlled converter • AC Voltage Controller using Lamp Universal motor foot mounted. • SCR Controlled Converter 1 phase with R-L Load • Effect of Free Wheeling Diode on SCR converter performance with Inductive load. • Study of SCR converter (Open Loop) output with Inductance Input & Capacitance Input filters • Effect of Source Impedance on performance of SCR converters. • Study of closed loop SCR converters with Resistive Load. • Study of closed loop SCR converters with Motor Load Select motor types from addons below. • Study of full wave -half controlled SCR bridge. • Resonant DC- DC converter. • Advanced firing Schemes • Study of H.F. gate type SCR triggering. • Study of relation between control voltage & SCR converter output DC voltage - using linear resistor controlled synchronized ramp firing (IC815 equivalent). • Study of Linear relation between control voltage & SCR converter output- using cosine firing scheme. • SCR forced Commutation Techniques • Study of forced commutation techniques for SCR, Class A,B,C,D,E,F • SCR based Inverters • SCR based Parallel Inverter. • SCR based series Inverter . • SCR based Bridge Inverter. • SCR based McMurray Bedford half bridge inverter. • Cycloconverter • SCR Based cycloconverter					
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	• SCR based Chopper • SCR based Jones chopper Resistive load, motor load • SCR based buck (step dn), boost (set up), buck boost chopper • Thyristor drive for DC motors-series shunt motors • Power Scope measurement (upto 1000V DC to facilitate checking inverter / converter waveform)					
13	Wires, Cables & their Gauges, Domestic Electrical Accessories:- 1) Side cutting pliers 2) Circle pliers 3) End wire stripping pliers 4) Bit Driver BD125 5) Digital Multimeter	1	Each			
14	Workshop Tools:- 1) Bit Driver set BDS125 25mm 2) Temperature Controlled Digital Soldering Station 3) Combination plier IS6149-1`984 grade II 4) Long Nose plier IS3553-1989 5) Bent Nose plier (Econ) 6) Electric Drill Machine 500W	1	Each			
15	Displacement measurement Trainer using LVDT Technical specification: With build in power supply : +5V,+/- 12V, Variable 0 to +/- 12V •Micrometer 0-20mm (Accuracy 0.01mm) • Precision phase sensitive rectifier • Measurement frequency of 1KHz sine • Signal conditioning circuit with zero & span adjustment for calibration of variac sensor output voltage 0-2.5V or suitable for DPM. • Zero & span adjustment for calibration of following transducers i) Resistive linear transducer : 0 -20mm ii) Capacitive linear transducer : 0 -20mm iii) Capacitive angular transducer : 0 - 90 degree iv) Inductive linear transducer : 0 -20mm v) LVDT transducer : 0 -20mm or (-10 to +10mm)	1	Each			

16	Displacement measurement Trainer using Strain Gauge based displacement transducer SALIENT FEATURES • Aesthetically designed injection moulded electronic desk. Master unit carrying useful experiment resources like Power supplies, DPMs, Computer Interface, Bar graph LED indicator Function Generator etc. while the central slot will carry replaceable experiment panel secured in an ABS molded plastic sturdy enclosure. • Has colorful screw less overlay showing schematic & its connection tag numbers for easy connectivity. Transparent acrylic overlays will be offered for all sensors Master Unit Technical specification: With build in power supply : +5V,+/- 12V, Variable 0 to +/- 12V • Piezo resistive transducer for strain measurement. • Micrometer 0-20mm (Accuracy 0.01mm) for strain generation. • Strain gauges mounted on cantilever in half & full Wheatstone bridge & instrumentation amplifier with Zero & span adjustment for calibration. • Experiments on Gauge factor determination, Strain indicator, Displacement measurement using Strain gauges.	1	Eac h			
17	Displacement measurement Trainer using Pickup SALIENT FEATURES • Aesthetically designed injection moulded electronic desk. Master unit carrying useful experiment resources like Power supplies, DPMs, Computer Interface, Bar graph LED indicator Function Generator etc. while the central slot will carry replaceable experiment panel secured in an ABS molded plastic sturdy enclosure. • Has colorful screw less overlay showing schematic & its connection tag numbers for easy connectivity. Transparent acrylic overlays will be offered for all sensors Master Unit • Built in power supply :DC supply +/- 12V, 500mA, Variable 7V to 14V @ 3Amp. • Built in function generator • O/P waveforms sine, triangular & square, TTL O/P freq. 1Hz to 200KHz in ranges with amplitude & freq. control pots, o/p voltage 10Vpp. • On board measurement :DC voltmeter 2V/20V (1 No) & LED BAR graph with 10 LED indicator to display 0-2.5V or 0-4V input. Addon: • 12V DC motor with speed varying from 0-4000rpm & rotating slotted wheel having 8 slots • Individual signal conditioning circuit with programmable threshold comparator. • F to V Converter with span & zero amplifier • 6 Nos. of Speed transducers & their experiments: 1) Magnetic pickup, 2) Photo reflective, 3) Photo interruptive, 4) Inductive pickup with 5) Stroboscope envelop detector. 6) Hall sensor.	1	Each			

18	Displacement measurement using Strain Gauge based Load Cell Trainer SALIENT FEATURES • Aesthetically designed injection moulded electronic desk. Master unit carrying useful experiment resources like Power supplies, DPMs, Computer Interface, Bar graph LED indicator Function Generator etc. while the central slot will carry replaceable experiment panel secured in an ABS molded plastic sturdy enclosure. • Has colorful screw less overlay showing schematic & its connection tag numbers for easy connectivity. Transparent acrylic overlays will be offered for all sensors Master Unit • Built in power supply : DC supply +/- 12V,500mA, Variable 7V to 14V @ 3Amp. • Built in function generator • O/P waveform sine, triangular & square, TTL O/P freq. 1Hz to 200KHz in ranges with amplitude & freq. control pots, o/p voltage 10Vpp. • On board measurement : DC voltmeter 2V/20V (1 No) & LED BAR graph with 10 LED indicator to display 0-2.5V or 0-4V input. Addon: Force / Weight measurement using piezo transducer (0- 20 kg)weighing scale sensor	1	each			
19	Water Level measurement using Strain Gauge based Water Level Transducer Trainer Technical specification: Level measurement by measuring water column height using pressure sensor by Air bubbler method in 500mm calibrated acrylic water tank, water pump, vibratory air pressure pump, manual bypass valve mounted on a compact table top panel. Can not share with a, f options simultaneously.	1	Each			
20	V-I characteristics of SCR & measure latching & holding currents Trainer •Aesthetically designed injection molded electronic desk carrying useful experiment resources Variable Power supplies / Status / Pulsar / Function Generator, DPMs etc. while the central slot will carry replaceable experiment panel secured in an ABS molded plastic sturdy enclosure, & has colorful screw less overlay showing circuit & its connection tag numbers for easy connectivity. • Connection through Sturdy 4mm Banana Sockets & Patch Cords. •Hands on learning by constructing circuits using built in power bread board panel as well as using Discrete component panel. •Set of Users Guide provided with each Unit. Specifications •Built in Power Supply : DC Supply :5V / 1A. & ± 12V, 1A. 0 to 15V DC (Variable), 100 mA (Isolated), 0 to 30V DC (Variable),	1	Each			

