

MAHARSHI DAYANAND UNIVERSITY, ROHTAK
(A state University established under Haryana Act. No.XXV of 1975)
'A Grade University Accredited by NAAC'
UNIVERSITY INSTITUTE OF ENGINEERING & TECHNOLOGY

e- Tenders on behalf of Registrar are invited subscribed as “Tender for lab instruments/ equipments (As per Annexure ‘A’) for the supply of Instruments/ equipments as per details given on website along with earnest money equal to 2% of the quoted rates on the total amount paid through online mode and a separate fee of **Rs. 1000/-** as tender fee and Rs. 1000/- as E services fee in account of Finance Officer, M.D. University, Rohtak will also be deposited through online mode. Last date of submission of tender will be **22-01-2020 upto 4.00 PM**. The e- tenders will be opened on **23-01-2020 at 11.00 a.m.** in UIET. For details may visit on <https://etenders.hry.nic.in/nicgep/app/> www.mdurohtak.ac.in

REGISTRAR

Tender Notice

| SR. NO | Name of Department | Name of Work | Opening Date | Closing Date | Amount (Approximate) | Website of the Department | Nodal Officer/ Contact Details/Email |
|--------|--|--|--------------|--------------|----------------------|---------------------------|---|
| 1. | University Institute of Engineering and Technology, (UIET), M.D. University, Rohtak. | Purchase of Instruments for Electrical Engineering Department of UIET, M.D. University, Rohtak | 23.01.2020 | 22.01.2020 | Rs.14.73 lac | www.mdu.ac.in | Director, UIET, MDU Mob. 8295088199 Email dir.uiet@mdurohtak.ac.in |

Director (UIET),
M.D. University, Rohtak.

**MAHARSHI DAYANAND UNIVERSITY, ROHTAK
UNIVERSITY INSTITUTE OF ENGINEERING AND TECHNOLOGY
M.D.UNIVERSITY, ROHTAK**

Phone:- 01262-393291
Mobile no. 8295088199

Email: dir.uiet@mdurohtak.ac.in

STANDARD BIDDING DOCUMENT FOR PURCHASE OF INSTRUMENTS/ EQUIPMENTS FOR B.TECH. ELECTRICAL ENGINEERING LABORATORIES IN UNIVERSITY INSTITUTE OF ENGINEERING AND TECHNOLOGY (UIET) MDU, ROHTAK.

PART1: COMPLETE BIDDING DOCUMENT

Name of work: Purchase of instruments/ equipments for Electrical Engineering Laboratories in UIET MDU, Rohtak.

PRESS NOTICE

**M.D. UNIVERSITY, ROHTAK
Notice Inviting E-Tender**

| | |
|---|--|
| M.D. UNIVERSITY, ROHTAK Notice Inviting E-Tender | |
| Name of work | Purchase of Instruments for B.Tech. Electrical Engineering Laboratories in University Institute of Engineering and Technology (UIET) MDU, Rohtak. |
| Tender Docs Fee + E Service Fees | Rs. 1000 + 1000 = 2000/- |
| Earnest Money | 2% of the quoted rate of the instruments/equipments. |
| Time Limit | 04 to 5 weeks |
| Tenders to be received till: | 4:00 PM on dated 22-01-2020 |
| <p>i) The tenders will be received only through E-tendering for further details visit website https://etenders.hry.nic.in/nicgep/app</p> <p>(ii) Cost of Bid document (to be paid online) is Rs. 1,000/- (non refundable) for each bid to be deposited through online.</p> <p>(iii) Willing Contractors shall have to pay is Rs. 1000/- the e- Service Fee through online.</p> | |

DIRECTOR (UIET)
M.D.U., Rohtak

DETAIL NOTICE INVITING TENDER

e-Tender is invited for purchase of below mentioned items in single stage two cover system i.e. Request for Pre-Qualification/Technical Bid (online Bid under PQQ/ Technical Envelope) and Request for Financial Bid (comprising of price bid Proposal under online available Commercial Envelope):-

| Sr. No | Name of Item | Appx. Cost (Rs. In lacs) | EMD to be deposited by Bidder | Tender Document Fee & e-Service Fee (Rs.) | Start Date & Time of Bid Preparation & Submission | Expiry Date & Time of Bid Preparation & Submission |
|--------|--|--------------------------|--------------------------------------|---|---|--|
| 1. | Purchase of Instruments for B.Tech. Electrical Engineering Laboratories in University Institute of Engineering and Technology (UIET) MDU, Rohtak. | As quoted by the bidder | 2% of the price quoted by the bidder | Rs. 1000/- for Tender Document fee & Rs. 1000/- for e-service fee | 21-12-2019 (2:00 PM) | 22-01-2020 (4:00 PM) |

