

# MAHARSHI DAYANAND UNIVERSITY ROHTAK

## TENDER NOTICE

Sealed tenders superscribing as Tender for various Lab Equipments of "Electrical Engg. and Civil Engineering" are invited for the purchase of equipments for UIET latest by 19.08.2013 at 01:00 P.M. alongwith Earnest money @ 2% of involved value as demand Draft in favour of Finance Officer, M.D. University, Rohtak in <sup>in</sup> separate envelop. For details may visit University website [www.mdurohtak.ac.in](http://www.mdurohtak.ac.in) Tenders will be opened on 19.08.2013 at 3.00 p.m. in the office of the Director, University Institute of Engineering & Technology.

  
REGISTRAR



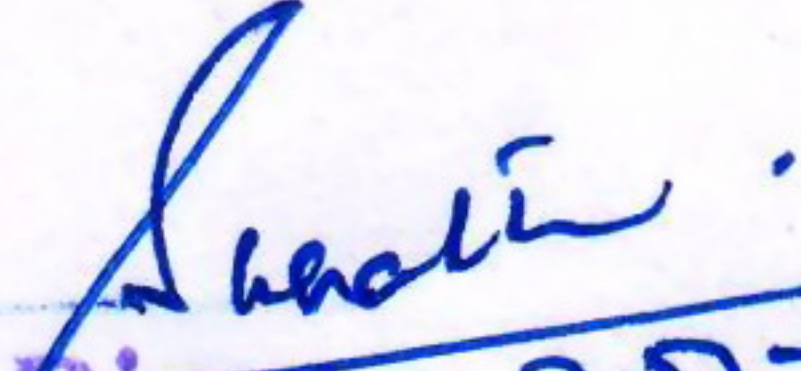
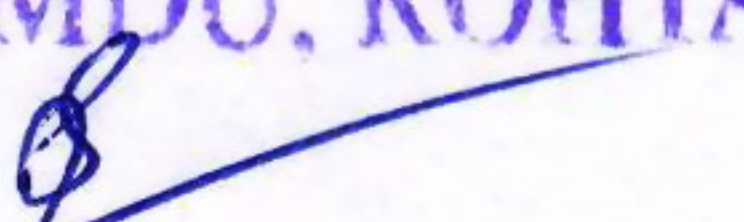


**UNIVERSITY INSTITUTE OF ENGINEERING & TECHNOLOGY**  
**MAHARSHI DAYANAND UNIVERSITY ROHTAK**

**TERMS & CONDITIONS OF THE TENDER FOR SUPPLY OF LAB EQUIPMENT FOR MECHANICAL LAB**

The articles/material as per specification given overleaf/attached is to be purchased for this Institute. You are requested to kindly quote your rates for the same. The following terms and conditions for quoting the rates may kindly be kept in view while you do so:-

1. All charges payable by the University should clearly be stated.
2. Sealed quotations/tender should be addressed to the Director, UIET, M.D.University, Rohtak and reach the office of the undersigned on before 19.8.13 at 1.00 p.m. quoting our reference and due date of opening on the envelope.
3. The quotation/tender should be submitted only if the material is available in you ready stock or can be supplied within 15 days after the order is placed.
4. The quotation/tender will be opened in the office of the undersigned on 19.8.13 at 3.00 p.m. in the presence of the parties or their representatives who so ever like to be present.
5. An amount of 2% of quoted amount only in the shape of Bank Draft in favour of Finance Officer, M.D. University, Rohtak as earnest money should accompany the quotation/tender in absence of which the tender/quotation will not be entertained.
6. Tender received without earnest money or after the due date shall not be entertained except with the special approval of the Registrar.
7. As far as possible the rates should be quoted for the make and specification of the items given. In case any alternative/equivalent item is offered its specifications and leaflets may be sent with the tender/quotation. The sample of material should accompany the tender/quotation for record.
8. Guarantee/warranty period for equipments should be clearly specified /mentioned.
9. 100% payment will be made on receipt and inspection of goods/items to ensure the specifications and their good condition by the inspection Committee.
10. Dispute, if any, will be subject to Rohtak jurisdiction.
11. The University reserves the right to reject any or all quotation/tenders without assigning any reason thereof.
12. If your rates are approved by the DGS&D and other Central/State Agency, the rates of the same must be quoted and the copy of the rate contract be attached.
13. Tender must be submitted by Either Manufacturer or their authorized dealer/Distributor. Authorization letter in proper format must be attached with tender otherwise Bids will not be considered. Authorization letter should be on letter head of Manufacturer and should be signed & stamped. Tenders from dealers will be rejected without proper authorization letter from the manufacturers.
14. 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.

  
**Director** 29/7/13  
**UIET, MDU, ROHTAK**  




## Transportation Engineering Lab

S. No.	Name of Items	Specifications	Qty
1	Flakiness and elongation test apparatus	<ul style="list-style-type: none"> <li>• A standard thickness gauge of IS sieve 63, 50, 40, 31.5, 25, 20, 16, 12.5, 10 and 6.3mm.</li> <li>• A standard length gauge of IS Sieve 50, 40, 31.5, 25, 20, 16, 12.5, 10 and 6.3mm.</li> </ul>	Three
2	Marshal Stability test	<ul style="list-style-type: none"> <li>• Mold Assembly: cylindrical moulds of 10 cm diameter and 7.5 cm height</li> <li>• consisting of a base plate and collar extension</li> <li>• Sample Extractor: for extruding the compacted specimen from the mould</li> <li>• Compaction pedestal and hammer.</li> <li>• Breaking head.</li> <li>• 5. Loading machine 6. Flow meter , water bath, thermometers</li> </ul>	One
3	CBR Test  <b>California Bearing Ratio Test Apparatus (CBR)</b>  <b>With all accessories</b>	<ul style="list-style-type: none"> <li>• Cylindrical mould 150 mm diameter and 175 mm height with a detachable extension collar 50 mm height and a detachable perforated base plate 10 mm thick.</li> <li>• Spacer disc 148 mm diameter and 47.7 mm height along with handle.</li> <li>• Metal rammers of mass 2.6 kg with a drop of 310 mm (or) a mass of 4.89 kg a drop 450 mm.</li> <li>• Weights: One annular metal weight and several slotted</li> </ul>	One