	100 mA (Isolated High Volt DC 15V to 110V, 100Ma, AC Supply : 12-0-12V AC, 150 mA. Short circuit Protected. •Built in Function Generator – - O/p Waveform: Sine, Triangle & TTL O/Ps - Output Frequency : 1 Hz to 1MHz in 6 ranges, with amplitude & frequency control pots. O/P Voltage 20Vp-p max. (Sin/TRG), - Modulation I/P:AM : - I/P voltage + 5V (100% modulation) O/P - For 0V (min), + 5V (max.) - 5V (Phase reversal of O/P) FM : I/P voltage $\pm$ 400mV (+ 50% modulation) •Clock Generator : 10 MHz TTL clock. •Data Switches (10 No.) & bi-colour LED status indicators 10X2 Nos, for High / Low indication. •Pulser switches (2 Nos.) with four debounced outputs - 2No. •BNC to 2 channel banana adapter - 2No. •Logic probe to detect High/Low level pulses upto 1MHz, with bi-colour LEDs to indicate status. •2 / 4 digit 7 segment display with BCD to 7 segment decoder. •Onboard DPMs provided with mode/range selection. (A) DC volt : 2V/200V - 1No. (B) DC current : 2mA/200mA - 1No. (C) DC Volts/Current : 20V/200mA - 1No. •Onboard moving iron meters provided for (A) AC Current : 1 AMP - 1No. (B) AC Voltage : 15V - 1No. •Onboard speaker : 8 Ohms, 0.5 Watt (1No.) •Onboard POTS : 1K - 1No. 1M - 1No. •Operating Voltage: 220/240Vac switch settable $\pm$10%, 50Hz/60VA. Semiconductor & Power Semiconductor Devices Experiment Panel [Provided with 41 banana tags] Characteristics of following devices : Silicon diode, Semiconductor Testing using Multimeter, Germanium diode, zener diode, LED, diac, bipolar transistor (NPN, PNP), Field Effect Transistor (FET), MOSFET, IGBT, UJT, Silicon Controlled Rectifier (SCR), Triac, Optocoupler, Thermistor, V-I Characteristics on CRO of SCR, Triac, Transistor as a Switch & MOSFET as a Switch.					
21	UJT Trigger Circuit for Half Wave & Full Wave Control Trainer Features •Aesthetically designed injection molded electronic desk. •Master unit carrying useful experiment resources like line Synchronized firing circuits, Power supplies, lamp load, RLC loads, Battery Charging supply etc. while the central slot will hold replaceable experiment panels. • Each multi experiment panel is secured in an ABS molded plastic sturdy enclosure, & has colorful screw less overlay showing circuit & Connection through Sturdy 4mm Banana Sockets & Patch Chords. • Set of User Guide provided with each unit. • Power Scope • Accessory for any Lab CRO for off ground differential measurements upto 1000VDC to facilitate checking inverter / converter waveform.	1	each			