1. Detailed notice inviting tender/estimate drawing can be seen in the office of the undersigned during office hours.
2. Bidding documents available on website <http://mdurohtak.ac.in> and <https://etenders.hry.nic.in/nicgep/app>
3. Newly enlisted contractors/societies/suppliers/manufactures should bring with them proof of their enlistment in appropriate class.
4. The bidders would submit bid through e-tendering only on the website i.e. <https://etenders.hry.nic.in/nicgep/app>

Under this process, the Pre-qualification/ Technical online bid Application as well as online Price Bid shall be invited at single stage under two covers i.e. PQQ/Technical & Commercial Envelope. Eligibility and qualification of the Applicant will be first examined based on the details submitted online under first cover (PQQ or Technical) with respect to eligibility and qualification criteria prescribed in this Tender document. The Price Bid under the second cover shall be opened for only those Applicants whose PQQ/ Technical Applications are responsive to eligibility and qualifications requirements as per Tender document.

1. The payment for Tender Document Fee and e-Service Fee shall be made by eligible bidders online directly through Debit Cards & Internet Banking Accounts and the payment for EMD can be made online directly through NET BANKING/RTGS/NEFT or OTC Please refer to 'Online Payment Guideline' available at the Single e-Procurement portal of GoH (Govt. of Haryana) and also mentioned under the Tender Document.

2. Intending bidders will be mandatorily required to online sign-up (create user account) on the website <https://etenders.hry.nic.in/nicgep/app> to be eligible to participate in the e-Tender. He/She will be required to make online payment of EMD fee in due course of time. The intended bidder fails to pay EMD fee under the stipulated time frame shall not be allowed to submit his / her bids for the respective event / Tenders.

3. The interested bidders must remit the funds at least T+1 working day (Transaction day + One working Day) in advance i.e. on or before 22-01-2020 (04:00 P.M); and make payment via NET BANKING/RTGS /NEFT or OTC to the beneficiary account number specified under the online generated challan. The intended bidder / Agency thereafter will be able to

successfully verify their payment online, and submit their bids on or before the expiry date & time of the respective events/Tenders at <https://etenders.hry.nic.in/nicgep/app>.

The interested bidders shall have to pay mandatorily e-Service fee (under document fee – Non refundable) of Rs.1000/- (Rupee One Thousand Only) online by using the service of secure electronic gateway. The secure electronic payments gateway is an online interface between bidders & online payment authorization networks.

The Payment for document fee/ e-Service fee can be made by eligible bidders online directly through Debit Cards & Internet Banking.

The Bidders can submit their tender documents (Online) as per the dates mentioned in the key dates:-

Key Dates

| Sr. No. | Department Stage | Bidder's Stage | Start date and time | Expiry date and time |
|----------------|----------------------------------|---|----------------------------------|---------------------------------|
| 1 | | Tender Document Down load and Bid Preparation/Submission | 21-12-2019 (2:00 PM) | 22-01-2020 (4:00 PM) |
| 2 | Technical Bidding Opening | | 23-01-2020 (11:00 AM) | |
| 3 | Financial Bid Opening | | 23-01-2020 (3:00 PM) | |

Important Note:

- 1) The Applicants/bidders have to complete 'Application / Bid Preparation & Submission' stage on scheduled time as mentioned above. If any Applicant / bidder failed to complete his / her aforesaid stage in the stipulated online time schedule for this stage, his / her Application/bid status will be considered as 'Applications / bids not submitted'.
- 2) Applicant/Bidder must confirm & check his/her Application/bid status after completion of his/her all activities for e-bidding.
- 3) Applicant/Bidder can rework on his/her bids even after completion of 'Application/Bid Preparation & submission stage' (Application/Bidder Stage), subject to the condition that the rework must take place during the stipulated time frame of the Applicant/Bidder Stage.
- 4) In the first instance, the online payment details of tender document fee + e-Service and EMD & PQQ/Technical Envelope shall be opened. Henceforth financial bid quoted against each of the item by the shortlisted bidder/ Agency wherever required shall be opened online in the presence of such bidders/ Agency who either themselves or through their representatives choose to be present. The bidder can submit online their bids as per the dates mentioned in the schedule/Key Dates above. The bids shall be submitted online in two separate envelopes:

Envelope 1: Technical Bid

The bidders shall upload the required eligibility & technical documents online in the Technical Bid.