		<p>weights weighing 2.5 kg each, 147 mm in dia, with a central hole 53 mm in diameter.</p> <ul style="list-style-type: none"> <li>• Loading machine of capacity at least 5000 kg and equipped with a movable head or base that travels at a uniform rate of 1.25 mm/min, complete with load indicating device.</li> <li>• Metal penetration piston 50 mm diameter and minimum of 100 mm long.</li> <li>• Two dial gauges reading to 0.01 mm.</li> <li>• Sieves: 4.75 mm and 20 mm I.S. Sieves.</li> <li>• 9. Miscellaneous apparatus, such as a mixing bowl, straight edge.</li> </ul>	
4	Bulk density and Void test	Bulking Apparatus Consist of 3, 15, 20 & 30 lit container & tamping rod	One
5	Dorry Abrasion Test	Dorry abrasion testing machine with a flat circular iron disc of diameter 600 mm, Metal tray, Two fine haired brushes	One
6	Specific gravity test and Aggregate Water absorption Test	<ul style="list-style-type: none"> <li>• Thermostatically Controlled Oven 20" x 20"</li> <li>• Wire Basket</li> <li>• Digital Weighing Balance</li> </ul>	One
7	Aggregate Impact Test	<ul style="list-style-type: none"> <li>• Impact testing machine with following accessories. <ul style="list-style-type: none"> <li>a) Metal base 300 mm diameter.</li> <li>b) Detachable cylindrical steel cup of internal diameter 102 mm and depth 50 mm</li> <li>c) Metal hammer of weight between 13.5 to 14 kg, 100</li> </ul> </li> </ul>	One

		<p>mm in diameter and 50 mm long.</p> <p>d) An arrangement for raising and lowering the hammer freely between vertical guides with a lift of 380 mm</p> <ul style="list-style-type: none"> <li>• Cylindrical metal measure 75 mm internal diameter and 50 mm high.</li> <li>• Tamping rod 10 mm diameter and 230 mm long, rounded at one end. Straight edge</li> </ul>	
8	Los-Angeles Abrasion Test on Aggregates	<ul style="list-style-type: none"> <li>• Los Angeles machine with inside diameter 700 mm and length 500 mm</li> <li>• Abrasive charges 12 numbers</li> <li>• Metal tray</li> </ul>	One
9	Deval Attrition Test on Aggregates	Deval attrition testing machine	One
10.	Crushing Strength Test on Aggregates.	<ul style="list-style-type: none"> <li>• Test mould (steel cylinder of internal diameter 152 mm with open ends)</li> <li>• A square base plate, plunger having a piston diameter of 150 mm.</li> <li>• A cylindrical measure of internal diameter of 11.5 and height 18 cms.</li> <li>• Steel tamping rod having diameter of 16 mm and length 450 to 600 mm.</li> <li>• Compression testing machine capable of applying load of 40 tonnes at a loading rate of 4 tonnes per minute</li> </ul>	One
11.	Penetration Test on Bitumen.	<ul style="list-style-type: none"> <li>• A cylindrical metallic dish 55 mm diameter and 35 mm deep with flat bottom</li> <li>• Needle</li> <li>• Penetrometer</li> </ul>	One

		<ul style="list-style-type: none"> <li>• Thermometer</li> <li>• Stop Watch</li> </ul>	
12.	Ductility Test on Bitumen.	<ul style="list-style-type: none"> <li>• Ductility machine with water bath and a pulling device</li> <li>• Briquette mould</li> <li>• Spatula</li> <li>• Thermometer</li> </ul>	One
13.	Viscosity Test on Bituminous Material	<ul style="list-style-type: none"> <li>• Viscometer with suitable orifice</li> <li>• Stirrer</li> <li>• Receiver</li> <li>• Thermometers two numbers</li> </ul>	One
14.	Softening Point Test on Bitumen ( with all accessories)	<ul style="list-style-type: none"> <li>• The ring and ball apparatus with following accessories. <ul style="list-style-type: none"> <li>○ Steel balls-two numbers each of 9.5 mm diameter and weighing <math>3.5 \pm 0.05</math> gm.</li> <li>○ Brass rings-two numbers each having depth of 6.4 mm. The inside diameter at bottom and top is 15.9 mm and 17.5 mm respectively.</li> <li>○ Ball guides to guide the movement of steel balls centrally.</li> <li>○ Support-to hold rings and thermometer in position</li> </ul> </li> <li>• Bath-A heat resistant glass beaker not less than 85 mm in diameter and 120 mm in depth</li> </ul>	One
15.	Flash and Fire Point Test on Bitumen	<ul style="list-style-type: none"> <li>• Pensky-Martens closed cup tester</li> <li>• Thermometer</li> <li>• Flame exposure device</li> </ul>	One