	Master Unit Built in power supply • DC supply : + 12V, 500mA, • Unregulated Power supply 17V / 750mA, • Regulated 7VDC to 14VDC/3A O/P is provided as 12V Battery charging supply. In absence of battery, same may be used as simulated battery source to run experiments on inverters etc. • Isolated DC supply +12V/ 300mA with isolated common. • On board Inverter transformer of Primary & Secondaries: 12-11-0-11-12/3A. • On board o/p to Isolated Drive Circuit AC supply • 230V AC line voltage is made available on two banana 4mm sockets as well as 1.5A fuse extender for variac if used. • Aux DC Power Supply : (Useful as field / armature supply for DC motor) • Variable upto 200Vdc/0.5Amp (Phase controlled Thyristor half bridge) • Field ON/OFF control with field failure relay & over current protection circuit. LSPT Panel consisting of • Two pulse transformers of 1:1:1 are provided for isolation & supplying firing pulses along with required DC Power supply to experiment panel under test through 15 pin female 'D' connector. • Selector switch of 2 pole 6 way for selecting different types of firing pulses like out of phase inverter firing using LM3525 with dead time, freq. Control in freq variation from 170 Hz to 250Hz, 12.5/25/6..25 Hz Frequency gated with High •Frequency (3KHz) for Cycloconverter, line Synchronized UJT firing for converter & pulse width R-L-C Load Panel • Load resistor of 10ohm/ 40W & 100ohm / 10W - 1No.each • Centre tapped 3A choke 4mH/ 16mH each -2Nos. • DC choke 0-100-200 mH/750mA- 1No.						
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• Commutation capacitors of 10uF/100V - 4Nos. • AC Paper capacitor of 4uF/440V - 1No. • DC Cap 220uF / 63V- 1No. • Diode BYT 71 (5407)- 1 No. • On board Lamp load of 15W/ 230VAC provided Accessories: • 15 pin D connector cable assembly, • 4mm patch cords : 100mm X 10 Nos & 500mm X 20 Nos. List of experiments: Thyristor based - Converters, Inverters, Cycloconverters, Choppers etc. MOSFET/IGBT based - Choppers, Inverters etc. (All .Hex & C listing files are provided on a CD, you need to download them into kit by ISP method to perform experiments). CON / INV Panel • SCR Converters - Provided with sturdy 800V/12A SCRs (4nos) with uncommitted snubbers, 6A diodes (2nos) commutation switch, 47μF/450V cap, Ramp Cosine firing circuit. However actual working currents are limited to 3A (max) for safety. • Half Wave & Full Wave Fully Controlled converter • AC Voltage Controller using Lamp Universal motor foot mounted. • SCR Controlled Converter 1 phase with R-L Load • Effect of Free Wheeling Diode on SCR converter performance with Inductive load. • Study of SCR converter (Open Loop) output with Inductance Input & Capacitance Input filters • Effect of Source Impedance on performance of SCR converters. • Study of closed loop SCR converters with Resistive Load. • Study of closed loop SCR converters with Motor Load Select motor types from addons below. • Study of full wave -half controlled SCR bridge. • Resonant DC- DC converter. • Advanced firing Schemes • Study of H.F. gate type SCR triggering. • Study of relation between control voltage & SCR converter output DC voltage - using linear resistor controlled synchronized ramp firing (IC815 equivalent). • Study of Linear relation between control voltage & SCR converter output- using cosine firing scheme. • SCR forced Commutation Techniques • Study of forced commutation techniques for SCR, Class A,B,C,D,E,F • SCR based Inverters • SCR based Parallel Inverter. • SCR based series Inverter . • SCR based Bridge Inverter. • SCR based McMurray Bedford half bridge inverter. • Cycloconverter • SCR Based cycloconverter • SCR based Chopper • SCR based Jones chopper Resistive load, motor load • SCR based buck (step dn), boost (set up), buck boost chopper • Thyristor drive for DC motors-series shunt motors • Power Scope measurement (upto 1000V DC to facilitate checking inverter / converter waveform)					
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22	Power Electronics Trainer with CON / INV Panel Features •Aesthetically designed injection molded electronic desk. •Master unit carrying useful experiment resources like line Synchronized firing circuits, Power supplies, lamp load, RLC loads, Battery Charging supply etc. while the central slot will hold replaceable experiment panels. • Each multi experiment panel is secured in an ABS molded plastic sturdy enclosure, & has colorful screw less overlay showing circuit & Connection through Sturdy 4mm Banana Sockets & Patch Chords. • Set of User Guide provided with each unit. • Power Scope • Accessory for any Lab CRO for off ground differential measurements upto 1000Vdc to facilitate checking inverter / converter waveform. Master Unit Built in power supply • DC supply : + 12V, 500mA, • Unregulated Power supply 17V / 750mA, • Regulated 7VDC to 14VDC/3A O/P is provided as 12V Battery charging supply. In absence of battery, same may be used as simulated battery source to run experiments on inverters etc. • Isolated DC supply +12V/ 300mA with isolated common. • On board Inverter transformer of Primary & Secondaries: 12-11-0-11-12/3A. • On board o/p to Isolated Drive Circuit AC supply • 230V AC line voltage is made available on two banana 4mm sockets as well as 1.5A fuse extender for variac if used. • Aux DC Power Supply : (Useful as field / armature supply for DC motor) • Variable upto 200Vdc/0.5Amp (Phase controlled Thyristor half bridge) • Field ON/OFF control with field failure relay & over current protection circuit. LSPT Panel consisting of • Two pulse transformers of 1:1:1 are provided for isolation & supplying firing pulses along with required DC Power supply to experiment panel under test through 15 pin female 'D' connector. • Selector switch of 2 pole 6 way for selecting different types of firing pulses like out of phase inverter firing using LM3525 with dead time, freq. Control in freq variation from 170 Hz to 250Hz, 12.5/25/6..25 Hz Frequency gated with High •Frequency (3KHz) for Cycloconverter, line Synchronized UJT firing for converter & pulse width R-L-C Load Panel • Load resistor of 10ohm/ 40W & 100ohm / 10W - 1No.each • Centre tapped 3A choke 4mH/ 16mH each -2Nos.	1	Each			
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• DC choke 0-100-200 mH/750mA- 1No. • Commutation capacitors of 10uF/100V - 4Nos. • AC Paper capacitor of 4uF/440V - 1No. • DC Cap 220uF / 63V- 1No. • Diode BYT 71 (5407)- 1 No. • On board Lamp load of 15W/ 230VAC provided Accessories: • 15 pin D connector cable assembly, • 4mm patch cords : 100mm X 10 Nos & 500mm X 20 Nos. List of experiments: Thyristor based - Converters, Inverters, Cycloconverters, Choppers etc. MOSFET/IGBT based - Choppers, Inverters etc. (All Hex & C listing files are provided on a CD, you need to download them into kit by ISP method to perform experiments). CON / INV Panel • SCR Converters - Provided with sturdy 800V/12A SCRs (4nos) with uncommitted snubbers, 6A diodes (2nos) commutation switch, 47μF/450V cap, Ramp Cosine firing circuit. However actual working currents are limited to 3A (max) for safety. • Half Wave & Full Wave Fully Controlled converter • AC Voltage Controller using Lamp Universal motor foot mounted. • SCR Controlled Converter 1 phase with R-L Load • Effect of Free Wheeling Diode on SCR converter performance with Inductive load. • Study of SCR converter (Open Loop) output with Inductance Input & Capacitance Input filters • Effect of Source Impedance on performance of SCR converters. • Study of closed loop SCR converters with Resistive Load. • Study of closed loop SCR converters with Motor Load Select motor types from addons below. • Study of full wave -half controlled SCR bridge. • Resonant DC- DC converter. • Advanced firing Schemes • Study of H.F. gate type SCR triggering. • Study of relation between control voltage & SCR converter output DC voltage - using linear resistor controlled synchronized ramp firing (IC815 equivalent). • Study of Linear relation between control voltage & SCR converter output- using cosine firing scheme. • SCR forced Commutation Techniques • Study of forced commutation techniques for SCR, Class A,B,C,D,E,F • SCR based Inverters • SCR based Parallel Inverter. • SCR based series Inverter . • SCR based Bridge Inverter. • SCR based McMurray Bedford half bridge inverter. • Cycloconverter • SCR Based cycloconverter • SCR based Chopper • SCR based Jones chopper Resistive load, motor load • SCR based buck (step dn), boost (set up), buck boost chopper • Thyristor drive for DC motors-series shunt motors • Power Scope measurements upto 1000V DC to facilitate checking inverter / converter waveform.					
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23	Power Electronics Trainer with CON / INV Panel Features •Aesthetically designed injection molded electronic desk. •Master unit carrying useful experiment resources like line Synchronized firing circuits, Power supplies, lamp load, RLC loads, Battery Charging supply etc. while the central slot will hold replaceable experiment panels. • Each multi experiment panel is secured in an ABS molded plastic sturdy enclosure, & has colorful screw less overlay showing circuit & Connection through Sturdy 4mm Banana Sockets & Patch Chords. • Set of User Guide provided with each unit. • Power Scope • Accessory for any Lab CRO for off ground differential measurements upto 1000Vdc to facilitate checking inverter / converter waveform. Master Unit Built in power supply • DC supply : + 12V, 500mA, • Unregulated Power supply 17V / 750mA, • Regulated 7VDC to 14VDC/3A O/P is provided as 12V Battery charging supply. In absence of battery, same may be used as simulated battery source to run experiments on inverters etc. • Isolated DC supply +12V/ 300mA with isolated common. • On board Inverter transformer of Primary & Secondaries: 12-11-0-11-12/3A. • On board o/p to Isolated Drive Circuit AC supply • 230V AC line voltage is made available on two banana 4mm sockets as well as 1.5A fuse extender for variac if used. • Aux DC Power Supply : (Useful as field / armature supply for DC motor) • Variable upto 200Vdc/0.5Amp (Phase controlled Thyristor half bridge) • Field ON/OFF control with field failure relay & over current protection circuit. LSPT Panel consisting of • Two pulse transformers of 1:1:1 are provided for isolation & supplying firing pulses along with required DC Power supply to experiment panel under test through 15 pin female 'D' connector. • Selector switch of 2 pole 6 way for selecting different types of firing pulses like out of phase inverter firing using LM3525 with dead time, freq. Control in freq variation from 170 Hz to 250Hz, 12.5/25/6..25 Hz Frequency gated with High •Frequency (3KHz) for Cycloconverter, line Synchronized UJT firing for converter & pulse width R-L-C Load Panel • Load resistor of 10ohm/ 40W & 100ohm / 10W - 1No.each • Centre tapped 3A choke 4mH/ 16mH each -2Nos. • DC choke 0-100-200 mH/750mA- 1No. • Commutation capacitors of 10uF/100V - 4Nos. • AC Paper capacitor of 4uF/440V - 1No.	1	Each			
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• DC Cap 220uF / 63V- 1No. • Diode BYT 71 (5407)- 1 No. • On board Lamp load of 15W/ 230VAC provided Accessories: • 15 pin D connector cable assembly, • 4mm patch cords : 100mm X 10 Nos & 500mm X 20 Nos. List of experiments: Thyristor based - Converters, Inverters, Cycloconverters, Choppers etc. MOSFET/IGBT based - Choppers, Inverters etc. (All .Hex & C listing files are provided on a CD, you need to download them into kit by ISP method to perform experiments). CON / INV Panel • SCR Converters - Provided with sturdy 800V/12A SCRs (4nos) with uncommitted snubbers, 6A diodes (2nos) commutation switch, 47μF/450V cap, Ramp Cosine firing circuit. However actual working currents are limited to 3A (max) for safety. • Half Wave & Full Wave Fully Controlled converter • AC Voltage Controller using Lamp Universal motor foot mounted. • SCR Controlled Converter 1 phase with R-L Load • Effect of Free Wheeling Diode on SCR converter performance with Inductive load. • Study of SCR converter (Open Loop) output with Inductance Input & Capacitance Input filters • Effect of Source Impedance on performance of SCR converters. • Study of closed loop SCR converters with Resistive Load. • Study of closed loop SCR converters with Motor Load Select motor types from addons below. • Study of full wave -half controlled SCR bridge. • Resonant DC- DC converter. • Advanced firing Schemes • Study of H.F. gate type SCR triggering. • Study of relation between control voltage & SCR converter output DC voltage - using linear resistor controlled synchronized ramp firing (IC815 equivalent). • Study of Linear relation between control voltage & SCR converter output- using cosine firing scheme. • SCR forced Commutation Techniques • Study of forced commutation techniques for SCR, Class A,B,C,D,E,F • SCR based Inverters • SCR based Parallel Inverter. • SCR based series Inverter . • SCR based Bridge Inverter. • SCR based McMurray Bedford half bridge inverter. • Cycloconverter • SCR Based cycloconverter • SCR based Chopper • SCR based Jones chopper Resistive load, motor load • SCR based buck (step dn), boost (set up), buck boost chopper • Thyristor drive for DC motors-series shunt motors • Power Scope measurements upto 1000V DC to facilitate checking inverter / converter waveform.					
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24	Power Electronics Trainer with CON / INV Panel Features •Aesthetically designed injection molded electronic desk. •Master unit carrying useful experiment resources like line Synchronized firing circuits, Power supplies, lamp load, RLC loads, Battery Charging supply etc. while the central slot will hold replaceable experiment panels. • Each multi experiment panel is secured in an ABS molded plastic sturdy enclosure, & has colorful screw less overlay showing circuit & Connection through Sturdy 4mm Banana Sockets & Patch Chords. • Set of User Guide provided with each unit. • Power Scope • Accessory for any Lab CRO for off ground differential measurements upto 1000Vdc to facilitate checking inverter / converter waveform. Master Unit Built in power supply • DC supply : + 12V, 500mA, • Unregulated Power supply 17V / 750mA, • Regulated 7VDC to 14VDC/3A O/P is provided as 12V Battery charging supply. In absence of battery, same may be used as simulated battery source to run experiments on inverters etc. • Isolated DC supply +12V/ 300mA with isolated common. • On board Inverter transformer of Primary & Secondaries: 12-11-0-11-12/3A. • On board o/p to Isolated Drive Circuit AC supply • 230V AC line voltage is made available on two banana 4mm sockets as well as 1.5A fuse extender for variac if used. • Aux DC Power Supply : (Useful as field / armature supply for DC motor) • Variable upto 200Vdc/0.5Amp (Phase controlled Thyristor half bridge) • Field ON/OFF control with field failure relay & over current protection circuit. LSPT Panel consisting of • Two pulse transformers of 1:1:1 are provided for isolation & supplying firing pulses along with required DC Power supply to experiment panel under test through 15 pin female 'D' connector. • Selector switch of 2 pole 6 way for selecting different types of firing pulses like out of phase inverter firing using LM3525 with dead time, freq. Control in freq variation from 170 Hz to 250Hz, 12.5/25/6..25 Hz Frequency gated with High •Frequency (3KHz) for Cycloconverter, line Synchronized UJT firing for converter & pulse width R-L-C Load Panel • Load resistor of 10ohm/ 40W & 100ohm / 10W - 1No.each • Centre tapped 3A choke 4mH/ 16mH each -2Nos. • DC choke 0-100-200 mH/750mA- 1No. • Commutation capacitors of 10uF/100V - 4Nos. • AC Paper capacitor of 4uF/440V - 1No.	1	Each		
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	• DC Cap 220uF / 63V- 1No. • Diode BYT 71 (5407)- 1 No. • On board Lamp load of 15W/ 230VAC provided Accessories: • 15 pin D connector cable assembly, • 4mm patchcords : 100mm X 10 Nos & 500mm X 20 Nos. List of experiments: Thyristor based - Converters, Inverters, Cycloconverters, Choppers etc. MOSFET/IGBT based - Choppers, Inverters etc. (All .Hex & C listing files are provided on a CD, you need to download them into kit by ISP method to perform experiments). CON / INV Panel • SCR Converters - Provided with sturdy 800V/12A SCRs (4nos) with uncommitted snubbers, 6A diodes (2nos) commutation switch, 47μF/450V cap, Ramp Cosine firing circuit. However actual working currents are limited to 3A (max) for safety. • Half Wave & Full Wave Fully Controlled converter • AC Voltage Controller using Lamp Universal motor foot mounted. • SCR Controlled Converter 1 phase with R-L Load • Effect of Free Wheeling Diode on SCR converter performance with Inductive load. • Study of SCR converter (Open Loop) output with Inductance Input & Capacitance Input filters • Effect of Source Impedance on performance of SCR converters. • Study of closed loop SCR converters with Resistive Load. • Study of closed loop SCR converters with Motor Load Select motor types from addons below. • Study of full wave -half controlled SCR bridge. • Resonant DC- DC converter. • Advanced firing Schemes • Study of H.F. gate type SCR triggering. • Study of relation between control voltage & SCR converter output DC voltage - using linear resistor controlled synchronized ramp firing (IC815 equivalent). • Study of Linear relation between control voltage & SCR converter output- using cosine firing scheme. • SCR forced Commutation Techniques • Study of forced commutation techniques for SCR, Class A,B,C,D,E,F • SCR based Inverters • SCR based Parallel Inverter. • SCR based series Inverter . • SCR based Bridge Inverter. • SCR based McMurray Bedford half bridge inverter. • Cycloconverter • SCR Based cycloconverter • SCR based Chopper • SCR based Jones chopper Resistive load, motor load • SCR based buck (step dn), boost (set up), buck boost chopper • Thyristor drive for DC motors-series shunt motors • Power Scope measurements upto 1000V DC to facilitate checking inverter / converter waveform.					
25	IDMT Over Current Relay Trainer (Numerical type) The Trainer set should consist of the following features:	1	Each			

• The trainer should consist of built in requisite relay testing kit typically consisting of voltage injector, current injector, elapsed time counter (1 msec resolution), trip relay logic etc. • The trainer should have a few set of associated relay testing (current / voltage injection etc.) panels (7-8 nos. typically) which are mounted in a light weight sturdy aluminum profile flat demo panel system. • Should have 4mm sturdy shrouded banana patch cords & shrouded arrangements. • Each panel should have ABS molded plastic sturdy enclosure, & colorful screwless overlays showing circuits diagrams & its connection tag numbers for easy understanding & connection • Should Facilitates easy & safe wiring by students due to use of 4mm sturdy Shrouded banana patch cords & shrouded socket arrange-ments for high voltage circuits & Set of Instructor Guide & Student Workbook should be provided • Trainer should be modular panels for easy site servicing not close control; panel box no wiring should not be there & shrouded 4 mm banana patch cords & shrouded sockets arrangements for the safety of the students Technical Specifications of interfacing panels: Aluminum profile sturdy Flat panel system carrying various high voltage components housed in modular plastic enclosures to minimize shock possibility. 1 phase AC Input supply panel Should consist of • 1ph. MCBs of 4A/1.6A - 2nos. • Bulb Load. Variable voltage & current injector panel Should consist of • 1 phase dimmer 230VAC/1A • Short circuit transformer with primary 230VAC/1A, secondary 0-2-8V/12A taps. Over current & elapsed time measurement panel Should consist of • AC ammeter of 20A • Elapsed time counter range 999.001 sec, resolution 1 msec. Over Current Relay Panel All the connecting of relay should brought out on this panel & it should consist of - o 2 NO trip contacts. - o Relay Coil Protection relay type (Numerical) Should consist of numerical type IDMT over current relay, current rating 5A, with current setting of 2-250% in seven equal steps of 2%, time setting 0.1 to 1. The above trainer should cover following experiments: 1. To plot Inverse Definite Minimum Time (IDMT) characteristics of over current relay. 2. To perform experiment on definite / instantaneous mode setting of the relay.					
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26	Cable Fault Locator Trainer by Bridge method •Aesthetically designed injection molded electronic desk carrying useful experiment resources Variable Power supplies / Status / Pulsar / Function Generator, DPMs etc. while the central slot will carry replaceable experiment panel secured in an ABS molded plastic sturdy enclosure, & has colorful screw less overlay showing circuit & its connection tag numbers for easy connectivity. • Connection through Sturdy 4mm Banana Sockets & Patch Cords. •Hands on learning by constructing circuits using built in power bread board panel as well as using Discrete component panel. •Set of Users Guide provided with each Unit. Specifications •Built in Power Supply : DC Supply :5V / 1A. & $\pm 12V$, 1A. 0 to 15V DC (Variable), 100 mA (Isolated), 0 to 30V DC (Variable), 100 mA (Isolated High Volt DC 15V to 110V, 100Ma, AC Supply : 12-0-12V AC,150 mA. Short circuit Protected. •Built in Function Generator – O/p Waveform: Sine, Triangle & TTL O/Ps Output Frequency : 1 Hz to 1MHz in 6 ranges, with amplitude & frequency control pots. O/P Voltage 20Vp-p max. (Sin/TRG), Modulation I/P:AM : - I/P voltage + 5V (100% modulation) O/P - For 0V (min), + 5V (max.) - 5V (Phase reversal of O/P) FM : I/P voltage $\pm 400mV$ (+ 50% modulation) •Clock Generator : 10 MHz TTL clock. •Data Switches (10 No.) & bi-colour LED status indicators 10X2 Nos, for High / Low indication. •Pulser switches (2 Nos.) with four debounced outputs - 2No. •BNC to 2 channel banana adapter - 2No. •Logic probe to detect High/Low level pulses upto 1MHz, with bi-colour LEDs to indicate status. •2 / 4 digit 7 segment display with BCD to 7 segment decoder. •Onboard DPMs provided with mode/range selection. (A) DC volt : 2V/200V - 1No. (B) DC current : 2mA/200mA - 1No. (C) DC Volts/Current : 20V/200mA - 1No. •Onboard moving iron meters provided for (A) AC Current : 1 AMP - 1No. (B) AC Voltage : 15V - 1No. •Onboard speaker : 8 Ohms, 0.5 Watt (1No.) •Onboard POTS : 1K - 1No. 1M - 1No. •Operating Voltage: 220/240Vac switch settable $\pm 10\%$, 50Hz/60VA. Cable Fault Locator Experiment : About panel : The panel consists of 7 step capacitor bank (100PF 100μF), 100Ω (wire wound) pot, 25Ω (wire wound) pot, 10KΩ (10 turns) pot, BNC connectors (8 nos), Banana sockets (47 nos), RG58 cables 25m x 3nos. & 1.5m x 3nos. Function blocks - AC to DC convertor for null detector, Sine generator (1KHz, 5Vp-p), Variable power supply (1.2 to 5Vdc settable).Needs +/-12Vdc external power supply. Experiments performed : 1) Murray loop for ground fault and short circuit fault. 2) Varley loop for	1	Each			
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	ground fault and short circuit fault. 3) Fisher loop for ground fault. 4) Open circuit fault by capacitance measurement.					
27	Breakdown strength of transformer Oil Technical Specifications: • Range : 0 — 60 KV Oil Test Kit • Power Supply : 220V AC, 50Hz, Single Phase • Voltage Range : 0- 60 KV AC • Indication : Analog / Digital Voltmeter • Transformer: 30 KV, 2 No. Epoxy molded transformer • Bushing : Epoxy molded bushings • Rate of rise of Voltage (for Motorized): 1.2—2KV/Sec. • Resolution: 1KV • Accuracy: +/- 1% Safety Features: (i) Zero Start Facility (ii) Over Voltage Protection (iii) Door Lock Safety	1	Each			

Annexure-VII
<<Organization letter Head>>
DECLARATION SHEET

We _____ hereby certify that all the information and data furnished by our organization with regard to this tender specification are true and complete to the best of our knowledge. We have gone through the specification, conditions and stipulations in details and agree to comply with the requirements and intent of specification.

This is certified that our organization has been authorized (Copy attached) by the OEM to participate in Tender. We further certify that our organization meets all the conditions of eligibility criteria laid down in this tender document. Moreover, OEM has agreed to support on regular basis with technology/ product updates and extend support for the warranty.

The prices quoted in the financial bids are subsidized due to academic discount given to Dr. Shakuntala Misra National Rehabilitation University, Mohaan Road, Lucknow.

We, further specifically certify that our organization has not been Black Listed/ De-Listed by an Institutional Agency/ Govt. Department/ Public Sector Undertaking in the last three years.	NAME AND ADDRESS OF THE Vendor/ Manufacturer/Agent
1 Phone	
2 Fax	
3 E-mail	
4 Contact Person Name	
5 Mobile Number	
6 GST Number	
7 PAN Number	
8 Tender Fees D.D. in favour of Finance Officer, DSMNRU, Lucknow.	
9 EMD through D.D./Banker's Cheque in favour of Finance Officer, DSMNRU, Lucknow.	
10 Bank details of the bidder a) Name of the Bank	
b) Account Number	
c) Kindly attach scanned copy of one Cheque book page to enable us to return the EMD to unsuccessful bidder.	

(Signature of the Tenderer)
Name: _____
Seal of the Company

**LETTER OF UNDERTAKING
(ON THE LETTER HEAD OF THE BIDDER)**

To,
Registrar
Dr. Shakuntala Misra National Rehabilitation University,
Mohaam Road,
Lucknow-226017
India

Sir,

SUBJECT- Supply, Installation and Commissioning of
Laboratory Equipment of Engineering and Technology at Dr. Shakuntala
Misra National Rehabilitation University, Mohaan Road, Lucknow (Uttar
Pradesh).

This bears reference to Dr. Shakuntala Misra National Rehabilitation
University, Mohaan road, Lucknow Bid No. Dated on __ (DD)/_
_ (MM)/20__ (YYYY). We, hereby, accept all the terms and conditions for
submitting bid as mentioned in this Bid Document.

We hereby certify that no terms and conditions have been stipulated by us in
the Financial Bid.

We warrant that the services do not violate or infringe upon any patent,
copyright, trade secret or other property right of any other person or other
entity. We agree that we shall not prevent Dr. Shakuntala Misra National
Rehabilitation University, Mohaan Road, Lucknow from any claim or demand,
action or proceeding, directly or indirectly resulting from or arising out of
any breach or alleged breach of any of the terms and conditions of bid
document and contract.

The above document is executed on __ (DD)/__ (MM)/20__ (YYYY) at (place)
_____ and we accept that if anything out of the information
provided by us is found wrong/false/incorrect; our bid/work order shall be
liable for rejection.

Thanking you,
Yours faithfully,

Name of the Bidder_____
Authorized Signatory_____
Seal of the Organization_____

Date:
Place:

Annexure-XI**UNDERTAKING**

This is to confirm that we M/s _____
 _____ (give full address) have not been declared neither failed to perform on any Agreement, nor have been expelled from any project or Agreement nor any Agreement terminated for breach by the us (Agency) in any of the government department and public sector undertaking /enterprise or by any other Client in India, in last five year before release of advertisement.

If the above information found false at any stage after the placement of Work Order /Supply Order /Agreement, Dr. Shakuntala Misra National Rehabilitation University, Mohaan Road, Lucknow (Uttar Pradesh) will have full right to cancel the contract and forfeit the Performance Guarantee. All the direct and indirect cost related to the cancellation of the order will be borne by us besides any legal action by Dr. Shakuntala Misra National Rehabilitation University, Mohaan Road, Lucknow (Uttar Pradesh).which shall be deemed fit at that point of time.

Authorized Signatory

Note: The undertaking regarding the non-blacklisting of firm is to be submitted on a non-judicial stamp paper of Rs. 100/- (Rupees Hundred only).

Annexure -X**ANNUAL AVERAGE TURN OVER**

Sl. No.	Financial Year	Annual Average Turn Over (in lakhs)
1.	2017 – 2018	
2.	2018– 2019	
3.	2019 – 2020	

Note: Certificate from Statutory Auditor/ Chartered Accountant certifying balance sheet only for all three years to be attached.

Signature with Seal of the Chartered Accountant
Signature with Seal of the Bidder

Annexure -XI

Details of Projects Completed During Last 03 Financial Years

Bid Number:

Date of Opening:

Time:

Name of the Firm:

Sl. No.	Name of the Projects	Order No. and Date	Description & quantity of ordered equipment	Value of order (in lakhs)	Date of Start	Scheduled Date of Completion	Actual Date of Completion	Reason for Delay (if any)

Signature with Seal

Annexure -XII

List of Order executed for Govt. Organization/ Department/ University during Last Three Financial Years

List of Govt./PSU's/Autonomous bodies/ Govt. Institutions such as IIT's/NIT's/IIIT's/Central Universities/ State Universities/ Rajkiya Engineering College (Uttar Pradesh), etc. for whom the Bidder has undertaken such work during last three financial years (must be supported with work orders)			
Name of the organization	Year of Procurement	Total Value (in Lakhs)	Name of Contact Person and other details

Technical Competency Details

Name of application specialist / Service Engineer who have the technical competency to handle and support the quoted product during the warranty period		
Name of the organization	Name of Contact Person	Contact No.

Details of Service Supports/Closest Service Station

Sl. No.	Full Address of Service Supports/Closest Service Station along with contact Nos.	Type of Service Supports/Closest Service Station

Signature of Bidder
Name:
Designation:
Organization Name:
Contact No. :

POWER OF ATTORNEY

Know all men by these presents, We.....
(Name of firm and address of the Registered office) do hereby constitute
nominate appoint and authorize Mr./Ms..... Son/
daughter/wife of and presently residing at....., who
is presently employed with/ retained by us and holding position of
.....as our true and lawful attorney.(hereinafter referred
to as the "Authorized Representative") to do in our name and on our behalf,
all such acts, deeds and things are necessary or required in connection or
incidental to submission of our proposal for and selection as the <Name of
the Work> for the <name of the client>work,
proposed to be developed by the(the "client")
including but not limited to signing and submission of all applications,
proposals and other documents and writings, participating in pre bid and
other conferences and providing information/responses to the client,
representing us in all matters before the client, signing and execution of all
contracts and undertaking consequents to acceptance of our proposal and
generally dealing with the client in all matter in connection with or relating to
or arising out of our proposal for the said project upon award thereof to us
till the entering into of the agreement with the client.