Envelope 2: Commercial Bid

The bidders shall quote the prices in price bid format under Commercial Bid.

CONDITIONS: -

1. DNIT & prequalification criteria can be seen on any working day during office hours in office of the undersigned.
2. Conditional tenders will not be entertained & are liable to be rejected.
3. In case the day of opening of tenders happens to be holiday, the tenders will be opened on the next working day. The time and place of receipt of tenders and other conditions will remain unchanged.
4. The undersigned reserve the right to reject any tender or all the tenders without assigning any reasons.
5. The societies shall produce an attested copy of the resolution of the Co-operative department for the issuance of tenders.
6. The tender without earnest money/bid security will not be opened.
7. The Jurisdiction of court will be at Rohtak.
8. The tender of the bidder who does not satisfy the qualification criteria in the bid documents are liable to be rejected summarily without assigning any reason and no claim whatsoever on this account will be considered.
9. The bid for the work shall remain open for acceptance during the bid validity period to be reckoned from the last date of 'Manual submission of BS. If any bidder/tenders withdraws his bid/tender before the said period or makes any modifications in the terms and conditions of the bid, the earnest money shall stand forfeited. Bids shall be valid for 120 days from the date of bid closing i.e. from last date of manual submission of EMD. In case the last day to accept the tender happens to be holiday, validity to accept tender will be the next working day.

For & on behalf of Registrar, MDU, Rohtak.

Director, UIET
M. D. University, Rohtak

TERMS AND CONDITIONS GOVERNING THE TENDERS FOR THE SUPPLY

1. Every e-tender shall be accompanied by the earnest money equal to 2% of the involved value and separate draft of Rs.1000/- as tender fee. The earnest money should be deposited through online.
2. The e-tender received without earnest money or after the due date shall not be entertained except with the special approval of the competent authorities.
3. The supplies shall be executed within the time specified in the supply order which may be extended by the Registrar on other application of the supplier explaining reasons/circumstances due to which time limit could not be adhered to. In the event of the supplier failing to supply the material within time, he shall be liable to pay as compensation an amount equal to one percent or such small amount as the Registrar may decided on the said amount of the contract, for every day that the quantity remains incomplete, provided that the entire amount of compensation shall not exceed 10 percent of the total amount of the contract. An appeal against these orders shall however lie with the Vice Chancellor whose decision shall be final.
4. In case the contractor backs out of his contract, the earnest money deposited by him shall be forfeited besides any other action as may be considered necessary by the Vice-Chancellor.
5. All the charges including packing, forwarding and installation, taxes and other levies should be specified in the tender. The charges etc. not specified in the tender shall not be paid.
6. The quantity of material/supplies shall be subject to increase or decrease on the tendered rates. This increase or decrease shall be communicated by the University within 30 days of acceptance of the tender.
7. Supplies shall be made as per the schedule and within such time as is indicated in the supply order.
8. 100% payment will be made on receipt and inspection of goods to ensure the specifications and their good condition.
9. The rates accepted by the University shall be valid for 120 days and the supplier shall have to make supply during the period as and when required.
10. **The e-tenders shall be opened in the office of Director, UIET, M.D. University, Rohtak on 23-01-2020 after 11.00 a.m. onwards by the Purchase Committee in the presence of contractor/supplier and the Committee reserves the right for negotiation thereafter if considered necessary.**
11. The Registrar reserves the right to reject or accept any offer without assigning any reasons.
12. All disputes subject to Rohtak jurisdiction.
13. Guarantee/warrantee of items must be mentioned.
14. The University stands exempted from the payment of Central Excise Duty/Custom Duty. The rates be quoted keeping that fact in view, Necessary certificate will be provided by the University.
15. No tender documents will be issued and rates are to be offered on company's letter pad.
16. If a holiday occurs on the opening day, the tenders will be opened on the next working day.