## Soil Mechanics Lab.

S. No.	Name of Items	Specifications	Qty
1	Thermostatically controlled oven	Thermostatically controlled oven, maintained at a temperature of $110\text{C}^{\circ} \pm 5^{\circ} \text{C}$ with two selves	One
2	. Weighing balance	An accuracy of 0.01g	One
3	Airtight containers	Made of non-corrodible material, with lid	Twenty
4	Pycnometer	1 liter capacity, Glass rod	Five
6	Sieve Set	Set of coarse sieves, 100 mm, 80 mm, 40 mm, 20 mm, 10 mm, and 4.75 mm with lid and pan Set of fine sieves, 2mm, 1mm, 600 $\mu$ 425 $\mu$ 150 $\mu$ , and 75 $\mu$ with lid and pan	Two
7	Mechanical sieve shaker	Sieve Shaker Hand operated 30 cm cum 20 cm dia	One
8	Liquid limit	Casagrande's liquid limit device with Grooving tool and base plate	Five
9	Plastic Limit	Glass plate, Brass rod 3 mm dia, 100 mm long, Spatula	Five
10	Shrinkage Limit	Shrinkage Limit standard apparatus with mercury	Two
11	Field Density by: Sand Replacement	<ul style="list-style-type: none"> <li>• Sand- pouring cylinder</li> <li>• Calibrating container, 100 mm diameter and 150 mm height</li> <li>• Soil cutting and</li> </ul>	Five

	method	<p>excavating tools, such as a scraper tool, bent spoon</p> <ul style="list-style-type: none"> <li>• Metal tray, 300 mm square and 40 mm deep with a hole of 100 mm in diameter at center</li> <li>• Desiccators</li> </ul>	
12	Field Density by : Core cutter method	<ul style="list-style-type: none"> <li>• Cylindrical core cutter, 100 mm internal diameter and 130 mm long</li> <li>• Steel rammer, mass 9 kg overall length, with the foot and staff about 900 mm</li> <li>• Steel dolley, 25 mm high and 100 mm internal diameter</li> <li>• Straight edge</li> <li>• Vernier caliper</li> </ul>	Five
13	Determination of water content –dry density relation using light compaction.	<ul style="list-style-type: none"> <li>• Compaction mould 1000 ml capacity</li> <li>• 2.6 kg rammer</li> <li>• Detachable base plate</li> <li>• Collar 60 mm high</li> <li>• Large mixing pan</li> <li>• Graduated jars</li> <li>• Mixing tools, spoons, trowels</li> <li>• Steel rule</li> </ul>	Five
14	Permeability (hydraulic conductivity) of soil	<ul style="list-style-type: none"> <li>• Permeameter mould 1000 ml capacity, (100 mm dia)</li> <li>• Detachable collar</li> <li>• Dummy plate</li> <li>• Drainage base with porous disc</li> <li>• Drainage cap porous disc</li> <li>• Compaction equipment (Rammer)</li> <li>• Constant head water supply reservoir</li> <li>• Constant head collecting</li> </ul>	One



		chamber <ul style="list-style-type: none"> <li>• Vacuum paump</li> <li>• Stop watch</li> <li>• Large funnel</li> <li>• Filter paper</li> <li>• Graduated glass stand pipes 5 to 20 mm diameter</li> <li>• Supporting frame for the stand pipe and the clamp.</li> </ul>	
15	Unconfined compressive strength (UCS) of cohesive soil in the laboratory.	Unconfined compression apparatus, (loading frame) Proving ring type Proving capacity 1 kN Dial gauge accuracy 0.01mm Stop watch Sampling tube Split mould 38 mm dia and 76 mm long Sample extractor Knife Large mould	One
16	D i r e c t s h e a r t e s t	<ul style="list-style-type: none"> <li>• Shear box, divided into two halves by a horizontal plane, and fitted with locking and spacing screws</li> <li>• Box container to hold the shear box</li> <li>• Base plate plane, having cross grooves on its top surface</li> <li>• Grid plates, perforated, 2 no</li> <li>• Porous stones, 6 mm thick, 2 no.</li> <li>• Loading pad</li> <li>• Loading frame</li> <li>• Loading yoke</li> </ul>	One



		<ul style="list-style-type: none"> <li>• Proving ring, capacity 2 kN</li> <li>• Dial gauges, accuracy 0.01 mm, 2 nos</li> <li>• Static or dynamic compaction device</li> <li>• Spatula</li> <li>• Set of weights</li> <li>• Vernier caliper</li> </ul>	
17	Unconsolidated undrained(UU) triaxial shear test	<ul style="list-style-type: none"> <li>• Loading frame</li> <li>• Triaxial cell to resist internal fluid pressure of 1000 kPa with all accessories</li> <li>• Constant pressure system to apply confining pressure</li> <li>• Load cell or proving ring</li> <li>• LVDT (to measure strain) or deformation dial gauge</li> <li>• Data acquisition system</li> <li>• Rubber membrane</li> <li>• Membrane former</li> <li>• O rings</li> <li>• Porous stones</li> <li>• Filter paper</li> <li>• Split mould</li> <li>• Trimming knife</li> <li>• Sample extruder</li> <li>• Wire saw</li> <li>• Thin walled tube</li> <li>• Soil lathe</li> <li>• Balance</li> <li>• Stop watch</li> </ul>	One



## CONCRETE TECHNOLOGY LAB

S. No	Name of Items	Specifications	Qty
1.	Vicat Apparatus	Vikat Plunger having <ul style="list-style-type: none"> <li>• 10 mm dia</li> <li>• 50 mm length</li> </ul>	Five
2.	Le-Chatelier's Apparatus	Small split cylinder of spring brass <ul style="list-style-type: none"> <li>• Dia 30mm</li> <li>• Height 30 mm</li> </ul> Two indicator arms <ul style="list-style-type: none"> <li>• 165 mm long with pointed ends</li> </ul>	Five
3.	Sieve	90 microns	Five
4.	Air Permeability Apparatus	Blaine Type Air Permeability Apparatus	One
4.	Vibrating Machine	For Cube 7.06 cm Size	One
5.	Cube Mould	7.06 cm	Twelve
6.	Compressive Testing Machine	Electrically operated 300 Tonns Capacity	One
7.	Le- chatelier flask	Le- chatelier flask	Two
8.	Heat of Hydration of cement	Heat of Hydration Apparatus	One
9.	Pycnometer for moisture content	1 liters Capacity, Glass rod	Five
10.	Bulking Apparatus of fine aggregates	Consist of mould & Tamping rod: <ul style="list-style-type: none"> <li>• Dia-16mm</li> <li>• Length:60 cm</li> </ul>	Two
11.	Weighing balance	Digital Weighing balance, 10 kg capacity sensitive up to 0.5gm	One
12.	Mechanical Sieve Shaker	For 20 cm & 30 cm dia sieves Mechanical Operated	One
13.	Sieve Set	Set of coarse sieves, 100 mm, 80 mm, 40 mm, 20 mm, 10 mm, and 4.75 mm with lid and pan Set of fine sieves, 2.36mm, 1.75mm, 600 $\mu$ 300 $\mu$ 150 $\mu$ , and 75 $\mu$ with lid and pan	One
14.	Slump test Apparatus	Slump Cone: Base diameter 20 cm Top diameter 10 cm Height 30 cm Materials thickness at least 1.6 mm	One
15.	Compaction Factor Apparatus	Compaction Factor Apparatus	One
16.	Flow Table	Table, which consists essentially of a	One



		board covered by a steel plate with a total mass of 16 kg	
17.	Cube mould	15x15x15 cm	Twenty Four
18.	Cylindrical mould	15 x 30 cm	Twelve
19.	Beam Mould	10 x 10 x 50 cm	Twelve
20.	Flexure testing machine	Hand Operated 60 tonns capacity	One
21.	Universal Testing machine	100Tonns Capacity	One
22.	Non destructive testing	Digital Type Rebound Hammer	One
23.	Vibrating Table for moulds of aggregates	Electical Operated	One

**NOTE: Beside above apparatus quoted above for concrete lab. you require following accessories for carrying out the actual test in the lab.**

S. No	Name of Items	Qty
1	Trowel	5
2.	Measuring Jar	
	(a) 100 ml cap.	2
	(b) 200 ml cap.	2
	(c) 1000 ml cap	2
3.	Stop Watch	
	(a) Electronic	2
	(b) Mechanical	2
4.	Glass Plate 18" x18" x 10mm thick	2
5.	Rice Plate	
	(a) 10" dia	2
	(b) 12" x 18"	2
6.	Bristle Brush	2
7.	Scale	
	(a) 30 cm	2
	(b) 50 cm	2
8.	Drying Oven 18" x18"	1
9.	Buckets made of G.I.	2



### 3<sup>rd</sup> Year Labs Equipments with Specifications

#### Electrical Machine lab (5<sup>th</sup> sem)

S.No	Name of the item	Specifications	Qty
01.	<b>Three Phase Slip ring Induction motor with Control Panel &amp; star Delta starter</b>	<p>Motor's Specifications</p> <p>Type : Slip ring ,Rating : 3 HP ,RPM : 1440 (No Load)</p> <p>Insulation : Class 'B'</p> <p>Control Panel:</p> <p>Ammeter : 0- 10 Amp ;Voltmeter : 0-500 V</p> <p>Wattmeter : 2.5 KW – 2 nos ;Three Phase MCB : 10 A</p> <p>Front Plate : Aluminum Screen Protected</p> <p>Tachometer : 20,000 RPM tachometer should be provided .</p> <p>Starter : Rotor Resistance type starter to be provided</p> <p>Mains Supply : Three Phase 415 V <math>\pm</math>10%, 50 Hz</p> <p>Accessories: 3 Phase Variac 415V/10A enclosed type with terminal brought on the top.</p> <p>Sockets &amp; Patch cords: BS 10 type sockets should be provided on panel &amp; machine. Different lengths of BS 10 type Patch cords should be provided along with the setup .Block/circuit diagram to be printed on Panel for the ease of connections.</p>	01

S.No	Name of the item	General Specification	Qty
02.	<b>Synchronous Machine Training System (Parallel Alternator setup with Control Panel)</b>	<p>Two identical Motor Generator set</p> <p>Both the M-G Sets should be Flexibly Coupled and Mounted on a "C" channel Base</p> <p>Electrical loading arrangement</p> <p>240 x 128 Graphical LCD Display on Panel</p> <p>RISC Microcontroller based design for measurement</p> <p>High Resolution ADC for accurate measurement</p> <p>Highly sensitive for change in reading for better controlling .Inbuilt digital Phase Sequence Indicator. In Built Synchroscope .Inbuilt multifunction meter for AC &amp; DC Measurement .Dark lamps should be provided on front panel .Designed considering all the safety precautions. BS 10 type Safety terminals &amp; Patch cords should be provided. Circuit/Block diagram to be printed on Panel for the ease of connections</p> <p>Detailed General Specification:</p> <p>DC Machine (Prime Mover) – 02 nos</p> <p>Type : DC Shunt ;Voltage Rating : 200 V</p> <p>Rating : 2 HP ; RPM : 1500 (no load);Insulation : Class B</p> <p>Three Phase Machine (Generator) – 02 nos</p> <p>Type : Salient Pole ; Rating : 3 HP ;RPM : 1500 (no load)</p> <p>Excitation Voltage : 120 V ;Insulation : Class "B"</p> <p>Control Panel:</p> <p>Graphical LCD Display for: AC Voltage , Current , Power , Power Factor , Frequency ,DC Voltage &amp; Dc Current, Phase sequence indication for both generators. Lamp Arrangement (for Bright Dark Lamp Experiment)should be provided on Panel</p> <p>External DC Power supply:</p> <p>DC Output Voltage : Variable : 0 - 200 V ;Fixed : 200 V</p> <p>Transformer : Rating : 2 KVA ;Primary Voltage : 0- 230V Secondary Voltage : 0 - 150 V, 0 - 150 V</p> <p>Meters :Voltmeter (MC) : 300 V ;Ammeter (MC) : 10 A</p> <p>Auto Transformer : 270 V, 10 A ;MCB : 10 A</p> <p>Mains Supply : 230 V <math>\pm</math>10%, 50 Hz</p>	01



	<p>Front Plate : Aluminum Screen Protected  Rheostats : 110 ohms/5A- 04 nos  Load : 3 phase resistive load 5A with 1 A steps  Sockets: BS 10 type sockets for safety  Sockets &amp; Patch cords: BS 10 type sockets should be provided on panel &amp; machine. Different lengths of BS 10 type Patch cords should be provided along with the setup.</p>	
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**Electronics Measurement & Instrumentation lab (5<sup>th</sup> sem)**

<b>S.No</b>	<b>Name of the item</b>	<b>General Specification</b>	<b>Qty</b>
01.	Oscilloscope Demonstrator	<p>Oscilloscope in open form with all components and controls placed on single PCB .Amplifier, Time base, Channel section signal available on test points. Separate sections for PS, EHT, VA, HA, TB &amp; Trigger for easy identification. Fault creation &amp; Rectification provided .Track printing with different colours on different sections on component board for easy circuit training</p> <p>Legend Printing on PCB for easy identification of components  Can be used as a standard 20 MHz Dual Trace Oscilloscope  Bandwidth : DC-20 MHz (-3 dB)  Channel I, Channel II, Channel I &amp; II Alternate or chopped, Controls provided on PCB. Channel selection signals available at Test points. X-Y operation 1:1</p> <p><b>Vertical Deflection (Y)</b>  Deflection Coefficients : 12 calibrated steps 5 mV / cm - 20 V / cm (1-2-5 sequence)  Maximum Input voltage : 350 V (DC + Peak AC)  Pre-Amp, Final Amp Outputs at Test Points.</p> <p><b>Time base</b>  Time Coefficients : 18 calibrated steps, 0.5 <math>\mu</math>s / cm - 0.2 s / cm (1-2-5 sequence) with magnifier x 5 to 100 ns /cm, with variable control to 40 ns / cm  TB generation at Test Points</p> <p><b>Trigger System:</b>  Modes : Automatic or Variable  Source : CH I, CH II, External  Slope : Positive or Negative  Coupling : AC, TV Frame</p> <p><b>Component Tester :</b>  Test Voltage : Max 8.6 V (Open) rms ;Test Current : Max 8 mA (Shorted) rms ;Test Frequency : 50 Hz, Test circuit grounded to chassis  Fault Simulation : Total 15 Faults included  Included Accessories: Learning material (CD)., BNC-BNC Cable 1 No., BNC - Prod tip Cable 1 No., Test Prods 1 pair,. Additional Jumpers 10</p>	01
<b>S.No</b>	<b>Name of the item</b>	<b>General Specification</b>	<b>Qty</b>
02.	Function Generator Trainer	<p>Trainer should demonstrate all concept of a Function generator  Block wise illustration should be provided  Facility for variable duty cycle  Fault Identification facility should be provided.  Frequency Ranges: Selectable 1 Hz to 100 KHz IN STEPS.  Sine wave Generation : By Wave Shaping Circuit  Duty Cycle : On Board Adjustment  Switched Faults: 4 Nos. ;Fuse : 350 mA, slow blow  Power Supply : 230 V <math>\pm</math>10%, 50 Hz  Interconnection sockets: 2 mm Gold plated</p>	01

		Patch cords : 2 mm gold plated stackable <b>Accessories included</b> : Operating and E Manual Cabinet Housing: Enclosed on a plastic Molded box with molded cover. No components on the top of the trainer.	
03.	Frequency Counter Trainer	To study Frequency Counter , Attenuator , wave shaping , Frequency divider, Display Driver , Gate time & sensitivity of frequency counter Circuit Frequency Range : 20 Hz - 30 MHz Resolution : 10 Hz (60 KHz Range) 10 KHz (30 MHz Range) Sensitivity : 0.5 Volts ; Accuracy : $\pm (0.5\% +1D)$ of rdg Attenuation : 1 : 1, 1 : 20 ; Input Coupling : AC Input Impedance : 1 M $\Omega$ Max. Input Voltage : 200 V (DC + AC Peak) Display : 4 digits, 7 Segment LED Display Interconnection sockets: 2 mm Gold plated Patch cords : 2 mm gold plated stackable Power Supply : 230 V $\pm 10\%$ , 50 Hz <b>Accessories included</b> : Operating and E Manual Cabinet Housing: Enclosed on a plastic Molded box with molded cover. No components on the top of the trainer.	01

S.No	Name of the item	General Specification	Qty
04.	Multimeter Demonstrator	Trainer should be able to demonstrate Voltage Measurement (both AC and DC), Current Measurement and Resistance Measurement. Signal Conditioning, AC to DC Conversion Sections, LED Display and a Continuity Tester should also be available on the training board. Rotary Switches should be provided for the Function, Range and Decimal Selection AC Voltage range : 2V to 350 V (40 Hz to 5 KHz) DC Voltage range : 2V to 350 V AC Current range : 200 $\mu$ A to 2 A (40 Hz to 5 KHz) DC Current range : 200 $\mu$ A to 2 A Resistance : 200 ohms to 2 M ohms Display: 3 ½ digit seven segment , 0.55 "LED Interconnection sockets: 2 mm Gold plated Patch cords : 2 mm gold plated stackable Accessories included : Operating and E Manual Cabinet Housing: Enclosed on a plastic Molded box with molded cover. No components on the top of the trainer.	01
05.	LCRQ-D Meter	Parameter : L-Q, C-D, R-Q , Z-Q & Z-D Frequency : 100 Hz, 120 Hz and 1 KHz Accuracy : Basic Accuracy: 0.3% Display : 5 digits backlit LCD display. Measurement : L 100 Hz, 120Hz - 1 $\mu$ H – 9.9999 KH , 1KHz -0.1 $\mu$ H – 999.99 H C 100 Hz, 120Hz - 1 pF – 9.9999 mF 1KHz - 0.1 pF – 999.99 $\mu$ F R,  Z  : 1 m $\Omega$ – 999.99 M $\Omega$ D, Q : 0.0001 - 99999 ;D% : 0.0001% - 99999% Range Selection : Autorange with hold facility Eq. Circuit Mode : Series & Parallel Display : Direct actual value , Delta/% : delta percent Correction : open/short circuit correction Test Signal level/speed : 0.3 V rms/approx 3 times/sec. Test terminals : 5 terminals.	01



S.No	Name of the item	General Specification	Qty
06.	Characteristics & Measurement of Displacement using LVDT	<p>Measurement Range: 20 mm (1=10 mm)  Excitation Frequency : KHz (approx.)  Excitation Voltage :4 Vp-p (approx.)  Sensitivity:10 m V DC/mm  Linear Range :Full Scale  Signal conditioner Output:0.1 V DC for maximum displacement  Display: 3 ½ Digit LED with polarity Indicator  Micrometer Scale : 25 mm  Micrometer Least Count :0.01 mm  Test Point :8 ;  Interconnection sockets: 2 mm Gold plated  Patch cords : 2 mm gold plated stackable  Power Requirement :230 V ±10% 50 Hz  Accessories included : Mains cord, E-Manual  Trainer should be encased in a plastic molded box ,with no circuitry components on the top only block diagram &amp; LVDT should be provided on top of trainer</p>	01
07.	Temperature Transducer Trainer	<p>The trainer should be able to perform following experiments:  Measurement of temperature &amp; plot the characteristics of Temperature transducers like Thermocouple, RTD &amp; Thermistor.  &amp; Study of Signal conditioning circuitry required for above transducers  Transducers : 4 Nos.  1) N.T.C. Thermistor 2) Platinum R.T.D 3) Type K Thermocouple  4) IC Temperature Sensor  Temp. Source : Wirewound resistance  Signal Conditioning Circuitry : 1) Instrumentation Amplifier  2) X100 Amplifier 3) DC Amplifier 4) Comparator  5) Electronic Switch  Input Circuits : Rotary and Slide Potentiometers  Output circuits : 1) Relay 2) Buzzer  Interconnection sockets: 2 mm Gold plated  Patch cords : 2 mm gold plated stackable  Power Supply 230 V±10% ,50Hz. Detachable Mains cord  Trainer should be encased in a plastic molded box, with no circuitry components on the top only block diagram should be provided on top of trainer.</p>	01

S.No	Name of the item	General Specification	Qty
08.	To study strain measurement using strain gauges and cantilever assembly	<p>Strain Gauge (350 ohms): 4 Nos.  Gauge factor :2.1  Maximum bearable weight:500 gms.  Cantilever material: Stainless Steel ;Cantilever width:2.5 cm  Cantilever thickness:0.16 cm ;Cantilever length:20 cm  Bridge Voltage:+ 8V DC  Bridge configuration :Full Bridge  Display:3 ½ Digit LED  Test Points:8 Nos.  Power Requirement:220V + 10%,50/60Hz,3VA  Interconnection sockets: 2 mm Gold plated  Patch cords : 2 mm gold plated stackable  Accessories Included Mains cord, E-Manual, Standard Weights  Trainer should be encased in a plastic molded box ,with no circuitry components on the top only block diagram &amp; Adjustment presets &amp; Cantilever should be provided on top of trainer</p>	01
09.	Pressure Transducer Trainer	<p>Pressure Transducer : 0 to 100 psi, Differential input  Pressure Gauge : 0 to 100 psi ;Pressure Vessel : 0 to 100 psi  Safety Valve : 0 to 100 psi ;Hoses : 1.5 m  Foot Pump : 0 to 150 psi  V-I General Specification: 0 to 5 VDC input, 4 to 20 mA</p>	0.1

		Output : Buzzer Indicator : 5 V DC ;LED Indicator : 5 V DC Digital Voltmeter : 0 to 10 V LCD ; Test points : 18 Interconnection sockets: 2 mm Gold plated Patch cords : 2 mm gold plated stackable Power Supply : 220 V+ 10%, 50 Hz There should be no components on the top of the board. The trainer should encased in a molded box with a molded Dust cover	
10.	Measurement of water level by Capacitance based Transducer	Capacitive Transducer : 0 to 2 liters Level Measurement Range : 0 to 120mm F-V General Specification: 5 KHz to 50 KHz input, 0 to 5V output V-I General Specification: 0 to 5 VDC input, 4 to 20 mA output Buzzer Indicator : 5VDC ; LED Indicator : 5V DC Digital Voltmeter : 0 to 10V LCD ; Test points : 18 PC Interface : USB with data acquisition Software Interconnection sockets: 2 mm Gold plated Patch cords : 2 mm gold plated stackable There should be no components on the top of the board. The trainer should encased in a molded box with a molded Dust cover.	01

S.No	Name of the item	General Specification	Qty
11.	Measurement of Distance using Ultrasonic Transducer	Ultrasonic Transducer : 27 cm to 1.5 meter (approx) Clock Generator : 40 KHz Amplifier : 60 db Display : Seven segment Threshold detector : 0 to 9 V DC Buzzer Indicator : 5 V DC Test points : 15 Interconnection sockets: 2 mm Gold plated Patch cords : 2 mm gold plated stackable Power Supply : 220 V ±10%, 50 Hz There should be no components on the top of the board. The trainer should encased in a molded box with a molded Dust cover	01
12.	30 MHz Microcontroller based Dual Trace Oscilloscope	Bandwidth : 30 MHz ; No. of Channels : 02 Digital Readout with Backlit LCD for Volts/Div & Time/division. X 10 Magnification ,20 ns max sweep speed Stable Triggering up to 40 MHz Alternate Triggering ,Sharp Trace CRT & Auto focus Gold Plated BNC Connectors , Built in one touch component Tester Accessories: BNC to Test probe, BNC to crocodile cable, Component tester cable & Manual in CD. Power supply: 230 V ±10%/50Hz	02



**Microprocessor & Interfacing Lab(5<sup>th</sup> sem)**

<b>S.No</b>	<b>Name of the item</b>	<b>General Specification</b>	<b>Qty</b>
01.	Advanced 8085 Microprocessor Trainer	<p>Only Diagrammatic representation of full system on the top of Trainer</p> <p>On Board Battery backup for RAM</p> <p>Three channel Timer/counter using 8253</p> <p>48 I/O lines using 8255</p> <p>On board EPROM programmer for 27 series</p> <p>On board 8 channel ADC ;On board DAC</p> <p>Facility of downloading and uploading the files from PC.</p> <p>Two command mode interface: ASCII Keyboard &amp; Serial Mode</p> <p>All Address and Control lines are available on 50 pin Connector</p> <p>Operating Frequency : 6.144 MHz ; ROM : 8 K ;RAM : 8 K</p> <p>Input : ASCII Keyboard ; Display : 20 X 2 LCD</p> <p>Mains supply : 90 - 230 V AC,50 Hz</p> <p>Accessories included : Operating and Experimental E Manual</p> <p>Cabinet Housing: Enclosed on a plastic Molded box with cover .</p> <p>Note: No components on the top of the Trainer only block diagram to be provided.</p>	2
02.	Advanced 8086 Microprocessor Trainer	<p>Only Diagrammatic representation of full system on the top of Trainer</p> <p>72 I/O lines through 8255</p> <p>Battery backup for RAM</p> <p>Three channel Timer/Counter using 8253</p> <p>On board 8 channel ADC ;On board DAC</p> <p>Two modes of operation: Keyboard mode &amp; Serial Mode</p> <p>Facility of downloading and uploading the files from PC</p> <p>All Address and Control lines are provided on 50 pin connector</p> <p>Operating Frequency : 5 MHz ;RAM : 16 K ;ROM : 16 K</p> <p>Display : 20 X 2 LCD ;Input : ASCII Keyboard</p> <p>Mains supply : 90 - 230V AC, 50 Hz</p> <p>Accessories included : Operating and Experimental E Manual</p> <p>Cabinet Housing : Enclosed on a plastic Molded box with cover .</p> <p>Note: No components on the top of the Trainer only block diagram to be provided</p>	2

<b>S.No</b>	<b>Name of the item</b>	<b>General Specification</b>	<b>Qty</b>
03.	ADC Card to be interfaced with 8085/8086	ADC Card to be interfaced with 8085/8086	02
04.	DAC Card to be interfaced with 8085/8086	ADC Card to be interfaced with 8085/8086	02
05.	Stepper motor Card to be interfaced with 8085/8086	Stepper motor Card to be interfaced with 8085/8086	02
06.	8X8 LED Matrix Display Card to be interfaced with 8085/8086	8X8 LED Matrix Display Card to be interfaced with 8085/8086	02
07.	Traffic light control system Card to be interfaced with	Traffic light control system Card to be interfaced with 8085/8086	02

	8085/8086		
08.	control of simulated elevator Card to be interfaced with 8085/8086	control of simulated elevator Card to be interfaced with 8085/8086	02
09.	8255 interface Card to be interfaced with 8085/8086	8255 interface Card to be interfaced with 8085/8086	02
10.	8251 interface Card to be interfaced with 8085/8086	8251 interface Card to be interfaced with 8085/8086	02



**Power electronic lab( 5<sup>th</sup> )**

<b>S.no.</b>	<b>Name of item</b>	<b>Specification</b>	<b>Qty</b>
1.	Trainer to study Static Characteristics of Power diode & Shottky diode and to study reverse recovery of Power Diode & Shottky diode	DC regulated power supply 0-5V /500mA variable . Two digital meters for volt & current Two diodes (Schottky & power rectifier diodes) The kit must have buffer circuit with load termination to study reverse recovery char. Circuit diagram should be printed on panel and supplied with necessary patch cords to conduct the expt.	02
2.	Trainer to study Characteristics of IGBT with built in digital meters	Two dc regulated continuously variable power supplies for collector – emitter (0-20V/4A) and gate – emitter(0-10V/0.1A), provided on sockets. A 6.6Ω resistor is in series with collector supply to save the device. The kit must have three digital meters to take readings of gate voltage, collector - emitter voltage and collector current respectively. The kit must have one IGBT (600V/15A) , fitted behind the panel with gate protection. Circuit diagram should be printed on panel and supplied with necessary patch cords to conduct the expt.	02
3	Trainer to study Characteristics of GTO (Gate Turn off Thyristor ) with built in meters	Two dc regulated continuously variable power supplies for anode- cathode (0-25V/0.3A) and gate-cathode (0-25V/0.3A), provided on sockets. The kit must have two digital meters to take readings of anode voltage, and gate current respectively. The kit must have one GTO , fitted behind the panel with gate current reversal switch. Circuit diagram should be printed on panel and supplied with necessary patch cords to conduct the expt.	02
4	Trainer to study RC and UJT firing Circuit with Pulse transformer	DC firing with superimposed AC pulse firing by UJT relaxation oscillator. One low voltage transformer 20V One voltmeter across RL One capacitor for phase delay ; Four potentiometers One small transformer with 0-1V dc supply Operable on 220V/50Hz AC Complete with manual and patch cords. Circuit diagram should be printed on panel and supplied with necessary patch cords to conduct the expt.	02
<b>S.no.</b>	<b>Name of item</b>	<b>Specification</b>	<b>Qty</b>
5	Trainer to study of Firing Circuit based on ICs NE555 7408 & 3140.	Step down transformer with rectifier necessary for expt. IC NE555 to generate line synchronized ramp (saw tooth) Comparator CA3140 to obtain different pulse width DC reference voltage (VR) for control IC 74LS08 to generate carrier modulated gate pulses Observation sockets must be at each block to understand principle of firing control circuit Circuit diagram should be printed on panel and supplied with necessary patch cords to conduct the expt.	02

6	Trainer to study Pulse transformer & optocoupler technique	Kit must have rectangular pulse generator with variable pulse width. With two spot frequency. Pulse transformer 1:1 with driver and termination. Optocoupler with pulse shaping circuit. Two dc regulated power supply(12V/0.2A) for optocoupler circuit. Circuit diagram should be printed on panel an supplied with necessary patch cords to conduct the expt.	02
7	Trainer to study SCR Communication Technique Class A-E.	DC 15 volt supply with resistive load, The kit must have seven SCR (400V/1A), capacitors (5no.) inductors(4no.) and diodes(1 no.) The kit must have in built trigger pulse generator to perform exp. Sockets to configure the class of commutation A,B,C,D, & E DC supply short circuit & overload protected Operable on 220V/50Hz AC The kit must have provision for observation sockets at output voltage and commutation ,at different places to observe the waveforms on CRO Circuit diagram should be printed on panel an supplied with necessary patch cords to conduct the expt.	02
<b>S.no.</b>	<b>Name of item</b>	<b>Specification</b>	<b>Qty</b>
8	Trainer to study Speed control of small motor using Single Phase Half wave & Full wave fully controlled Converter	The kit consists isolated ac supply, firing angle control circuit with two, 1 : 1 : 1 pulse transformer with four 600V/10A silicone controlled rectifier wired in half wave/full wave bridge (mode selectable) converter. The kits must have in built one small dc series motor (90V) connected at output as load. Action of Freewheeling diode must be realized with given DFW. The kit must have provision for observation sockets at input /output voltage and load current places to observe the waveforms on CRO Circuit diagram should be printed on panel an supplied with necessary patch cords to conduct the expt.	02
9	Speed control of small motor using Single Phase Dual Converter (Continuous and discontinuous Control)	Eight S.C.R.(600V/12A) to form two full wave bridges Current circulating (limiting) inductance Trigger circuit based upon logic IC Pulse transformer to trigger thyristors The kits must have in built one Fractional H.P. shunt wound DC (90V) motor as load Fixed AC supply 100Vac AC 10-0-10V supply for trigger circuit. Selector to run motor in first and third quadrant The kit must have sockets for observations of waveforms of rectifier circuit and 1 & 2 to verify $1 + 2 = 180$ degree on CRO ; One center zero ammeter Operable on 220V/50Hz AC Cabinet fitted with acrylic top cover Circuit diagram should be printed on panel an supplied with necessary patch cords to conduct the expt.	02
<b>S.no.</b>	<b>Name of item</b>	<b>Specification</b>	<b>Qty</b>



10	Study of Mc Murray - Bedford Half & Full Bridge Inverter	<p>The circuit must be configured as half/full bridge .          Separate pulse transformer for each scr          Eight SCR (400V/1A), eight diodes (400V/1A) , two commutation capacitors &amp; two inductor.          Fixed resistive load          Provided with two (cascadable) DC supply 0-6V 1Amp          Digital pulse generator to trigger main and aux. thyristors          The kit must have sockets for observations of waveforms of load voltage &amp; commutation on CRO          DC supply short circuit &amp; overload protected          Operable on 220V/50Hz AC          Circuit diagram should be printed on panel an supplied with necessary patch cords to conduct the expt..</p>	02
11	To study Parallel Inverter to drive small AC Induction motor	<p>Two SCR with one inductor and one commutation capacitor          One double wound transformer,          Pulse generator (30-90 Hz nominal) with pulse transformer,          The kit must have inbuilt small induction motor as load.          The input supply in form of DC 24 volt 3 Amp.          The kit must have sockets for observations of waveforms of load voltage ,current, gate pulse and commutation on CRO          Cabinet fitted with acrylic top cover.          DC supply short circuit &amp; overload protected          Operable on 220V/50Hz AC          Circuit diagram should be printed on panel an supplied with necessary patch cords to conduct the expt.</p>	02
12	Trainer to study Speed control of a small DC motor using MOSFET based Chopper with output voltage control technique.	<p>SCR regulated DC power supply 90V          One power MOSFET (600V/8A) mounted upon heat sink          +12 volt regulated DC for complete control circuit          Ramp generator with comparator for gating circuit          OPTO isolator in MOSFET gate drive circuit          D-R-C active Snubber          Fractional H.P. DC series (90V) motor as load          Test points must be given for observation of waveforms upon CRO. Cabinet fitted with acrylic top cover          DC supply short circuit &amp; overload protected          Operable on 220V/50Hz AC          Circuit diagram should be printed on panel an supplied with necessary patch cords to conduct the expt.</p>	2
13	Trainer to study Speed control of small AC induction motor using Single Phase non circulating type bridge by frequency conversion	<p>Eight SCR (600V/12A)with one tapped inductor          One step down transformer 120 Vac          Logic controlled firing control circuit.          A selector switch is provided to obtain 1/2, 1/3 and 1/4 of input frequency f.          Pulse transformers are used for coupling of logic signals with the thyristors.          Test points must be given at different places for observations on CRO          Inductive load in form of small induction motor (45W) is provided.</p>	02

		<p>+5V DC regulated power supply for logic circuit Cabinet fitted with acrylic top cover DC supply short circuit &amp; overload protected Operable on 220V/50Hz AC Circuit diagram should be printed on panel and supplied with necessary patch cords to conduct the expt.</p>	
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