AND, we do hereby agree to ratify and confirms all the acts, deeds and things
lawful done or caused to be done by our said Authorized Representative
pursuant to and in exercise of the powers conferred by this power and
Attorney and that all the acts, and things done by our said Authorized
Representative in exercise of the powers hereby conferred shall and shall
always be deemed to have been done by us.

[IN WITNESS WHEREOF WETHE ABOVE NAMED
PRINCIPAL HAVE EXECUTED THIS POWER OF ATTORNEY ON
THIS.....DAYS OF.....2020.

For..... (Name and registered address of
client)

(Signature, name, designation and address)

Witness:

1. (Signature, name and address)
2. (Signature, name and address)

Notarized

Accepted

..... (Signature, name, designation and address
of the Attorney)

Notes:

1. The mode of the execution of the power of Attorney shall be in accordance with the procedure, if any, laid down by the application law and the charter documents of the executions (s) and when it is so required the same should be under seal affixed in accordance with the required procedure.
2. Whenever required, the application should have submitted for verification the extract of the charter documents and other documents such as resolution/Power of Attorney in favor of the applicant.

LETTER OF BID SUBMISSION

To,
Registrar
Dr. Shakuntala Misra National Rehabilitation University,
Mohaan Road, Lucknow
Uttar Pradesh – 226017

SUBJECT- Supply, Installation and Commissioning of Laboratory Equipment of Engineering and Technology at Dr. Shakuntala Misra National Rehabilitation University, Mohaan Road, Lucknow, Uttar Pradesh.

Submission of Bid

Sir,

Having examined the details given in Press Notice, Notice Inviting Bid & Bid Document for the above work, I/we hereby submit the relevant information:

- 1) I/We hereby certify that all the statements made and information supplied in the enclosed form..... and accompanying statements are true and correct to the best of my/our knowledge and belief and nothing has been concealed.
- 2) I/we certify that we have not changed/alterd any word/sentence or any figure in number/s or words appearing the original tender document uploaded by Dr. Shakuntala Misra National Rehabilitation University on the designated web page for e-tendering. In case, if a fraudulent activity is found at any stage between tender submission to final closure of the tender/contract, my/our candidature/bid/contract shall be immediately cancelled and EMD/Performance security/ security deposit along with the due amount towards the work executed or advance shall be forfeited. Dr. Shakuntala Misra National Rehabilitation University may not entertain any claim or entertain any reason for this act. Dr. Shakuntala Misra National Rehabilitation University may go for the legal action against the bidder for recovering any one or all damages caused to Dr. Shakuntala Misra National Rehabilitation University.
- 3) I/We have furnished all information and details necessary for eligibility and have no further pertinent information to supply.
- 4) I/We submit the requisite certified solvency certificate and authorize the Dr. Shakuntala Misra National Rehabilitation University to approach the Bank issuing the solvency certificate to confirm the correctness thereof. I/We also authorize Dr. Shakuntala Misra National Rehabilitation University to approach individuals, employers, firms and corporation to verify our competency and general reputation.
- 5) I/We submit the following certificates in support of our suitability, technical knowledge and capability for having successfully completed the following works:

Sl. No.	Name of Work	Certificate From

- 6) Earnest Money Deposit amounting to Rs..... is submitted.
7) Cost of tender document of Rs...../- is submitted. Enclosures:

Thanking you,
Yours faithfully,

Name of the

Bidder.....

Authorized Signatory.....

Seal of the

Organization.....

Date:

Place:

PERFORMANCE BANK GUARANTEE FORMAT

Name of the Bank:.....

To,
Registrar
Dr. Shakuntala Misra National Rehabilitation University,
Mohaana Road, Lucknow
Uttar Pradesh – 226017

In consideration of the Registrar Dr. Shakuntala Misra National Rehabilitation University having agreed under the terms and conditions of agreement/ Contract Acceptance letter No.:.....
Dated:.....made
between..... (Designation & address
of contract signing Authority)
and.....(here in after called “the said
Agency”) for the work.....(here in after called “the
said agreement”) having agreed for submission of an irrevocable Bank
Guarantee Bond for..... (only) as a performance
security Guarantee from the Agency for compliance of his obligations in
accordance with the terms & conditions in the said agreement.

- 1) We..... (Indicate the name of the Bank)
hereinafter referred to as the Bank, undertake to pay to the Dr. Shakuntala
Misra National Rehabilitation University, Mohaana Road, Lucknow, Uttar
Pradesh an amount not
exceeding.....(..... only) on
demand by the Dr. Shakuntala Misra National Rehabilitation University.
- 2) We..... (Indicate the name of the bank,
further agree that (and promise) to pay the amounts due and payable under
this guarantee without any demur merely on a demand from the Dr.
Shakuntala Misra National Rehabilitation University through the Registrar,
Dr. Shakuntala Misra National Rehabilitation University, Mohaana Road,
Lucknow or..... (Designation &
Address of contract signing authority), stating that the amount claimed is
due by way of loss or damage caused to or would be caused or suffered by
the Dr. Shakuntala Misra National Rehabilitation University, Lucknow by
reason of any breach by the said Agency of any of the terms of conditions
contained in the said agreement or by reason of the Agency failure to
perform the said agreement. Any such demand made on the Bank shall be
conclusive as regards the amount due and payable by the Bank under this
guarantee. However, our liability under this guarantee shall be restricted to
an amount not exceeding Rs.....
(Rupees.....only).
- 3) (a) We..... (indicate the name of Bank)
further undertake to pay to the Dr. Shakuntala Misra National Rehabilitation
University any money so demanded notwithstanding any dispute or dispute
raised by the Agency in any suite or proceeding pending before any court or

Tribunal relating to liability under this present being absolute and unequivocal. (b) The payment so made by us under this Performance Guarantee shall be a valid discharge of our liability for payment there under and the Agency shall have no claim against us for making such payment.

- 4) We..... (Indicate the name of bank) to further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said agreement and that it shall continue to be enforceable till all the dues of the Dr. Shakuntala Misra National Rehabilitation University under or by virtue of the said agreement have been fully paid and its claims satisfied or discharged by..... (Designation & Address of contract signing authority) on behalf of Dr. Shakuntala Misra National Rehabilitation University, Mohaan Road, Lucknow, certify that the terms and conditions of the said agreement have been fully and properly carried out by the said Agency and accordingly discharges this guarantee.
- 5) (a) Notwithstanding anything to the contrary contained herein the liability of the bank under this guarantee will remain in force and effect until such time as this guarantee is discharged in writing by the Dr. Shakuntala Misra National Rehabilitation University or until (date of validity/ extended validity) whichever is earlier and no claim shall be valid under this guarantee unless notice in writing thereof is given by the Dr. Shakuntala Misra National Rehabilitation University within validity/ extended period of validity of guarantee from the date aforesaid. (b) Provided always that we..... (indicate the name of the Bank) unconditionally undertakes to renew this guarantee or to extend the period of guarantee form year to year before the expiry of the period or the extended period of the guarantee, as the case shall be on being called upon to do so by the Dr. Shakuntala Misra National Rehabilitation University. If the guarantee is not renewed or the period extended on demand, we..... (indicate the name of the Bank) shall pay the Dr. Shakuntala Misra National Rehabilitation University the full amount of guarantee on demand and without demur.
- 6) We..... (indicate the name of Bank) further agree with the Dr. Shakuntala Misra National Rehabilitation University that the Dr. Shakuntala Misra National Rehabilitation University shall have the fullest liberty without our consent and without effecting in any manner out of obligations hereunder to vary any of the terms and conditions of the said contract from time to time or to postpone for any time or from time to time any to the powers exercisable by Dr. Shakuntala Misra National Rehabilitation University against the said Agency and to forbear or enforce any of the terms and conditions of the said agreement and we shall not be relieved from our liability by reason of any such variation, or extension being granted to the said Agency for any bearance act or omission on the part of Dr. Shakuntala Misra National Rehabilitation University or any indulgence by Dr. Shakuntala Misra National Rehabilitation University to the said Agency for by any such matter or thing whatsoever under the law relating to sureties for the said reservation would relive us from the liability.