17. Technical documents must reach the office of the Director, UIET upto 22-01-2020 at **04.00 PM**.

List of Technical Documents

| Sr. No | Description | Bidders Response (Yes/No) |
|---------------|---|----------------------------------|
| 1 | Authorization certificate from the manufacturer of equipment | |
| 2 | Copy of PAN card. | |
| 3 | Copy of latest income tax return | |
| 4 | List of institutions where equipment has been installed | |
| 5 | Satisfactory report regarding the equipment from institution | |
| 6 | Specification of Equipment | |

Annexure- 'A'

TECHNICAL SPECIFICATIONS AND REQUIEREMENT TO BE PURCHASED FOR ELECTRICAL ENGINEERING LABORATORIES

LAB 1:- Project Lab

| Sr. No. | Item | Specification | Quantity |
|---------|----------------------------|--|----------|
| 01. | Multimeter, Analog | Analog | 05 |
| 02. | Multimeter, Digital | Digital, 3 digit with frequency and capacitance measurement and terminal shutter blocking | 05 |
| 03 | M.I.Type Ammeter, | 0-2A, Analog Portable Type | 03 |
| 04. | M.I.Type Ammeter | 0-5A Analog Portable Type | 03 |
| 05. | Moving CoilType Ammeter | 0-15A Analog Portable Type | 05 |
| 06. | M.I.Type Voltmeter | 0-500V Analog Portable Type | 05 |
| 07. | Moving Coil Type.Voltmeter | 0-300V Analog Portable Type | 05 |
| 08. | Inductive Load | 230/415V, Single phase and three phase operation star/Delta Switch should be provided, MCB for step and protection, current rating- 15A(5A per phase), power-3.5KVAR, loading step- single phase-30 No. and for three phase-5 steps per phase, wheel should be provided under the chassis for portability, Supply indication lamp should be provided | 01 |
| 09. | Capacitive Load | 230/415V, Single phase and three phase operation star/Delta Switch should be provided, MCB for step and protection, 10 selectable load value on each bank, current rating- 4.6A each phase in star connection and 13A each phase for Delta Connection, wheel should be provided under the chassis for portability, Supply indication lamp should be provided | 01 |
| 10. | Hall effect voltage sensor | Primary nominal voltage rms-10..500 V, Primary nominal current rms-10 mA, Primary current, measuring range -0.. \pm 14 A, Secondary nominal current rms-25mA, Conversion ratio-2500:1000, Supply voltage (\pm 5 %)- \pm 12..15 V, Accuracy @ 10 mA- \pm 0.8%, Linearity error-< 0.2% | 01 |

| | | | |
|-----|-------------------------------------|---|---------|
| 11. | Power Factor meter portable | 0.5 Lag to 0.5 Lead + pointer | 02 |
| 12. | Synchroscopemeter | LED Type Display(portable) | 02 |
| 13. | Current transformer | 100A/5 A | 02 |
| 14. | Potential Transformer | 11kv/110v | 02 |
| 15. | Insulation Tester | 0-500V | 01 |
| 16. | Induction Motor with open terminals | 3hp, 1-phase, 230V, 50hz, 1500rpm, Duty cycle-S1, type-Squirrel Cage | 02 |
| 17. | Battery | Lead acid battery combination required for output 420V DC/10A | 01 Set |
| 18. | Capacitor | 16 μ f, 30 μ f, 42 μ f, 50 μ f, 90 μ f, 100 μ f, 140 μ f, 150 μ f, 300 μ f. | 02 each |
| 19. | Dspace ACE1104CLP_USBKit | <p>ACE Kits</p> <p>Advanced Control Education Kit 1104 - Consisting of:</p> <p>Hardware</p> <p>a. DS1104 R&D Controller Board., MPC8240, PowerPC 603e core, 250MHz. with 32 MB RAM</p> <p>b. CLP1104 - Connector and LED Panel for DS1104</p> <p>Software</p> <p>a. CDP1104 Control Development Software Package (for processor boards, containing Real Time Interface, ControlDesk NG Basic + Standard Platforms, and Platform_API with USB dongle)</p> <p>b. Microtec PowerPC cross Compile</p> | 01 |

LAB-2 : Power System Lab

| Sr. No. | Specifications (Name of item) | Qty |
|---------|---|-----|
| 01. | <p>To draw the operating characteristics of IDMT relay.</p> <p>Provided with protective MCB, Fuses, wherever requires for protection</p> <p>Over Current Relay : Type : Electromechanical ;Inverse Type</p> <p>Normal Voltage:: 110V AC, 50Hz</p> <p>Current Setting : 0.5A, 0.75A, 1A, 1.25A, 1.50A, 1.75A and 2A</p> <p>CT Secondary : 1A</p> <p>Display: AVR RISC Microcontroller Based</p> <p>Measurement Method : CT based ADC interface</p> <p>Current Measurement: 0.2 – 5A ; Voltage Measurement: 25 - 300</p> <p>Time: 10mSec – 30min (Automatic with relay start)</p> <p>Display Resolution: 0.01A</p> <p>LCD Specification : 16 X 2 Line LCD for simultaneous display of Voltage, current & Tripping time</p> <p>Single Phase Variac : Input Voltage : 230V, 50Hz</p> <p>Output Voltage : 0 – 270V \pm10% ; Rated Current : 0 – 5A</p> <p>Single Phase Transformer:</p> <p>Rating : 1kVA ; Primary Voltage: 0-230V ;Secondary Voltage : 0-230V</p> <p>Rheostat:110Ω, 5A ;MCB : 2A (SPN)</p> <p>Mains Supply : 0 - 230V AC \pm10% 50Hz</p> <p>Rust free powder coated mechanical structure;</p> <p>Front Plate :Aluminum Screen Printed with /connection diagrams printed</p> <p>BS 10 type terminal and bs 10 patch cord should be provided along with the setup.</p> | 01 |

| | | |
|-----|---|----|
| 02. | <p>To study the performance of Earth fault relay.</p> <p>Earth Fault Relay : Electromechanical Inverse Time</p> <p>Normal Voltage : 110V AC, 50Hz</p> <p>Plug Setting : 0.5A, 0.75A, 1.0A, 1.25A, 1.50A, 1.75A and 2A</p> <p>Display Measurement Unit</p> <p>Display: AVR RISC Microcontroller Based</p> <p>Measurement Method : CT based ADC interface</p> <p>Current Measurement: 0.2 – 5A ; Voltage Measurement : 25 - 300V</p> <p>Time:10mSec – 30min (Automatic with relay start)</p> <p>Display Resolution: 0.01A</p> <p>LCD Specification : 16 X 2 Line LCD <u>for simultaneous display of Voltage, current & Tripping time</u></p> <p>Single Phase Variac : Input Voltage : 230V, 50Hz</p> <p>Output Voltage : 0 – 270V \pm10% ; Rated Current : 0 – 5A</p> <p>Single Phase Transformer:</p> <p>Rating : 1kVA ; Primary Voltage: 0-230V ;Secondary Voltage : 0-230V</p> <p>Rheostat:110Ω, 5A ;MCB : 2A (SPN)</p> <p>Mains Supply : 0 - 230V AC \pm10% 50Hz</p> <p>Rust free powder coated mechanical structure;</p> <p>Front Plate :Aluminum Screen Printed with /connection diagrams printed</p> <p>BS 10 type terminal and bs 10 patch cord should be provided along with the setup.</p> | 01 |
| 03. | <p>a) To study the performance of an over voltage relay.</p> <p>b) To study the performance of under voltage relay.</p> <p><u>Auto selection of over voltage/under voltage relay & display according to relay selection</u></p> <p>Under Voltage Relay</p> <p>Normal Voltage: 110V AC, 50Hz ; Contacts : 1 N/O, 2 N/C</p> <p>Plug Setting : 44, 51.3, 58.6, 65.9, 73.2, 80.5 and 88 Volt</p> <p>Over Voltage Relay</p> <p>Normal Voltage: 110V AC, 50Hz ; Contacts : 2 N/O, 1 N/C</p> <p>Plug Setting :121, 126.5, 132, 137.5, 143, 148.6 and 154 Volt</p> | 01 |

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|-----|--|----|
| | <p>Display: AVR RISC Microcontroller Based Measurement Method : CT based ADC interface Voltage Measurement : 25 – 300V LCD Specification : 16 X 2 Line LCD Single Phase Variac : Input Voltage : 230V, 50Hz Output Voltage : 0 – 270V \pm10% ; Rated Current : 0 – 2A Single Phase Transformer: Rating : 1kVA ; Primary Voltage: 0-230V ;Secondary Voltage : 0-170V Rated Current: 1A ; MCB : 2A (SP)</p> <p>Rust free powder coated mechanical structure; Front Plate :Aluminum Screen Printed with /connection diagrams printed</p> <p>BS 10 type terminal and bs 10 patch cord should be provided along with the setup.</p> | |
| 04. | <p>a) Testing of breakdown strength of a transformer oil.</p> <p>b) To study flash point test of transformer oil.</p> <p>a) Should have automatic tripping mechanism Test cup with adjustable gap electrode arrangement Output Voltage Source : Continuously variable between 0-80kV, 20mA Transformer to boost the voltage to required voltage Type : Step up wound Epoxy molded Rating : 80kVA Single Phase Variac for controlling the output from zero to maximum Input Voltage : 230V ;Output Voltage : 0-270V Should be Suitable to work on 230V AC mains</p> <p>Diagrammatic representation for the ease of connections</p> <p>Temperature Indicator : 1200°C</p> <p>Induction Heater Specification</p> <p>Rated Power : 1900W</p> <p>Power Adjustment Range : 120W to 1900W</p> <p>Temperature : 400°C</p> <p>MCB Rating : 6A (DP)</p> <p>Mains Supply : 230V AC \pm10%, 50Hz Main Features & specifications</p> <p>Should be a Fully automatic control unit</p> <p>Microcontroller based Design</p> <p>Should be Provided with Brass machined oil cup with handle</p> | 01 |

| | | |
|-----|--|----|
| | <p>Should have Electrically operated heater</p> <p>Should be Suitable to work on 230V AC mains</p> <p>Diagrammatic representation for the ease of connections</p> <p>Temperature Indicator : 1200°C</p> <p>Induction Heater Specification</p> <p>Rated Power : 1900W</p> <p>Power Adjustment Range : 120W to 1900W</p> <p>Temperature : 400°C</p> <p>MCB Rating : 6A (DP)</p> <p>a) Mains Supply : 230V AC $\pm 10\%$, 50Hz</p> | |
| 05. | <p>a) To observe the Ferranti effect in a model of transmission line.</p> <p>b) To find ABCD ,Hybrid & Image parameters of a model of transmission line.</p> <p>In built Single Phase Variac :Input : 230V ;Output : 0-270V ;Current : 0-2A</p> <p>Single Phase Transformer :Rating : 0.5KVA ;Input : 230V ;Output : 230V</p> <p>High resolution ADC for accurate measurement</p> <p>Graphical LCD Display for Measurement of</p> <p>Voltage : $\geq 25V$;Current : $\geq 0.2A$; Active Power : $\geq 20W \leq 2000W$</p> <p>Reactive Power : $\geq 20VAR \leq 2000VAR$;</p> <p>Apparent Power : $\geq 20VA \leq 2000VA$</p> <p>On panel Loads : Resistor : 700Ω/ 100W ;Inductor : 800mH/ 0. 5A ; Capacitor : 12.5μF/ 450V ; MCB : 2A (DP) ;</p> <p>Mains Supply : 230V $\pm 10\%$, 50Hz</p> <p>Rust free powder coated mechanical structure.</p> <p>Front Plate :Aluminum Screen Printed with /connection diagrams printed</p> <p>BS 10 type terminal and bs 10 patch cord should be provided along with the setup.</p> | 01 |

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|-----|---|----|
| 06. | <p>To study performance characteristics of typical DC distribution system in radial & ring main configuration.</p> <p>Isolated Power supply with 2 nos of inbuilt DC variable source</p> <p>Separate configuration for Ring & Radial distribution</p> <p>Multiple consumer loads for ring & radial configuration controlled by switches.</p> <p>Rated Voltage : 0 - 220V \pm 10% (Variable) ; Rated Current : 2A</p> <p>Transformer Rating : Rating : 0.5kVA ;Input : 230V ;Output : 150V</p> <p>Single Phase Variac : 0-270V AC, 50Hz</p> <p>Input : 230V ;Output : 0-270V ;Current : 2A</p> <p>Digital DC Voltmeter (3 Nos.) ;Range : 0-500V ;Display Accuracy : 0.1%</p> <p>Digital DC Ammeter (3 Nos.) ;Range : 0-5A ;Display Accuracy : 0.3%</p> <p>MCB : 2A (SP). Protection Connector : BS-10 Safety connector</p> <p>Rust free powder coated mechanical structure; Front Plate :Aluminum Screen Printed with /connection diagrams printed</p> <p>Mains Supply:230V AC \pm 10%, 50Hz</p> <p>BS 10 type terminal and bs 10 patch cord should be provided along with the setup.</p> | 01 |
| 07. | <p>To study characteristics of MCB & HRC Fuse.</p> <p>Should have built in alphanumeric LCD for Display of time , current & temperature</p> <p>Isolated power supply with inbuilt variable current injection facility</p> <p>Transparent type MCB should be provided to study internal architecture of MCB</p> <p>Single Phase Variac :Input : 230V ;Output : 0-270V ;Current : 10A</p> <p>Single Phase Transformer :Rating : 1kVA ;Input : 230V ;Output : 230V</p> <p>MCB's : B type, 6A & C type, 2A ; HRC Fuse : 6A</p> <p>Temperature Sensor : LM35, 2 Nos. Mounting Type with MCB Mounting with Brass Holder mounded on PCB</p> <p>Display Resolution : 0.1°C ; Protective Device : 10 A (SPN)</p> <p>Mains Supply : 0 - 220V AC \pm10% 50Hz ; Rheostat : 100Ω /5A</p> <p>Rust free powder coated mechanical structure; Front Plate :Aluminum Screen Printed with /connection diagrams printed</p> <p>BS 10 type terminal and bs 10 patch cord should be provided along with the setup.</p> | 01 |

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|--------------------------------|---|----------------------|-------------|--|--|-----------|-----------------------------|--|--|------------------------------|---------------|--|--|-----------|----------|--|--|--------------|-------------|-------------|-------------|--------------|-----------------|--------|---------|--------------|------------------|----------|----------|----------------|----------------------------|--|--|-------------------------------|--|--|--|--------------------------------|--|--|--|-------------------|--|--|--|------------------|----------------------|--|--|------------|----------------------|--|--|--------------------|----------------------|--|--|----------------------|------------------------------|--|--|--------------------|--|--|--|----------------------|----------------------|--|--|---------------------|---------------|--|--|------------------|-------------|--|--|------------------------------|----------------------|--|--|--------------|---|--|--|----|
| 08 | <p>a) To study and perform the proximity and skin effect. The above said experiment on transmission line penal with portable equipments/instruments and accessories: In built Single Phase Variac :Input : 230V ;Output : 0-270V ;Current : 0-2A, Single Phase Transformer :Rating : 0.5KVA ;Input : 230V ;Output : 230V</p> <p>b) To study and perform the various D.C link. Simple module for unipolar and bipolar D.C. link:</p> <p>Rated Voltage : 0 - 220V ± 10% (Variable) ; Rated Current : 2A</p> <p>Transformer Rating : Rating : 0.5kVA ;Input : 230V ;Output : 150V</p> <p>Single Phase Variac : 0-270V AC, 50Hz</p> <p>Input : 230V ;Output : 0-270V ;Current : 2A</p> <p>Digital DC Voltmeter (3 Nos.) ;Range : 0-500V ;Display Accuracy : 0.1%</p> <p>Digital DC Ammeter (3 Nos.) ;Range : 0-5A ;Display Accuracy : 0.3% , SCR- 6A, 300V</p> | 01 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 09. | <p>Pilot-wire differential relay for lines and feeder protection.</p> <table border="1" data-bbox="224 877 1318 1633"> <tr> <td>Rated current, I_r</td> <td colspan="3">1 or 5 A</td> </tr> <tr> <td>Ac burden</td> <td colspan="3">3 VA, total for three-phase</td> </tr> <tr> <td>Continuous overload capacity</td> <td colspan="3">$2 \cdot I_r$</td> </tr> <tr> <td>Frequency</td> <td colspan="3">50-60 Hz</td> </tr> <tr> <td>Sensitivity:</td> <td>2-terminals</td> <td>3-terminals</td> <td>4-terminals</td> </tr> <tr> <td> earth faults</td> <td>25-42% of I_r</td> <td>40-66%</td> <td>60-100%</td> </tr> <tr> <td> phase faults</td> <td>64-126% of I_r</td> <td>100-200%</td> <td>150-300%</td> </tr> <tr> <td>Operating time</td> <td colspan="3">20 ms at 1,5 $I_{pick-up}$</td> </tr> <tr> <td>Maximum pilot-wire resistance</td> <td colspan="3">1000 ohms (2000 ohms with isolating transformer ratio 1:1,7)</td> </tr> <tr> <td>Maximum pilot-wire capacitance</td> <td colspan="3">2,0 μF (0,7 μF with isolating transformer ratio 1:1,7)</td> </tr> <tr> <td>Dielectric tests:</td> <td colspan="3"></td> </tr> <tr> <td> current circuits</td> <td colspan="3">50 Hz, 2,5 kV, 1 min</td> </tr> <tr> <td> pilot-wire</td> <td colspan="3">50 Hz, 5,0 kV, 1 min</td> </tr> <tr> <td> remaining circuits</td> <td colspan="3">50 Hz, 2,0 kV, 1 min</td> </tr> <tr> <td>Impulse voltage test</td> <td colspan="3">1,2/50 μs, 5 kV, 0,5 J</td> </tr> <tr> <td>Disturbance Tests:</td> <td colspan="3"></td> </tr> <tr> <td> Power frequency test</td> <td colspan="3">50 Hz, 0,5 kV, 2 min</td> </tr> <tr> <td> Fast frequency test</td> <td colspan="3">4-8 kV, 2 min</td> </tr> <tr> <td> 1 MHz burst test</td> <td colspan="3">2,5 kV, 2 s</td> </tr> <tr> <td>Flag relay auxiliary voltage</td> <td colspan="3">24-55 V or 110-250 V</td> </tr> <tr> <td>Trip outputs</td> <td colspan="3">2 make contacts capable of closing 30A dc for 200ms</td> </tr> </table> | Rated current, I_r | 1 or 5 A | | | Ac burden | 3 VA, total for three-phase | | | Continuous overload capacity | $2 \cdot I_r$ | | | Frequency | 50-60 Hz | | | Sensitivity: | 2-terminals | 3-terminals | 4-terminals | earth faults | 25-42% of I_r | 40-66% | 60-100% | phase faults | 64-126% of I_r | 100-200% | 150-300% | Operating time | 20 ms at 1,5 $I_{pick-up}$ | | | Maximum pilot-wire resistance | 1000 ohms (2000 ohms with isolating transformer ratio 1:1,7) | | | Maximum pilot-wire capacitance | 2,0 μF (0,7 μF with isolating transformer ratio 1:1,7) | | | Dielectric tests: | | | | current circuits | 50 Hz, 2,5 kV, 1 min | | | pilot-wire | 50 Hz, 5,0 kV, 1 min | | | remaining circuits | 50 Hz, 2,0 kV, 1 min | | | Impulse voltage test | 1,2/50 μs , 5 kV, 0,5 J | | | Disturbance Tests: | | | | Power frequency test | 50 Hz, 0,5 kV, 2 min | | | Fast frequency test | 4-8 kV, 2 min | | | 1 MHz burst test | 2,5 kV, 2 s | | | Flag relay auxiliary voltage | 24-55 V or 110-250 V | | | Trip outputs | 2 make contacts capable of closing 30A dc for 200ms | | | 01 |
| Rated current, I_r | 1 or 5 A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ac burden | 3 VA, total for three-phase | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Continuous overload capacity | $2 \cdot I_r$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Frequency | 50-60 Hz | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Sensitivity: | 2-terminals | 3-terminals | 4-terminals | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| earth faults | 25-42% of I_r | 40-66% | 60-100% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| phase faults | 64-126% of I_r | 100-200% | 150-300% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Operating time | 20 ms at 1,5 $I_{pick-up}$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Maximum pilot-wire resistance | 1000 ohms (2000 ohms with isolating transformer ratio 1:1,7) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Maximum pilot-wire capacitance | 2,0 μF (0,7 μF with isolating transformer ratio 1:1,7) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dielectric tests: | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| current circuits | 50 Hz, 2,5 kV, 1 min | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| pilot-wire | 50 Hz, 5,0 kV, 1 min | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| remaining circuits | 50 Hz, 2,0 kV, 1 min | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Impulse voltage test | 1,2/50 μs , 5 kV, 0,5 J | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Disturbance Tests: | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Power frequency test | 50 Hz, 0,5 kV, 2 min | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Fast frequency test | 4-8 kV, 2 min | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 MHz burst test | 2,5 kV, 2 s | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Flag relay auxiliary voltage | 24-55 V or 110-250 V | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Trip outputs | 2 make contacts capable of closing 30A dc for 200ms | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |