

GOVERNMENT COLLEGE OF ENGINEERING
JAMUNALIA, OLD TOWN, KEONJHAR-758 002

No. 1395

Dated 26-09-2017

TENDER CALL NOTICE

Sealed tenders are invited from reputed original manufacturers/ authorized distributors up to the date mentioned in the tenders for supply of equipment through speed post/registered post only for **Department of Electrical Engineering**. The date of opening the tender is mentioned in the respective tender document, which will be opened in the office of the Principal, Government College of Engineering, Keonjhar in the presence of bidders and/or their nominees. The tender bid documents with details of terms and conditions are to be downloaded from the College Website: www.gcekjr.ac.in.

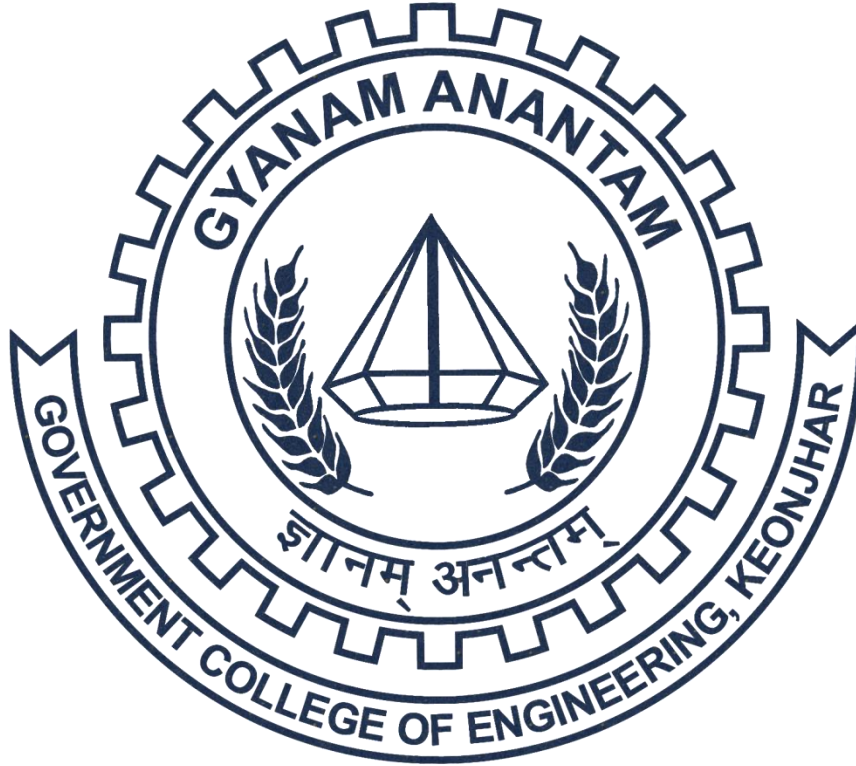
The authority reserves the right to reject/cancel the tenders in whole or in part without assigning any reason thereof. The authority will not be responsible for any postal delay.

Sd/-
Principal

Bid Ref No.1395

Date: 26-09-2017

**BIDDING DOCUMENTS AND INSTRUCTION TO SUPPLY EQUIPMENT
FOR
DEPARTMENT OF ELECTRICAL ENGINEERING**



GOVERNMENT COLLEGE OF ENGINEERING, KEONJHAR

[A Constituent College of Biju Patnaik University of Technology]

Jamunalia, Old Town, Keonjhar – 758 002

INVITATION FOR BIDS

Principal, Government College of Engineering, Keonjhar invites sealed bids from eligible bidders for supply of machineries/equipment for Department of Electrical Engineering.

Interested eligible Bidders may obtain detail information and list of items with technical specifications from the **website of the College www.gcekjr.ac.in**

Particulars about submission of bidding document are as follows:

(a) Price of bidding document : **Rs.1000/-**
(non-refundable)

(b) First date of availability of Bidding Document in the website: **26-09-2017**

(c) Last date and time for submission of bids: **26.10.2017**

(d) Time and date of opening of bids : **27.10.2017**

(e) Place of opening of bids:

**Principal Office
Government College of Engineering
Jamunalia, Old Town, Keonjhar-758002**

(f) Address for communication:

**Principal
Government College of Engineering
Jamunalia, Old Town,
Keonjhar-758002**

Sd/
Principal

1. Eligibility of Tenderer and General Instructions:

1.1 Eligibility:

Those who fulfill the following criteria are eligible to participate in the tender.

- a) The tenderer must be a reputed Original Manufacturer and/or the Authorized agent/ dealer of a reputed manufacturer. Manufacturers must provide all documents relating to their Manufacturing Capabilities.
- b) If the tenderer is an Authorized Dealer/Agent of a reputed manufacturer, necessary certificate to this effect from his manufacturer must be enclosed
- c) The tenderer must be registered with GST.
- d) Annual turn-over of the tenderer must be more than Rs. Fifty Lakhs in last three years. As a letter of support the bidder should submit audited balance sheet of last three financial years.
- e) The bidder should be a registered firm with GST Authority. The bidder should furnish the GST registration certificate, details along with the tender paper and necessary clearance certificates up to March 2017. Enclose copies supporting documents. In absence of such certificates, the Bid is liable to be rejected, up to date and PAN Number must be enclosed along with the Tender documents.
- f) The tenderer must have cleared Income Tax payment up to date. Attested copies of attested copy of Income Tax Clearance Certificate or non-assessment certificate, as the case may be, from the competent authority, up to date and PAN Number must be enclosed along with the Tender documents.
- g) The tenderer must have the willingness for providing comprehensive maintenance support of the Machine supplied by him for at least two years after expiry of the warranty period.
- h) The tenderer must provide evidence of purchase order and successful execution of supply of orders with installation and successful after sales support in reputed organizations like NITs/IITs/IIESTs/IISERs/NISER/IISc/Central Research Laboratories/ Government Engineering Colleges of Odisha.
- i) All after sales support must be provided directly by the manufacturer only.
- j) The manufacturer should be preferably ISO: 9001-2008.
- k) The manufacturer should have preferably its own NABL (National Accreditation Board for Testing and Calibration Laboratories) accredited laboratory or equipments supplied should have certification from any NABL accredited laboratory in respect of quality and performance.
- l) The manufacturer should be preferably registered with ESI.
- m) The manufacturer should have preferably its own R&D section registered with Government of India.

1.2 General Instructions:

The selection for procurement of equipment will be based on quality and performance along with cost. In this context decision of technical committee is final based on documentary evidence or actual physical verification.

- a) Submission of more than one bid by a particular tenderer under different names is strictly prohibited. In case it is discovered later on that, this condition is violated, all the tenders submitted by such tenderer/s would be rejected or contract cancelled.
- b) The tenderer should mention in the tender paper, the location of its service centre nearest to Keonjhar.
- c) All offers should be in English and the price quoted for each item should be firm.
- d) Warranty period, Delivery period and After-Sale-Service conditions, etc. are also to be clearly indicated.
- e) The rates and the conditions of the offer will remain valid for three months from the date of opening of the tender and no change or alteration of the rate will be acceptable on any account.
- f) Submitted tender forms with overwriting or erased or illegible specifications and rates will be rejected.
- g) Request from tenderer in respect of additions, alterations, modifications, corrections, etc. of either terms & conditions or rate after opening of the bid may not be considered. However, negotiation may be made before finalization.
- h) Tenderers shall carefully examine the bid documents and fully inform themselves of all the conditions, which may in any way affect the work of the cost thereof.
- i) Should a tenderer find discrepancies or omissions from the specification or other documents and any doubt as to their meaning, he should at once notify the purchaser and obtain clarification in writing.
- j) This, however, does not entitle the tenderer to ask for time beyond the due date fixed for receipt of tenders.
- k) The tenderer must also specify minimum time and maximum time to repair/replace in the event of a failure and penalty thereof.
- l) Verbal clarification and/or information given by the purchaser or its employees or representatives shall not be binding on the purchaser.
- m) Submission of sealed bid will carry with the implication that the tenderer agrees to abide by the conditions laid down in the detailed particulars of the bid notice.
- n) Conditional offers and offers qualified by vague and indefinite expression, as 'subject to immediate acceptance' 'subject to prior sale', etc. will not be considered.
- o) While tenders are under consideration, tenderers and their representatives or other interested parties are advised to refrain from contacting by any means, to the purchaser's personnel or representatives on matter relating to the tenders under study.
- p) The purchaser, if necessary, will obtain clarification on tenders by requesting such information from any or all the tenderers either in writing or through personal contact as may be necessary.
- q) The tenderer will not be permitted to change the substance of his offer after the tenders have been opened.
- r) In the event of non-compliance with this provision, the tenderer is liable to be disqualified.

1.3 Procedure for Submission of Tenders:

The Tenderers must submit their bids as required in two parts in separate sealed covers prominently super scribed as Part-I "Technical Bid" and Part-II "Financial Bid" and also

indicating on each of the covers the “Tender callNotice Number & Date” and due date and time of submission as mentioned in Tender Call Notice.

Part-I (Technical Bid)

Excepting the price schedule, all other documents as mentioned in para 1.1 i.e details of technical specifications, printed information Catalogue for each instrument, Copy of Firm Registration Certificate from the competent authorities, GST Registration, Income Tax Clearance, PAN Card copy, list of clients, evidence of successful execution with photograph, etc. along with tender document duly signed by the authorized person in each page shall be covered in Part-I (Technical Bid).

Part-II (Financial Bid)

All indications of price shall be given in Part-II (Financial Bid).

- a) Both sealed covers Part-I “ **Technical Bid**” and Part-II “Financial Bid” should be placed in a third cover along with requisite **EMD & cost of Tender documents** (separately in the form of DD drawn in favour of **Principal, Government College of Engineering, Keonjhar** at any Nationalized Bank payable at Keonjhar) , others requisite supporting documents etc. and sealed. The sealed cover containing tender documents as per procedure indicated above should be sent to the Office of the Principal, GCE, Keonjhar by Registered Post/Speed Post only addressing to the Principal, Government College of Engineering, Jamunalia, Old Town, Keonjhar-758002**within the due date and time as stipulated in Tender. The sealed envelope must show the name of the tenderer and his address and should be super scribed as “Tender for supply of Equipment for Electrical Engineering Department” on the top of the envelope.**
- b) All the documents submitted must be in the papers showing signature of the tenderer and printed office name of the tenderer on official seal.
- c) All the documents must be submitted in a sequential manner with separator/flags to help in quick scanning of the topics. Wherever possible, data in tabular form should be given.

2. Requirements by Tenderer before Supply:

2.1 Rating Plate, Name Plate and Labels:

Each of the equipment is to have permanently attached to it, a rating plate of non-corrosive material in a conspicuous position, upon which the total specifications along with the manufacturer’s name, address, etc. are to be engraved.

2.2 Packaging:

All the equipment are to be suitably protected, covered in water -proof packing and crated to prevent damage or deterioration during transit and storage till the time of installation. The

supplier shall be responsible for any loss or damage caused during transportation, handling or storage till their successful installation.

2.3. Inspection:

- a) All materials / equipment shall be inspected and tested for completeness, proper assembly, operation, cleanliness and state of physical condition and performance as per quoted specification.
- b) The test shall be conducted, reported and certifications to be provided by the tenderer.
- c) The tenderer shall provide all test and measuring equipment/tools required for inspection / testing.
- d) The cost of all such tests shall be borne by the Tenderer.
- e) GCE reserves the right to reject any equipment if it does not comply with the specifications during site testing, installation and commissioning stage.
- f) Inspection & testing would be conducted, jointly, at various stages as applicable during unpacking, installation and commissioning of respective equipment / components at the manufacturing site.

2.4. Environmental Condition:

All the equipment supplied shall be rugged and should operate without any deviation in quality, or degradation of equipment performance. All the specification/parameters shall be guaranteed over the following environmental conditions:

- * Storage Temperature : 0 to 50⁰ C
- * Operating Temperature : 0 to 50⁰ C
- * Humidity : 95% RH (non-condensing)

All the equipment are intended to operate under 220 V/ 440V, 50 Hz power supply.

3. Requirements by Tender after Supply:

3.1 Supply:

- a) The material would be delivered by the supplier at GCE, Jamunalia, Old Town, Keonjhar – 758002, Odisha.
- b) The items should be supplied directly from the manufacturing terminal having passed all tests successfully with Certifications as required.
- c) The equipment should conform to the latest relevant National/International standards and shall be completed in all respect.
- d) Any component, fitting etc. which may not have been specifically mentioned in the specifications but which are usual and necessary for the equipment, shall be supplied by the tenderer at no extra cost.

- e) In case, articles are found damaged in transit or found short at the time of delivery the full cost of the same will be deducted from the bill of the supplier in case the supplier does not replace the stock within a week from the date of the complain.
- f) The articles ordered must be supplied in one lot within 4 (four) weeks of placing of the order.
- g) In case of delay in delivery or successful installation, a penalty of 1% (one per cent) per week shall be levied.
- h) GCE reserves the right to procure the materials from alternative sources at the risk and cost of the successful tenderer giving 15 days notice.
- i) Any increase in tax and duties after expiry of delivery period will be borne by the supplier.
- j) In case the items supplied by the supplier are found not up to the specification shall be rejected.
- k) The supplier will be intimated to take back the stocks at his own cost within three days from the date of rejection and to replace the same within 7 days, failing which the EMD will be invoked in addition to taking legal actions.
- l) Imported consignment, if any, should be destined to GCE, Jamunalia, Old Town, Keonjhar – 758002, Odisha, India through Bhubaneswar Air Port.
- m) The suppliers shall be responsible for releasing the consignments from the carriers/transporters.
- n) The equipment shall be delivered and installed at site at the cost of the tenderer.
- o) All taxes, levies, surcharges including the customs clearance and handling freight and insurance should be paid and handled by the tenderer.

3.2 Installation and Commissioning:

Installation and Commissioning shall include the following:

- a) Installation and Testing of the Equipment, Machineries etc. must be conducted by the tenderer at GCE.
- b) It will be the responsibility of the tenderer to provide all necessary spares and consumables, which may be required during installation and commissioning, at no extra cost to purchaser.
- c) The tenderer is to bring their own testing and measuring instruments required for installation, testing, commissioning, which can be taken back after completion.
- d) Installation must complete within 15 days after delivery on site.
- e) During installation and commissioning the complete intended experiments is to be conducted with results must be within accepted level of accuracy.
- f) The raw materials and samples required for conducting experiments during installation is to be supplied by the tenderer free of cost.

3.3 Documentation:

- a) Detailed technical manuals, handbooks, drawings, Warranty card and Factory Quality Assurance checklist, test results and any other certifications mentioned in the Technical specifications shall be supplied along with the consignment.
- b) Supplied manuals/handbooks must cover detailed technical specifications and installation, operation, maintenance and System Safety procedures.
- c) For Experimental setups details of theory, procedure and methods of taking measurements etc. should be provided in the form of hand books for each experiment.
- d) The receipts for taxes paid, if any, for the supplied materials should also be submitted.

3.4 Trial Operation and Performance Guarantee Test:

- a) After successful completion of Installation and Commissioning of the equipment, a 7-day continuous trial operation putting those on optimum use shall be conducted by the tenderer at site, during which the performance of the equipment shall be demonstrated for trouble-free continuous operation, meeting the specified standards and proper training shall be imparted to two persons of the purchaser.
- b) During trial operation, tenderer shall do all necessary adjustments required to ensure the performance as per the acceptable level.
- c) In case, guaranteed performance is not established, the tenderer shall be given opportunity to rectify/replace the equipment/components, and restart the 7 days continuous trial operation, at the risk and cost of the tenderer.

3.5 On-Site Warranty:

- a) The entire materials may be used continuously. The reliability and safety of the total installed system and trouble-free operation are, therefore, of prime importance. The supplied devices/equipment and components shall be covered under **Two-years or more** comprehensive on-site warranty from the date of issue of successful completion of Performance Guarantee Report.
- b) During the period of warranty, it shall be the responsibility of the tenderer to provide all essential spares and consumables, which may be required for maintenance and trouble-free operation of the devices / components at the tenderer's cost.
- c) Software, if any, has to be tested with at least one-year warranty for trouble free operation.

3.6 Comprehensive Maintenance Contract:

- a) The tenderer shall be under the obligation of entering into a Comprehensive Maintenance Contract (CMC) with GCE for a minimum period of two years, renewable if felt necessary, on mutually acceptable rates, terms and conditions. CMC shall start after the completion of Warranty.

- b) The scope of CMC shall cover maintenance and supply/replacement of materials and components, for smooth and reliable operation of the systems without trouble.
- c) Accordingly, the tenderer has to offer rates for the CMC structure per equipment along with the price for the Systems and other associated Equipment supplied.

3.7 After Sales Service:

- a) During the warranty period and subsequently, after signing of Agreement for CMC the tenderer shall attend to the problems reported by the users of GCE on a priority basis.
- b) For any problem reported the tenderer shall attend and rectify the problem within 7 (seven) days or provide a standby system of the similar configuration.
- c) The report on any problem will be informed through phone or fax number of which shall be given by the tenderer.
- d) The branch office of the concerned manufacturing firm will be fully responsible to provide maintenance service, in case of any negligence, in providing the service by the tenderer.
- e) On failure to comply with those instructions, the Bank Guarantee provided for the warranty period shall be invoked.

4. Financial Terms:

4.1 EMD

- a) The tenderer has to submit a Demand Draft / Banker's Cheque / Pay order of Rs.20000/- **in favour of Principal, Government College of Engineering, Keonjhar** payable at Keonjhar in any Nationalized Bank towards EMD.
- b) There will be no interest paid to the tenderer towards EMD money.
- c) In no case, the EMD Money in cash or other forms will be accepted at the time of opening of the bid.
- d) No request for adjustment of claims, if any, will be accepted.
- e) The EMD of unsuccessful tenderers will be refunded as soon as possible after the tenders are finalized.

4.2 Performance Security Deposit

In case of successful Bidder EMD will be kept as Performance Security Deposit and will be refunded after expiry of stipulated warranty periods from the completion date of installation and commissioning on satisfactory performance of the equipment.

4.3 PRICES:

Price quoted should be **FOR Government College of Engineering, Keonjhar only. Tax components as applicable should be mentioned clearly in the financial bid.**

- a) Price should be quoted for unit item.
- b) Purchase order will be placed as a single lot for each type of item or for all the items together, as the case may be.
- c) In case of items of import, the tenderer should take full responsibility for customs clearance, handling, tax payment, etc. and specify the charge for the same in the price bid.

4.4 Sales Tax Concession:

Central Sales Tax Concession is to be availed on production of the required certificates applicable to Educational Institution.

4.5 Discount:

- a) Our Institute is a pioneer Institution in the field of Teaching and Research in Engineering and allied disciplines and do not run with profit motive.
- b) As such we are availing price discount for purchase of equipment/instruments.
- c) The rate of discount or any other Institutional benefit arising out of Govt. Policy etc., on each item may also be indicated in the bid specifically.

4.6 Payments:

- a) In case of imported items, payment will be made by opening LC in the name of the manufacturer subject to the condition that a Bank Guaranty for an equal amount will be submitted by the selected tenderer to GCE for the period of completion of installation and commissioning.
- b) In case of purchase in Indian Rupees, payment of 90 percent of the ordered value will be made after successful installation and commissioning of the equipment subject to submission of satisfactory performance report by the concerned Head of Department. The rest 10 percent of the payment will be made after one year of successful installation of the equipment.

4.7 Rate Contract with DGS&D or any other Government Organisation:

In case the tenderer has entered into a Rate Contract with DGS & D or any other Government Organization such as EPM, rate contract preference, number & copy of rate contract have to be submitted along with tender.

5. Instruction to the Tenderer:

- a) Some of the minimum specifications specified may be redundant, obsolete or incompatible and in these cases, quote the particulars of correct specification of latest trend and technology.
- b) Higher specifications instead of minimum specifications are allowed if a minimum specification is not available, obsolete or incompatible.
- c) Otherwise, model with higher specification should be in addition to the model with minimum specifications.
- d) Specify brand name and full model name and number for each offer.
- e) Include the printed catalogue and pricelist if any for each of the equipment quoted.
- f) Specify the list of Accessories required along with each of the equipment.
- g) Quote the additional price of the accessories; only those, which are fully compatible with the quoted model, should be furnished.
- h) Specify the list of Accessories to be given free of cost, along with the equipment as “**Free Accessories**”; these should be fully compatible with the quoted models.

5.1 Solving Disputes:

- a) GCE, the tenderer and the manufacturer shall make all efforts to resolve amicably by direct informal negotiation on any disagreement or dispute arising between them under or in connection with this contract.
- b) All disputes arising out of the contract shall be referred to courts under the jurisdiction of the Keonjhar court only.
- c) **The above terms and conditions except those otherwise agreed upon, shall form a part of the Purchase Order.**
- d) **Sign on each page of this tender document and Return it along with the offer enclosing this part together with the Technical Offer.**
- e) **The GCE authority has all rights to accept / reject any tender without assigning any reasons thereof.**

6. Technical Specifications:

Following are the minimum specifications of the equipment.

- a) The minimum specifications are indicative and not exhaustive.
- b) The models with higher specifications may be quoted.
- c) The quoted materials should be of latest trend and technology.
- d) Each equipment should be complete in itself without needing any extra requirements except the requirement of general test and measuring instruments.

List of equipment with technical specifications required for Electrical Engineering Department:

Electrical Power Transmission and Distribution Lab

1	<p><i>TRANSMISSION LINE SIMULATION UNIT</i> a. Determination of ABCD Parameter b. Study and of Ferranti Effect. c. Series and shunt Capacitance Computation in Transmission Line.</p>	<p>System should contain: 1.Artificial Transmission Line Training Unit (a) Power Supply : 1phase, 230V AC, 50Hz Current Rating : 2A,Short Circuit Capacity : 4A No. of π sections : 4 (b) Generating Station End Transformer Input Voltage : 1ph 110V, 50Hz, Output voltage : variable 0-230 volts, Operating voltage : 110 / 230V (C) Measuring Unit Ammeter : 3½ Digit , Voltmeter : 3½ Digit DSP based Power Analyzer Operating Temperature : -5°C to +45°C Storage Temperature : -20°C to +60°C</p>	01
2	<p><i>CORONA TEST UNIT</i></p>	<p>System should contain: a) Corona cage test set b) Transformer Testing Unit : 100KV, 50mA c) Horn Gap Apparatus</p>	01
3	<p><i>DETERMINATION OF STRING EFFICIENCY</i></p>	<p>System should contain: (a) 11KV Disc Insulator String (Minm 05 Discs) (b) Capacitor Divider Unit : 100KV (c) Efficiency Jig Test Unit (d) 100kV, 50mA AC Test set</p>	01
4	<p><i>EARTH RESISTANCE MEASUREMENT</i></p>	<p>System should contain: Earth Resistance meter with accessories (a) 10 Ohms/100 Ohms,1000ohms , Three electrodes, hammer & other necessary accessories etc.</p>	01
5	<p><i>DISTRIBUTION SYSTEM POWER FACTOR IMPROVEMENT USING SWITCHED CAPACITOR</i></p>	<p>System should contain: (a) 5HP Induction Motor, 415V, 3-Phase, 1440rpm. Loading arrangement consisting of Drum, breaking system with spring balance. (b) Capacitor Bank from 0.1KVAR to 11KVAR. Power Analyzer , User friendly Software</p>	01

		USB Converter. This equipment will have indication lamps, switches, BTI connectors, etc.	
6	STUDY OF VARIOUS LIGHTNING ARRESTORS	System should contain: Lighting Arrestor of 2KV & 9KV rating. Standard 2year warranty all the above items	01
7	To determine fault current for L-G, L-L, L-L-G and L-L-L faults at the terminals of an alternator at very low excitation.	System should contain: 1. Identify the different fault 2. L-G fault 3. LLG fault 4. LLL fault 5. LLLG fault	01
8	To determine location fault in a cable fault locator.	System should contain: 1. Medium/ high resistance faults. 2. Open circuit faults. 3. Short circuit faults. Max & min fault resistances: 0 Ohms to 10 meg Ohms as measured with a avo meter. Max cable length: 5 km for all cases. Accuracy: $\pm 5\%$ or better. Type of cables: all type of underground Power, Control & Telecom cables. Power source: 1.2 Volts AAA batteries. Standard 2years warranty all the above items	01

Control System Engineering Lab

1	To study and validate the controllers for a temperature control system	System should contain: <ul style="list-style-type: none"> • Temperature control using P,PI, PID. • Provision to adjust the gain of P,I,& D. • Heating source is provided. • RTD is used as temperature sensor to conduct the experiments 2. Fully compatible with MATLAB® and SIMULINK®. 3. PC based	01
2	To study the position control system using Synchroscope	System should contain: <ul style="list-style-type: none"> • The input and Output angular displacement displayed on dials. 	01

		<ul style="list-style-type: none"> • AC panel meter is provided to measure the Voltage of stator and rotor points. • Separate switches are provided for both transmitter and receiver rotor supply. • One No. of power on/off switch with indication. • Measurement of induced stator voltages of transmitter. • Study of position control of 120 degree lag. • Study of forward/reverse position of receiver • Study of Synchros act as error detector. <p>May or May not PC based compatible with MATLAB® and SIMULINK®.</p>	
3	<i>To determine the transfer function of a system (network) using transfer function Analyser</i>	<p>System should contain:</p> <ul style="list-style-type: none"> • May or May not PC based with MATLAB® and SIMULINK®. • Transfer function Analyzer <p>Warranty: Standard 2 year warranty of all the items</p>	01
4	<i>DSO(70MHz to 100MHz) built in 20MHz function Generator</i>	<p>System should contain:</p> <ul style="list-style-type: none"> • No. of Analog Channels : 2 • No. of Digital Channels : 1 or 2 • Bandwidth : 70 MHz (Upgradable to 100 MHz) • Time baseRange : 5 nsec. to 50 sec/div • Trigger Modes : Normal , Auto , Single , Force. • Detect, Averaging, High Resolution, • Automatic Measurements : 24 or higher • Vertical Sensitivity : 500 μV/div to 10 V/div • Maximum Sampling Rate : 2 GSa/s . • Maximum Memory Depth : 1 Mpts standard with standard segmented memory • Waveform update Rate : 50,000 	10

		<p>waveforms / sec</p> <ul style="list-style-type: none"> • Inbuilt 20 MHz Function Generator : Sine, square, ramp, pulse, DC, noise ; Modulation types: AM, • FM, FSK ; Amplitude range : 1 mVpp to 10 Vpp • Waveform Math : Add, subtract, multiply, divide, FFT (magnitude), FFT (phase), low-pass filter • Display System : 7 inch TFT LCD Display • Connectivity : USB • Trigger Types : Edge, pulse width, video, rise/fall time, setup and hold,pattern/state • Optional Serial Protocol Analysis facility & Inbuilt 3 digit Digital Voltmeter and standard Mask/Limit Testing option & BODE Plot test • Warranty: Standard 2 year warranty; additional 2 years comprehensive warranty. 	
5	<i>Dc modular servo system</i>	<p>System should contain:</p> <ol style="list-style-type: none"> 1. Operational Amplifier Unit: Offset range should be +/-1.5V 2. Attenuator Unit 3. Pre-amplifier Unit:Offset range should be between +/-270mv to +/-330mv.Gain around 25 4. Servo Amplifier:Load current 2Amp 5. DC Motor Unit:Speed 3000rpm, Rotor inertia should be between 3×10^{-5} Kg m² to 4×10^{-5} Kg m², Maximum load .1Nm, Shaft Length: 3cm to 4 cm 6. Reduction gear tacho unit:Speed reduction around 30:1 7. Input & output potentiometers: Minimum: +1 Volt Step Disturbance 8. Loading Unit: Moment of inertia 0.001 Kg m² to 0.002 Kg m² 9. Power Supply: Power Supply 230V 50Hz, Output 24V,2A DC, For low power requirement: DC +/- 15V, 150mA. <p>Warranty : Standard 2year warranty & additional 2 years comprehensive warranty</p>	01
6	<i>Magnetic Levitation System</i>	<ol style="list-style-type: none"> 1. The Magnetic levitation System should provide experiments on a magnetically suspended steel ball using digital and analogue control techniques. 	01

		<p>2. Should have Integrated Hardware and software for both design and instructional use. Extensive Matlab® toolboxes should be available.</p> <p>3. Should be Self-contained; all supplies, signal sources and virtual instrumentation included.</p> <p>Dimensions and Weights. Depth: 300mm, Width: 250mm, Height: 450mm, Weight: 8Kg.</p>	
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Electrical Machine Lab

1	<i>To study Transformer Connection: Polarity Test, Parallel Operation and Scott Connection</i>	<p>System should contain:</p> <ul style="list-style-type: none"> • TRANSFORMER : 1KVA (ratio 1:2), double wound, 1-phase, 440/220 V, air cooled, enclosed type (tapping : 50% and 86.6% both at primary and Secondary) 3. PC based • VARIAC, Input: 415V, Output: 0~470V, 20A, 3-Ø, Air cool type, enclosed model • LPF WATT METER Range: 5/10A, 150/300/600V • Portable AC Ammeter Range: 2.5/5/10A Portable AC Voltmeter Range: 150/300/600V 	<p>06</p> <p>01</p> <p>02</p> <p>02</p> <p>02</p>
2	<i>Tachometer</i>	Digital and Non contact	05
3	<i>Measurement of sub-transient and transient reactance of a Salient Pole and determine negative and zero sequence synchronous Reactance of an alternator.</i>	<p>System should contain:</p> <ul style="list-style-type: none"> • Alternator of 3KVA, 3-phase, 415V, 50 HZ, <p>Separately excited type (Rotating Field – Stationary Armature -SALIENT POLE type) coupled with GE/Kirloskar/Crompton Greaves/Simens/ Ramson Make DC Shunt Motor of 5 HP, 220 V, 1500 RPM, SPDT foot mounted type.</p> <ul style="list-style-type: none"> • 3-Point starter 5HP Motor Range :600 ΩX 600W • FieldRheostart5HP Motor Range :600 ΩX 400W • Field Rheostart 3Kva Aleternator • Experimental Panel Board for the 	<p>01</p> <p>01</p> <p>01</p> <p>01</p>

		<p>Motor Alternator Set</p> <p>Consisting of :</p> <ul style="list-style-type: none"> • DC-Voltmeter (0-300V), DC-Ammeter (0-2A), 1no.2-pole MCB, AC-Voltmeter (0-500V), AC-Ammeter (0-5A), 1no 3-pole MCB, Special <p>Copper based Nylon coated insulated terminals, indication lamp assembled and wired in on a Hylem Sheet of suitable size</p> <ul style="list-style-type: none"> • VARIAC, Input: 415V, Output: 0~470V, 8A, 3-Ø, Air cool type, enclosed model • TPDT Knife Blade Switch <p>Standard 2year warranty all the above items</p>	<p>01</p> <p>01</p> <p>01</p>
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POWER ELECTRONICS LAB

1	<i>To study of V-I characteristics of SCR, TRIAC, IGBT and MOSFET:-</i>	<p>System should contain:</p> <ul style="list-style-type: none"> • V-I characteristics study trainer to find out holding and latching current of SCR and TRIAC. • One variable DC power supply from 1.5V to 10V @ 100ma to vary $V_{gk}/V_{gT1}/V_{gs}$ • One variable DC power supply from 2.5V to 30V @ 500ma to vary $V_{ak}/V_{T2T1}/V_{ds}$ • Consists of one SCR , one TRIAC & one MOSFET and one IGBT. • One no-25 watts Variable load potentiometer. • 4 Nos of Digital meters to measure voltages & currents • This unit is enclosed in a powder coated MS box with Screen printed front panel. • Works directly on 230V AC mains. 	01(EACH)
2.	<i>Study of single phase full wave controlled rectifier circuits(midpoint and Bridge type) with R & RL load:-</i> Single phase converter	<p>System should contain:</p> <p>Single phase Half and Fully controlled Power Circuit:230V/5A</p> <ul style="list-style-type: none"> ▪ Four SCR's (25TTS12) rated for 1200V/16A with heat sink, snubbed and fuse. 	01(EACH)

	Firing circuit.	<ul style="list-style-type: none"> ▪ ONE freewheeling diode. ▪ Two digital meters to measure o/put Voltage and Current. ▪ This unit is enclosed in a powder coated MS box with Screen printed front panel PVC striker. <p>Accessories:-</p> <ul style="list-style-type: none"> a) R-load: - 230V/5A-150 Ohms/5A. b) L-Load: - 0-150 mH/5A with tappings. c) 0-230V/5A Single phase isolation Transformer with tapings. d) 10:1 CRO Probe e) 1HP DC Shunt Motor 220V, 4A with Mechanical Loading Arrangement. 	
3	<i>Study of three phase full wave controlled rectifier and semi converter circuit with R and R-L Load.</i>	<p>System should contain: Consisting of :</p> <ul style="list-style-type: none"> • Three phase converter Firing circuit based on Ramp – comparator method. • Three SCR's (25TTS12) rated for 1200V/25A, and three diodes with heat sink, snubber and fuse. • ONE free- wheeling diode. • Two digital meters to measure output Voltage and Current. This unit is enclosed in a powder coated MS box with Screen printed front panel PVC striker. • R-load:- 600V/5A loading Rheostat. • L-Load: - 0-150 mH/5A with tapings. • 0-440V/2A Three Phase Isolation Transformer with tapings. <p>Sheet of suitable size</p>	01(EACH)
4.	<i>Study the performance of three phase VSI with PWM control</i>	<p>System should contain:</p> <ul style="list-style-type: none"> • Operating frequency is 25 Hz to 50 Hz using the potentiometer. PWM can be varied by a potentiometer provided. . • IGBT based Voltage Source Inverter circuit consists of 6 IGBTs. • All the 6 IGBTs are selected for three phase VSI action. Power devices are mounted on proper heat sink protected by fuse & snubber circuits. 	01(EACH)

		<ul style="list-style-type: none"> • Devices used are 30A/1200V. 	
5.	<i>Study of the forward converter and flyback converter.</i>	<p>System should contain: MOSFET/IGBT Based</p> <p>Technical Specifications and Features: -</p> <ol style="list-style-type: none"> 1. FRQUENCY: Potentiometer to vary the frequency from 100Hz to 500Hz approximately. 2. DUTY CYCLE: Potentiometer to vary the Duty Cycle from 0% to 80% approximately. 3. ON/OFF: Switch for driver output pulse with soft start. 4. + , - : Driver output to connect base and emitter of POWER MOSEFET/IGBT. 5. G, D, S: Gate, Drain & Source terminals of POWER MOSEFET.IRF 740-10A/400V. 6. D1 , D2: Diodes 10A / 400V – BYQ 28 7. POWER : Mains switch for control circuit (IN + , -) 8. Vdc : Regulated power supply(30V/2A) 9. ON: Switch for DC Supply to the Power Circuit. 10. L : Inductor – 40mH / 2Amps. 7. POWER : Mains switch for control circuit (IN + , -) 8. Vdc : Regulated power supply(30V/2A) 9. ON: Switch for DC Supply to the Power Circuit. 10. L : Inductor – 40mH / 2Amps. 11. C : Capacitor – 220 f / 200V 	01(EACH)
6	<i>Study of Buck and Boost Converter</i>	<p>Technical Specifications and Features: - MOSFET/IGBT Based</p> <ul style="list-style-type: none"> • FRQUENCY: Potentiometer to vary the frequency from 100Hz to 500Hz approximately. • DUTY CYCLE: Potentiometer to vary the Duty Cycle from 0% to 80% approximately • L : Inductor – 40mH / 2Amps. • C : Capacitor – 220 f / 200V • Regulated power supply(30V/2A) 	01(EACH)
7	<i>Isolation Transformer</i>	-	02
8.	<i>Isolation Probes</i>	-	10
9.	<i>Measurement of R,L, and C using Q-meter (LCR meter)</i>	<p>Technical Specifications and Features: -</p> <ul style="list-style-type: none"> • Q-meter Trainer Module/LCR Module 1Mhz A.F. Oscillator, Fine Adjustment, Multiplier Adjustment, Amplitude Adjustment, • ON/OFF Switch with connection Diagram & connecting terminals. <p>Input – 0-230V AC</p>	01
10.	<i>Spectrum Analyzer</i>	<p>System contain:</p> <ul style="list-style-type: none"> • 9 KHz to 3 GHz or better • Resolution 1Hz • Bandwidth 10Hz to 1 MHz 	01

		<ul style="list-style-type: none"> • Video Bandwidth 1Hz to 1 MHz • Interface : USB, LAN, GPIB (optional), VGA • Range: 10 ms to 1000 s Span > 0Hz 6 s to 200 s Span = 0Hz(minimum resolution = 6 us) • Display : 6 - Inch or more Color TFT Display with Built-in power measurements: channel power, OBW, ACP, SEM and TOI • Internal Memory: 16 MB nominal and should support USB 2.0 compatible memory devices • Warranty -3years • Upgrade Features: The instrument should have future upgrade to add capability of tracking generator, preamplifier, and analog demodulation (AM, FM, ASK, FSK), CISPR16-1-1 EMI filters for preliminary EMI pre-compliance measurements and GPIB Interface connectivity. • Detector: Positive-peak, negative-peak, sample, normal, RMS • 4 trace and 12 Marker • Sweep time Min 2 ms <p>Standard 2years warranty all the above items</p>	
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