- 7) This guarantee will not be discharged by any change in the constitution of the Bank or the Agency.
- 8) We.....(indicate the name of the Bank) lastly undertake not to revoke this guarantee except with the previous consent of Dr. Shakuntala Misra National Rehabilitation University in writing.
- 9) This guarantee shall be valid up to (Date of Completion plus Handholding Period). Unless extended on demand by Dr. Shakuntala Misra National Rehabilitation University. Notwithstanding anything to the contrary contained hereinbefore, our liability under this guarantee is restricted to Rs..... (Rs.....only) unless a demand under this guarantee is made on us in writing on or before.....We shall be discharged from our liabilities under this guarantee thereafter.

Dated:.....the.....Day of.....for.....
(indicate the name of bank)

Signature of Banks Authorized official
Witness (Name).....
Designation with Code No.....
Full Address.....

PROFORMA PRE CONTRACT INTEGRITY PACT**GENERAL**

This pre-bid pre-contract Agreement (hereinafter called the Integrity Pact) is made on..... day of the month..... of 2020, between, on one hand, acting through Shri/Smt. , Designation, Dr. Shakuntala Misra National Rehabilitation University (hereinafter called the “BUYER”/ “Dr. Shakuntala Misra National Rehabilitation University” interchangeably, which expression shall mean and include, unless the context otherwise requires, his successors in office and assigns) of the First Part.

AND

M/s..... represented by Shri....., Chief Executive Officer (hereinafter called the “BIDDER/Seller” which expression shall mean and include, unless the context otherwise requires, his successors and permitted assigns) of the Second Part. WHEREAS the Dr. Shakuntala Misra National Rehabilitation University proposes to procure services towards “Supply, Installation and Commissioning of.....Laboratory Equipment at Dr. Shakuntala Misra National Rehabilitation University ” For its clients and BIDDER/Seller is willing to offer the said services and related items as referred to in the Bid document No. / 2020 Dated 2020.

WHEREAS the BIDDER is a private company /public company / Government undertaking / partnership / registered expert agency, constituted in accordance with the relevant law in the matter and Dr. Shakuntala Misra National Rehabilitation University is an autonomous body of Uttar Pradesh Government.

NOW, THEREFORE,

To avoid all forms of corruption by following a system that is fair, transparent and free from any influence / prejudiced dealings prior to, during and subsequent to the currency of the contract to be entered into with a view to: Enabling the Dr. Shakuntala Misra National Rehabilitation University to obtain the desired services as referred to in the Bid document No. dated2020 at a competitive price in conformity with the defined specifications by avoiding the high cost and the distortionary impact of corruption on public procurement and Enabling BIDDERS to abstain from bribing or indulging in any corrupt practice in order to secure the contract by providing assurance to them that their competitors will also abstain from bribing and other corrupt practices and the Dr. Shakuntala Misra National Rehabilitation University will commit to prevent corruption, in any form, by its officials by following transparent procedures. The parties hereto hereby agree to enter into this Integrity Pact and agree as follows:

1) Commitments of the DSMNRU:

DSMNRU undertakes that no official of DSMNRU, connected directly or indirectly with the contract, will demand, take a promise for or accept, directly or through intermediaries, any bribe, consideration, gift, reward, favour or any material or immaterial benefit or any other advantage from the BIDDER, either for themselves or for any person, organization or third party related to the contract in exchange for an advantage in the bidding process, bid evaluation, contracting or implementation process related to the contract.

The BUYER will, during the pre-contract stage, treat all BIDDERS alike, and will provide to all BIDDERS the same information and will not provide any such information to any particular BIDDER which could afford an advantage to that particular BIDDER in comparison to other BIDDERS.

All the officials of the DSMNRU will report to the appropriate Government office any attempted or completed breaches of the above commitments as well as any substantial suspicion of such a breach.

- 2) In case any such preceding misconduct on the part of such official(s) is reported by the BIDDER to the DSMNRU with full and verifiable facts and the same is prima facie found to be correct by the DSMNRU, necessary disciplinary proceedings, or any other action as deemed fit, including criminal proceedings shall be initiated by DSMNRU and such a person shall be debarred from further dealings related to the contract process. In such a case while an enquiry is being conducted by the DSMNRU the proceedings under the contract would not be stalled.

3) Commitments of Bidders

The BIDDER commits itself to take all measures necessary to prevent corrupt practices, unfair means and illegal activities during any stage of its bid or during any pre-contract or post-contract stage in order to secure the contract or in furtherance to secure it and in particular commit itself to the following:

The BIDDER will not offer, directly or through intermediaries, any bribe, gift, consideration, reward, favour, any material or immaterial benefit or other advantage, commission, fees, brokerage or inducement to any official of the DSMNRU, connected directly or indirectly with the bidding process, or to any person, organization or third party related to the contract in exchange for any advantage in the bidding, evaluation, contracting and implementation of the contract.

The BIDDER further undertakes that it has not given, offered or promised to give, directly or indirectly any bribe, gift, consideration, reward, favour, any material or immaterial benefit or other advantage, commission, fees, brokerage or inducement to any official of the DSMNRU or otherwise in procuring the Contract or forbearing to do or having done any act in relation to the obtaining or execution of the contract or any other contract with the Government for showing or forbearing to show favour or disfavor to any person in relation to the contract or any other contract with the Government. The BIDDER further confirms and declares to the DSMNRU that the BIDDER is the original manufacturer/integrator/authorized government sponsored export entity and has not engaged any individual or firm or company whether Indian or foreign to intercede, facilitate or in any way to recommend to the DSMNRU or any of its functionaries, whether officially or unofficially to the award to the contract to the BIDDER, nor has any amount been paid, promised or intended to be paid to any such individual, firm or company in respect of any such intercession, facilitation or recommendation, as the case shall be for satisfactory performance of the proposed terms of Bidder.

The BIDDER, either while presenting the bid or during pre-contract negotiations or before signing the contract, shall disclose any payments he has made, is committed to or intends to make to officials of DSMNRU or their family members, agents, brokers or any other intermediaries in connection with the contract and the details of services agreed upon for such payments. The BIDDER will not collude with other parties interested in the contract to impair the transparency, fairness and progress of the bidding process, bid evaluation, contracting and implementation of the contract.

The BIDDER will not accept any advantage in exchange for any corrupt practice, unfair means and illegal activities.

The BIDDER shall not use improperly, for purposes of competition or personal gain, or pass on to others, any information provided by the DSMNRU as part of the business relationship, regarding plans, technical proposals and business details, including information contained in any electronic data carrier. The BIDDER also undertakes to exercise due and adequate care lest any such information is divulged.

If the BIDDER or any employee of the BIDDER or any person acting on behalf of the BIDDER, either directly or indirectly, is a relative of any of the officers of DSMNRU, or alternatively, if any relative of an officer of the DSMNRU has financial interest / stake in the BIDDER's firm, the same shall be disclosed by the BIDDER at the time of filing of Bid.

4) EARNEST MONEY DEPOSIT

While submitting Technical bid, the BIDDER shall deposit an amount of Rs. as Earnest Money as mentioned in tender document.

The instrument for Security Deposit made shall be valid up to the specified period and the bidder shall be liable to keep the said instrument valid for such extended period as the case shall be for satisfactory performance of the

terms of Bidder above referred till the complete conclusion of the contractual obligations to the complete satisfaction of both the BIDDER and the DSMNRU, including warranty period, whichever is later.

In case of the successful BIDDER a clause would also be incorporated in the Article pertaining of Performance Bond in the corresponding Contract governing such agreement that the provisions of Sanctions for Violation shall be applicable for encashment of Performance Bank Guarantee deposited towards forfeiture of said amount in case of a decision by the DSMNRU to forfeit the same without assigning any reason for imposing such sanction.

No interest shall be payable by the DSMNRU to the BIDDER on Earnest Money Deposit.

5) SANCTIONS FOR VIOLATIONS

Any breach of the aforesaid provisions by the BIDDER or any one employed by it or acting on its behalf (whether with or without the knowledge of the BIDDER) shall entitle the DSMNRU to take all or any one of the following actions, wherever required:

- i) To immediately call off the pre contract negotiations without assigning any reason or giving any compensation to the BIDDER. However, the proceedings with the other BIDDER(s) would continue.
- ii) The Earnest Money Deposit (in pre-contract stage) and/or Security Deposit / Performance Bond (Bank Guarantee) (after the contract is signed) shall stand forfeited either fully or partially, as decided by the DSMNRU and the BUYER (DSMNRU) shall not be required to assign any reason therefore.
- iii) To immediately cancel the contract, if already signed, without giving any compensation to the BIDDER.
- iv) To encash the advance bank guarantee and performance bond/warranty bond, if furnished by the BIDDER, in order to recover the payments, already made by the DSMNRU, along with interest.

6) LAW AND PLACE OF JURISDICTION

This Pact is subject to Indian Law. The place of performance and jurisdiction is the seat of the DSMNRU.

7) VALIDITY

The validity of this Integrity Pact shall be governed by the terms of the Bid No. towards complete execution of the contract to the satisfaction of both DSMNRU and the BIDDER/Seller, including warranty period, whichever is later. In case BIDDER is unsuccessful, this Integrity Pact shall expire after six months from the date of the signing of the contract awarding the Bidder with successful bidder.

Shall one or several provisions of this Pact turn out to be invalid; the remainder of this Pact shall remain valid. In this case, the parties will strive to come to an agreement to their original intentions.

- 8) The parties hereby sign this Integrity Pact at..... on.....

BIDDER

Name of the Officer:

Authorised Signatory of DSMNRU,

Designation:

Witness:

1.

2.

Witness:

1.

2.

Annexure -XVII

MANUFACTURER AUTHORIZATION FORM

No..... dated.....

To

.....
.....
.....

Dear Sir:

Bid No.....

We.....who are established and reputed
manufacturer of(name and
description of goods offered) having factories at
.....(address of factory) with factory
registration no.....do hereby authorize
M/s (Name and address
of Agent) to submit a bid, and sign the contract with you for the goods
manufactured by us against the above bid.

We hereby extend our full warranty for the goods and services offered for
supply by the above firm against this Invitation for Bid. We further certify
that we shall support vendor with all related spares and maintenance during
the entire contract period including the period of warranty.

Yours

faithfully,

(Name):.....

(Name of manufacturers): -----

Note: This letter of authority should be on the letterhead of the manufacturer
or OEM and should be signed by a person competent and having the power of
attorney to legally bind the manufacturer.

Annexure -XVIII**EARNEST MONEY DETAILS**

Sl.No.	Name of Laboratory/ Equipment	Earnest Money (INR)

Annexure -XIX**CONTRACT FORM**

THIS AGREEMENT made on the day of 2020 between
 Dr. Shakuntala Misra National
 Rehabilitation University of the one part and
 (Name & address of Supplier)
 of the other part:

WHEREAS the Purchase is desirous that certain Goods and ancillary services
 viz. (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
 (Contract Prize in words and Figures) (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 be deemed to form and be read and
 constructed as part of this Agreement, viz.,

[a] The Price Schedule submitted by the Bidder;

[b] The Schedule of Requirements;

[c] The Terms & Conditions

[d] The Consignee's Notification of Award/ Purchase Order

3. In consideration of the payments to be made by the Consignee to the
 Supplier as hereinafter mentioned, the Supplier hereby covenants with the
 Consignee to provide the goods and services and to remedy defects herein in
 conformity in all respects with the provisions of the Contract.

4. The Consignee hereby covenants to pay the Supplier in consideration of the
 provision of the goods and services and the remedying of defects therein, the
 Contract prices or such other sum as shall become payable under the
 provisions of the Contract at the times and in the manner prescribed by the
 Contract.

Brief particulars of the goods and services, which shall be supplied/
 provided by the Supplier, are as under:

Sl. No.	Brief Description of Goods & Services	Quantity to be supplied	Unit Price	Total Price	Delivery Terms

Total Value: Delivery

Schedule:

IN WITNESS where of the parties hereto have caused this Agreement to be executed in accordance with their respective laws the day and year first above written.

Signed, Sealed and Delivered by the
said (For the Consignee) in the
Presence of

Signed, Sealed and Delivered by the
said (For the Supplier) in the
presence of

FORM - A: DELIVERY CERTIFICATE

(To be completed by the Consignee/Purchaser)

1. The items mentioned as per details given below, have been physically verified by way of opening the cartons/packing and verifying the machine/equipment supplied and model of the Equipments/Items. It is certified and acknowledged that the same have been received at this Institution in good condition.

Sl. No.	Sl. No. (As per Work Order)	Description of Equipment	Origin	Model & Make	Quantity

Please make appropriate column, as per requirement.

2. The items as per details given below was/were received in damaged conditions and therefore are not acceptable. The damaged goods/equipment has been returned to the supplier and supplier is required to supply the new equipment in lieu of damaged one.

Details of the Goods/Equipment received in objectionable condition:

Sl. No.	Sl. No. (As per Work Order)	Description of Equipment	Origin	Model & Make	Quantity

(Signature of the issuing official)
 Authorized Official,
 Dr. Shakuntala Misra National
 Rehabilitation University
 Name
 Designation
 Rubber Seal of the Institution

Received the Acknowledgement Certificate

Date:.....

Signature of Supplier or his Authorized Representative

Name:.....

FORM – B: FORM FOR ACCEPTANCE OF GOODS/EQUIPMENT AT SITE**INSTALLATION CERTIFICATE**

(to be completed and issued by the Consignee/Purchaser)

Note: In case of need, a fresh form on these lines shall be prepared & issued by Consignee. 2 copies of this certificate to be provided to Supplier.

1. The following goods/equipment, supplied by the Supplier at this University have been successfully installed by the Supplier:

Sl. No.	Sl. No. (As per Work Order)	Description of Equipment	Origin	Model & Make	Quantity

2. The Supplier has fulfilled his contractual obligations related to supply & installation of the items.
Or
3. The Supplier has not fulfilled his contractual obligation with regard to following. (Mention here deviation, if any, related to successful installation.)
- (a)
- (b)
- (c)

(Signature of the issuing official)

Dr. Shakuntala Misra National Rehabilitation University

Name:

Designation:

Rubber Seal of the Institution

Received the Acceptance Certificate

Date:.....

Signature of Supplier or his Authorized
Representative Name

FINANCIAL BID SUBMISSION FORM

To,
Registrar
Dr. Shakuntala Misra National Rehabilitation University,

Mohaam Road, Lucknow
Uttar Pradesh – 226017

Dear Sir,

We, the undersigned, offer to provide “SUPPLY, INSTALLATION, COMMISSIONING OFx..... LABORATORY EQUIPMENT OF ENGINEERING AND TECHNOLOGY DEPARTMENT in accordance with your bid document. Our attached Financial Bid is for the amount of.....x..... [*Indicate the corresponding to the amount(s), {Insert amount(s) in words and figures}*]. Please note that all amounts shall be the same as in Bill of Quantity (BOQ). Our Financial Bid shall be binding upon by us subject to the modifications resulting from Contract negotiations, if any, up to expiration of the validity period of the Proposal.

Yours sincerely,

Authorized Signature {In full and initials}:

Name and Title of Signatory:

In the capacity of:

Address:

E-mail: