

**TECHNICAL & HIGHER EDUCATION INSTITUTIONS SOCIETY,
U.T. OF DAMAN & DIU, GOVT. POLYTECHNIC-DIU,
EDUCATION HUB, KEVDI,
DIU: 362520.**

No. 5.1/THEIS/GP-DIU/TENDER/2019-20/162

Dated: 18/09/2019

E-TENDER (ONLINE TENDER, SECOND CALL)

Sealed tenders are hereby invited by the Principal. Govt. Polytechnic - Diu for supply of **Electrical Engineering Laboratory Equipment's**, as stated below as per the terms and condition stipulated attached herewith. Tender documents should be submitted along with nonrefundable tender fees of Rs. 500/- DD, favor of Daman & Diu Society for Technical Edu. & Higher Edu. (CENT) and refundable E.M.D Rs. 1,27,000/- of the total cost of supply items in favor of Daman & Diu Society for Technical Edu. & Higher Edu. (CENT). With the **VAT / GST Department of U.T. of Daman & Diu** **(Lowest bidder must obtain local VAT/GST Registration within 15 days)**

Last date of Submission of Tender : 17/10/2019 at 12:00 PM

Opening of Tender : 17/10/2019 at 03:00 PM (if Possible)

Sr. No.	Configuration/ Specification	Qty.	Rate	Total
1.	<p>Experiment logic gates Exclusive and compact design Straight forward representation of all logic gates +5V SMPS Adaptor provided with the trainer for power supply Designed by considering all the safety standards Provided with an extensive manual including illustration of all logic gates +5V DC Logic levels, +5V : HIGH (Logic 1) 0V : LOW (Logic 0), Dimensions (mm) : W 240 x D 345 x H 110 Weight : 1 Kg. Study of AND gate and to verify its truth table Study of OR gate and to verify its truth table Study of NOT gate and to verify its truth table Study of NAND gate and to verify its truth table Study of NOR gate and to verify its truth table Study of XOR gate and to verify its truth table Study of XNOR gate and to verify its truth table</p>	01		
2.	<p>Clipper and Clamper Trainer Technical specification:- Good quality, reliable sockets and test points are provided Strongly supported by systematic operating instructions A low cost training system including many experiments Built-in 1KHz Sine Wave Generator Mains Supply : 230 V \pm10%, 50 Hz Sine Wave Generator : 1 KHz, 15V Vpp (approx.) DC Power Supply : 0 - 5 V (vary through (2No.) rotary switch for specific voltage level) Weight : 1.7 Kgs. (approx.) Dimensions (mm.) : W 260 \times D 355 \times H 125 Study of Series Positive Clipper and Series Negative Clipper Circuits Study of Shunt Positive Clipper and Shunt Negative Clipper Circuits Study of Biased Series Positive Clipper and Biased Series Negative, Clipper Circuits, Study of Biased Shunt Positive Clipper and Biased Shunt Negative, Clipper Circuits, Study of Combination Clipper Circuit, Study of Positive and Negative Clamper Circuits, Study of Biased Clamper Circuits</p>	01		
3.	<p>Experimentation with De-Morgan's Theorem Technical specification: Input : +5V DC, Logic levels +5V : HIGH(Logic 1), 0V : LOW (Logic 0), Dimensions (mm) : W 240 x D 345 x H 110 Weight : 1kg (approximate), The setup performed following experiments, Verifying $(A+B)' = A'. B'$, Verifying $(A.B)' = A'+B'$</p>	01		

4.	<p>Experimentation with Adders and Subtractors</p> <p>Technical specification:- Input : +5V DC Logic levels, +5V : HIGH (Logic 1), 0V : LOW (Logic 0) Dimensions (mm) : W 240 x D 345 x H 110, Weight : 1 Kg.</p> <p>Scope of Learning, Study of Binary Half Adder Binary Full Adder using two Half Adders Binary Half Subtractor Binary full Subtractor</p>	01		
5.	<p>Flip-Flop Demonstrator</p> <p>Tender Specifications:- Input : +5V DC Logic levels +5V : HIGH(Logic 1) 0V : LOW (Logic 0) Dimensions (mm) : W 240 x D 345 x H 110 Weight : 1kg (approximate) Scope of Learning Study of S-R Flip-Flop and to verify its Transition table Study of J-K Flip-Flop and to verify its Transition table Study of D Flip-Flop and to verify its Transition table Study of T Flip-Flop and to verify its Transition table</p>	01		
6.	<p>Encoder and Decoder Trainer</p> <p>Technical specification:- +5V SMPS Adaptor provided with the trainer for power supply Easy illustration of Encoder and Decoder LEDs for visual indication of inputs and outputs status SPDT switches for logic selection Good quality, reliable sockets are provided at appropriate places on board for connections Strongly supported by systematic operating instructions Input : +5V DC, Logic levels, +5V : HIGH (Logic 1) 0V : LOW (Logic 0), Dimensions (mm) : 240 W x 345 D x 10 H Weight : 1kg. (approximate), LED Indication : LED will be ON (glow) for 1 state, and will be OFF for 0 state, Features: +5V SMPS Adaptor provided with the trainer for power supply Easy illustration of Encoder and Decoder LEDs for visual indication of inputs and outputs status SPDT switches for logic selection Good quality, reliable sockets are provided at appropriate places on board for connections Strongly supported by systematic operating instructions Scope of Learning:- Study and verification of the Truth Table of 8-to-3 Line Encoder. Study and verification of the Truth Table of 3-to-8 Line Decoder.</p>	01		
7.	<p>Shift Registers Trainer</p> <p>Technical specification:- DC Power Supply : +5V, Logic levels, +5 V High (Logic 1) 0 V Low (Logic 0) LED Indication LED will be ON for logic high or '1' state and will be OFF for logic low or '0' state Dimensions (mm) 260 W x 355 D x 125 H Features:- Stand alone system Easy illustration of all types of 3-bit and 4-bit shift registers LEDs for visual indication of input and output logic states SPDT switches for easy input logic selection e-Manual Scope of Learning Study of 3-bit and 4-bit serial in serial out shift register study of 3-bit and 4-bit serial in parallel out shift register Study of 3-bit and 4-bit parallel in serial out shift register Study of 3-bit and 4-bit parallel in parallel out shift register</p>	01		
8.	<p>Counters Trainer</p> <p>Technical Specifications Input : +5V DC, Features, Stand Alone system Easy illustration of different types of counters LEDs for visual indication of input and output logic states SPDT switches for input logic selection, e-Manual DC Power Supply : +5 V DC, Logic levels +5 V : High (Logic 1) 0 V : Low (Logic 0), LED Indication : LED will be ON for logic high or '1' state and will be OFF for logic low or '0' state, Dimensions (mm) : (W) 260 x (D) 355 x (H) 125</p>	01		

9.	<p>ADC/DAC module</p> <p>Features :</p> <ul style="list-style-type: none"> • 4 bit discrete & 8 bit Monolithic converters • Unipolar & Bipolar DC voltages • O/P status displayed by LED • Functional block indicated on board mimic. • Built in DC power supply <p>Technical Specifications :</p> <p>A/D Conversion :</p> <p>1) 4 bit discrete (ramp)</p> <p>2) 8 bit Monolithic converter.</p> <p>Signal source : Unipolar & Bipolar DC voltages</p> <p>O/P Indication : By LEDs separate for each type</p> <p>Inter connections : 4mm banana socket</p> <p>Dimensions : W 325 x H 90 x D 255mm</p> <p>Weight : 2 Kg. approx.</p> <p>Power Supply : 230V ± 10%, 50Hz.</p> <p>Accessories included : Line cord, Manuals and set of patch cords.</p> <p>D/A Converter</p> <p>Features :</p> <ul style="list-style-type: none"> • 4 bit weighted resistor-4 R-2R network • 10 bit monolithic D/A converters. • On board Sine Generator • Functional block indicated on board mimics • Built in DC power supply <p>Technical Specifications :</p> <p>D/A Conversion</p> <p>1) 4 bit weighed resistor</p> <p>2) 4 Bit R-2R ladder network</p> <p>3) 10 bit monolithic D/A converter</p> <p>Signal : 1) DC supply 2) Sine wave Generator</p> <p>O/P indication : On DMMK or Oscilloscope</p> <p>Inter Connections: 4mm. banana sockets.</p> <p>Dimensions : W 325 x H90x D255mm</p> <p>Weight : 2 Kg. approx.</p> <p>Power Supply : 230V ± 10%, 50Hz</p> <p>Accessories Included : Line cord, Manuals & set of patch cords.</p>	01		
10.	<p>Display module</p> <p>Technical specification:-</p> <p>Display : 16 x 2 character LCD, Contrast control : 0 - 5 V (Variable), Backlight control : 0 - 5 V (Variable), Seven segment display: 4 nos., LED bar graph: 1 no.</p> <p>Interface : 20 pin FRC cable, Test points : 32 nos (Gold plated)</p> <p>Power Supply : From Microcontroller development platform NV50XX series, Dimensions (mm) : W 250 x D 150 x H 80, Weight : 380 gms approximately</p> <p>Learning Material : CD (Theory, procedure, reference results, etc), Online (optional) Included Accessories : Learning material (CD) : 1 no., Features 16 x 2 character LCD interface, Seven segment display interface, LED bar graph interface, PC based programming, Expansion connectors for plug in with Microcontroller unit and prototyping area</p> <p>Every pin is marked in order to make the learning easier</p> <p>Input/Output & test points provided on board, Exhaustive Learning Material</p>	01		
11.	<p>Kelvin double bridge Specification</p> <p>Managing wire exceptionally low temperature Co-efficient of the Order of $\pm 10.10^{-6} / ^\circ\text{C}$, Resistance measurements conforming to international standards DIN 17471</p> <p>Remarkably long lasting resistance values with excellent stability. Adherence to tolerance values with excellent stability. Reproducible measurements. Wonderful elastic limits of managing 20kp/mm Perfectly aged Managing coils/strips employed in Kelvin Bridges. Click type hard silver plated self-cleaning switches. Oil immersed slide wire in Senior Kelvin Double Bridge. Wide resistance measurement range 0.02 micro-ohm nto 1 megohm. Solid brass blocks for positive plug contacts. Easy-to-control knobs.</p> <p>Range of : 0.02 micro-ohm to 1.1 ohm</p>	01		

measurement			
Accuracy	:Below 0.0001 ohm :0.0001 ohm to 0.01ohm :above 0.01 ohm	+/- 0.2% +/- 0.1% +/-0.05%	or +/- 1 slide wire division
Slide wire	: 0.001 ohm divided in 500 equal divisions. (immersed in oil)		
Variable standard resistance	: 10 steps of 0.001 ohm		
Multiplied ratio	: 0.01, 0.1, 1, 10 and 100		
Range Setting	Factor	Total Range	Resolution
0.01		0.00011 ohm	0.02 micro-ohm
0.1		0.0011 ohm	0.2 micro-ohm
1.0		0.011 ohm	2 micro-ohm
10		0.11 ohm	20 micro-ohm
100		1.1 ohm	200 micro-ohm
Switches	: Hard silver plated giving constant values up to 10,000 operations		
Current source	: 25 Amp DC.		
Dimensions	: 55(L) x 30(B) x 17(H) cm. (Approx)		
Weight	: 15 Kg. (Approx)		

Sport Reflecting Galvanometer

The Spot Reflecting Galvanometer will serve as a null detector to obtain the balance point in the circuit. The instrument is housed in a black bakelite case with lamp and scale arrangement for providing moving spot on the calibrated scale. The galvanometer resistance is of the order of 125 ohms. The critical damping resistance will be 1000 ohms and the galvanometer will be working on 220 volt AC

High Amperage DC Source 50Amp

This galvanometer is used for null detection. The sensitivity of the galvanometer is approximately 5 microvolt per mm. A moving light spot provides visual detection of the null point. The movement of the galvanometer is protected against shocks and vibrations. Clamping facility is provided to safeguard the moving coil against jerks and jitters during transit. Different shunts in the order of 1/0, 1/100, 1/1000 and 1 are incorporated in the Spot Reflecting Galvanometer to control the sensitivity of the galvanometer. Lamp and scale arrangement is built-in for spot null detection.

Conductivity Attachment

This attachment is useful in the determination of specific resistance of a metal rod or metal sheet. Resistance per unit length of a sample can be measured with this attachment. Binding post terminals are provided which can hold the rod of 1/2" dia to 42 SWG Wire. The distance between two potential contacts is 50 cm.

Current Reversing Switch

The direction of current is reversed in a Kelvin Bridge during the course of measurements. Current reversal is necessary to eliminate the errors due to thermo.e.m.f. This current Reversing Switch is a rugged device for the purpose.

12.	<p>Universal Impedance bridge Technical Specifications Measuring parameter Inductance: L, Capacitance: C, Resistance: R, Quality Factor: Q, Dissipation Factor: D Measuring Frequency: 100 Hz, 1 KHz and 10 KHz $\pm 0.02\%$ Test signal voltage level: 0.3 Vrms $\pm 10\%$ (Open circuit) Test speed: 5 meas/sec, Temperature: 0°C ~ 40°C Humidity: [85% RH, AC Power, Line Voltage: 220 V $\pm 10\%$, 50 Hz $\pm 5\%$, Dimensions (mm) (L x W x H) : 330 x 100 x 310 Weight : 3.5 Kg Power consumption: < 20 W Display Range</p> <table border="0"> <thead> <tr> <th>Parameter</th> <th>Frequency</th> <th></th> </tr> </thead> <tbody> <tr> <td colspan="3">Measuring Range</td> </tr> <tr> <td>L</td> <td>100 Hz, 120 Hz</td> <td>1mH ~ 9999H</td> </tr> <tr> <td></td> <td>1 KHz</td> <td>0.1mH ~</td> </tr> <tr> <td>999.9H</td> <td>100 Hz, 120 Hz</td> <td>1pF ~ 19999m</td> </tr> <tr> <td>C</td> <td>1 KHz</td> <td>0.1pF ~</td> </tr> <tr> <td>1999.9mF</td> <td>10 KHz</td> <td>0.01pF ~</td> </tr> <tr> <td>19.99Mf</td> <td></td> <td></td> </tr> <tr> <td>R</td> <td>0.1mV ~ 99.99MV</td> <td></td> </tr> <tr> <td>Q</td> <td>0.0001 ~ 9999</td> <td></td> </tr> <tr> <td>D</td> <td>0.0001 ~ 9.999</td> <td></td> </tr> </tbody> </table> <p>Measurement Accuracy</p> <table border="0"> <thead> <tr> <th>Parameter</th> <th>Frequency</th> <th>Accuracy</th> </tr> </thead> <tbody> <tr> <td></td> <td>100, 120 Hz</td> <td></td> </tr> <tr> <td></td> <td></td> <td>$\pm [1\text{mH} + 0.25\%(1+L/2000\text{H} + 2\text{mH}/L)](1+1/Q)$</td> </tr> <tr> <td>L</td> <td>1kHz</td> <td></td> </tr> <tr> <td></td> <td></td> <td>$\pm [0.1\text{mH} + 0.25\%(1+L/200\text{H} + 0.2\text{mH}/L)](1+1/Q)$</td> </tr> <tr> <td></td> <td>10kHz</td> <td></td> </tr> <tr> <td></td> <td></td> <td>$\pm [0.01\text{mH} + 0.25\%(1+L/10\text{H} + 0.04\text{mH}/L)](1+1/Q)$</td> </tr> <tr> <td></td> <td>100, 120 Hz</td> <td></td> </tr> <tr> <td></td> <td></td> <td>$\pm [1\text{pF} + 0.25\%(1+1000\text{pF}/C_x + C_x/1000\text{mF})](1+D_x)$</td> </tr> <tr> <td>C</td> <td>1kHz</td> <td></td> </tr> <tr> <td></td> <td></td> <td>$\pm [0.1\text{pF} + 0.25\%(1+100\text{pF}/C_x + C_x/100\text{mF})](1+D_x)$</td> </tr> <tr> <td></td> <td>10kHz</td> <td></td> </tr> <tr> <td></td> <td></td> <td>$\pm [0.01\text{pF} + 0.25\%(1+20\text{pF}/C_x + C_x/4\text{mF})](1+D_x)$</td> </tr> <tr> <td>R</td> <td></td> <td>$\pm [1\text{mV} + 0.25\%(1+R/2\text{MV} + 2\text{V}/R)](1+Q)$</td> </tr> <tr> <td>Q</td> <td>100, 120, 1kHz</td> <td>$\pm [0.020 + 0.25(Q_x + 1/Q_x)]\%$</td> </tr> <tr> <td></td> <td>10kHz</td> <td>$\pm [0.020 + 0.3(Q_x + 1/Q_x)]\%$</td> </tr> <tr> <td>D</td> <td>100, 120, 1kHz</td> <td>$\pm 0.0010(1+D_x)$</td> </tr> <tr> <td></td> <td>10kHz</td> <td>$\pm 0.0015(1+D_x)$</td> </tr> </tbody> </table>	Parameter	Frequency		Measuring Range			L	100 Hz, 120 Hz	1mH ~ 9999H		1 KHz	0.1mH ~	999.9H	100 Hz, 120 Hz	1pF ~ 19999m	C	1 KHz	0.1pF ~	1999.9mF	10 KHz	0.01pF ~	19.99Mf			R	0.1mV ~ 99.99MV		Q	0.0001 ~ 9999		D	0.0001 ~ 9.999		Parameter	Frequency	Accuracy		100, 120 Hz				$\pm [1\text{mH} + 0.25\%(1+L/2000\text{H} + 2\text{mH}/L)](1+1/Q)$	L	1kHz				$\pm [0.1\text{mH} + 0.25\%(1+L/200\text{H} + 0.2\text{mH}/L)](1+1/Q)$		10kHz				$\pm [0.01\text{mH} + 0.25\%(1+L/10\text{H} + 0.04\text{mH}/L)](1+1/Q)$		100, 120 Hz				$\pm [1\text{pF} + 0.25\%(1+1000\text{pF}/C_x + C_x/1000\text{mF})](1+D_x)$	C	1kHz				$\pm [0.1\text{pF} + 0.25\%(1+100\text{pF}/C_x + C_x/100\text{mF})](1+D_x)$		10kHz				$\pm [0.01\text{pF} + 0.25\%(1+20\text{pF}/C_x + C_x/4\text{mF})](1+D_x)$	R		$\pm [1\text{mV} + 0.25\%(1+R/2\text{MV} + 2\text{V}/R)](1+Q)$	Q	100, 120, 1kHz	$\pm [0.020 + 0.25(Q_x + 1/Q_x)]\%$		10kHz	$\pm [0.020 + 0.3(Q_x + 1/Q_x)]\%$	D	100, 120, 1kHz	$\pm 0.0010(1+D_x)$		10kHz	$\pm 0.0015(1+D_x)$	01		
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		10kHz				
		$\pm[0.01\text{mH}+0.25\%(1+L/10\text{H}+0.04\text{mH}/L)](1+1/Q)$				
		100, 120 Hz				
		$\pm[1\text{pF}+0.25\%(1+1000\text{pF}/C_x+C_x/1000\text{mF})](1+D_x)$				
	C	1kHz	$\pm[0.1\text{pF}+0.25\%(1+100\text{pF}/C_x+C_x/100\text{mF})](1+D_x)$			
		10kHz				
		$\pm[0.01\text{pF}+0.25\%(1+20\text{pF}/C_x+C_x/4\text{mF})](1+D_x)$				
	R		$\pm[1\text{mV}+0.25\%(1+R/2\text{MV}+2\text{V}/R)](1+Q)$			
	Q	100, 120, 1kHz	$\pm[0.020+0.25(Q_x+1/Q_x)]\%$			
		10kHz	$\pm[0.020+0.3(Q_x+1/Q_x)]\%$			
	D	100, 120, 1kHz	$\pm 0.0010(1+D_x)$	2		
		10kHz	$\pm 0.0015(1+D_x)$			
14.	Power factor meter Current Range : 5/10A Voltage Range : 150/300/600V Portable Power Factor meter should be a moving iron type require. Instrument with Accuracy Class 1. Robust housing suitable for laboratory operations for continuous use. Housing material made of Black Engineering Plastic. Scale length 145mm approx. Confirming to BS89, IEC 51 & IS 1248 Company Test report should be provide with meter. Company must be having ISO certification.			01		
15.	Trivector meter			01		
16.	Two element wattmeter 3 Phase 2 Element Wattmeter Range : 5/10A, 300/600V Portable Type Wattmeter with Accuracy Class 1. Robust housing suitable for laboratory operations for continuous use. Housing material made of Black Engineering Plastic. Scale length 145mm approx.			01		
17.	Three phase power factor meter 5/10Amp. - 250/500V Portable Type 3Phase 2Element Power Factor Meter with Accuracy Class 1. Robust housing suitable for laboratory operations for continuous use. Housing material made of Black Engineering Plastic. Scale length 145mm approx.			01		
18.	Phase sequence indicator 96 X 96 mm Sq. Electro Mechanical 50V to 500 Volts AC FOR 25 to 60Hz			01		
19.	Clip on meter 4-3/4 Digit AC T-RMS/DC Clamp Meter General Specification:- Clamp jaw opening : 2.0”(52mm) approx. Display : Dual 4-3/4 digits 40,000/4,000 count backlit LCD Continuity check : Threshold 50Ω; test current <0.5mA Diode test : Test current of 0.3mA typical; Open circuit voltage (2.8VDC typical) Low Battery Indication is displayed : Battery symbol Over-range indication : ‘OL’ display Measurement rate : 2 readings per second, nominal Peak detector : >1ms Max Min Values : Records Max/Min Inrush Current : For Motor			01		

	<p>Current Measurement</p> <p>Data hold :To Freeze the displayed data</p> <p>Non Contact Voltage Detector : Display when near LIVE wire</p> <p>Thermocouple sensor : Type K thermocouple required</p> <p>Input Impedance : 10MΩ(VDC and VAC)</p> <p>AC bandwidth : 50 to 400Hz(AAC and VAC)</p> <p>AC response : True rms (AAC and VAC)</p> <p>Crest Factor : 3.0 in 40A and 400A ranges, 1.4in 1000A range (50/60Hz and 5% to 100% of range)</p> <p>Operating Temperature : 5° C to 40° C (41°F to 104°F)</p> <p>Storage Temperature :-20°C to 60°C (-4°F to 140° F)</p> <p>Operating Humidity : Max 80% up to 31° C(87°F) decreasing linearly to 50% at 40°C(104°F)</p> <p>Storage Humidity :<80%</p> <p>Operating Altitude : 7000ft.(2000meters) maximum.</p> <p>Battery : One (1) 9V Battery (NEDA 1604)</p> <p>Auto Power Off : After approx. 30 minutes</p> <p>Dimensions & weight : 11.57 x 4.13 x 1.85”(294x105x47mm); 18.9oz. (536g)</p> <p>Safety : For indoor use and in accordance with the requirements for double insulation to IEC1010-1V(2001) EN61010-1(2001) Over Voltage Category IV 600V and Category III 1000V, Pollution Degree 2. Approvals : CE</p> <p>TECHNICAL SPECIFICATION :-</p> <table border="1"> <thead> <tr> <th>Function</th> <th>Range & Resolution</th> <th>Accuracy (% of reading)</th> </tr> </thead> <tbody> <tr> <td rowspan="2">DC current</td> <td>400.00 ADC</td> <td>± (2.5% +30 digits)</td> </tr> <tr> <td>1500.0 ADC</td> <td>± (2.5% +30 digits)</td> </tr> <tr> <td rowspan="2">AC current True RMS (50Hz to 60Hz)</td> <td>400.00 AAC</td> <td>± (3% +50 digits)</td> </tr> <tr> <td>1500.0 AAC</td> <td>± (3% +50 digits)</td> </tr> <tr> <td colspan="3">All AC voltage ranges are specified from 5% of range to 100% of range</td> </tr> <tr> <td rowspan="4">DC Voltage</td> <td>400.00 mVDC</td> <td>± (0.1% +5 digits)</td> </tr> <tr> <td>4.0000 VDC</td> <td>± (0.1% +4 digits)</td> </tr> <tr> <td>40.000 VDC</td> <td></td> </tr> <tr> <td>1000.0 VDC</td> <td>± (0.5% +4 digits)</td> </tr> <tr> <td>AC Voltage True RMS (50Hz to 1000 Hz)</td> <td>400.0 mVAC</td> <td>± (0.8% +40 digits)(50/60Hz)</td> </tr> <tr> <td></td> <td>4.000 VAC</td> <td></td> </tr> <tr> <td></td> <td>40.00 VAC</td> <td>± (1.0% +30 digits)</td> </tr> <tr> <td></td> <td>750 VAC</td> <td></td> </tr> </tbody> </table>	Function	Range & Resolution	Accuracy (% of reading)	DC current	400.00 ADC	± (2.5% +30 digits)	1500.0 ADC	± (2.5% +30 digits)	AC current True RMS (50Hz to 60Hz)	400.00 AAC	± (3% +50 digits)	1500.0 AAC	± (3% +50 digits)	All AC voltage ranges are specified from 5% of range to 100% of range			DC Voltage	400.00 mVDC	± (0.1% +5 digits)	4.0000 VDC	± (0.1% +4 digits)	40.000 VDC		1000.0 VDC	± (0.5% +4 digits)	AC Voltage True RMS (50Hz to 1000 Hz)	400.0 mVAC	± (0.8% +40 digits)(50/60Hz)		4.000 VAC			40.00 VAC	± (1.0% +30 digits)		750 VAC				
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	<p>-Provides fast and accurate Non-contact RPM and surface speed measurements of rotating objects.</p> <p>- Uses the CPU technique, photoelectrical technique, and junction laser technique for one instrument combined PHOTO TACHOMETER (RPM & REV).</p> <p>- Two test modes: Rotation speed mode (unit: RPM) and count mode (unit: REV)</p> <p>- Wide measure range and high resolution</p> <p>Display 5 digital Large Backlit LCD</p> <p>RPM Test 2 to 99,9999 RPM Range</p> <p>Count Range 1 to 99,9999</p> <p>Accuracy ±0.05% ±1 Digit</p> <p>Resolution 0.1 RPM up to 1000RPM else 1 RPM</p> <p>Sampling 0.5 seconds (Over 120 RPM) Time</p> <p>Detecting 50mm to 500mm Distance</p>			
21.	<p>Soldering Station and De soldering station Features</p> <ul style="list-style-type: none"> • Accurate and advanced temperature Control with micro controller technology • User-friendly operation • Set / Read of temperature • Increase and Decrease of keys to set temperature once set the read • Temperature will display after two seconds by default • Temperature control accuracy ± 1°C • Last set value of temperature is stored in memory • Digital calibration will be done through micro controller to avoid analog components tolerances • Password protection feature to stop tampering with set temperature by the operators for (Bulk Customers) • Burn proof silicon cable with thermal resistance up to 600°C <p>Technical Specifications</p> <p>Soldering Power consumption : 60 W, Input voltage : 170 to 270 V, Temperature range : 180 to 270 V (180 to 480 °C) Temp stability : ± 10°C, Temp accuracy : ± 1°C of tolerance at idling time, Tip to ground potential : Under 2mv Tip to ground resistance : Under 20hms</p> <p>De soldering : De soldering :-70 Watts, Input : 170 to 270 V AC Temperature range : 180 to 480°C, Pump : Diaphragm type Vacuum : 600 mm/hg</p> <p>Included Accessories Unit : 01 no., Complete Soldering Handle : 01 no. Complete De-soldering Handle : 01 no. Stand Soldering : 01 no. Stand Desoldering : 01 no. Sponge : 02 nos. Fibre Filters (primary/small) (secondary/big) : 10 nos. Cleaning Spring : 2 nos. Silicon Washers : 1 set Glass Tubes : 01 no. Mains Cord : 01 no.</p>	01		
22.	<p>Transformer Oil Testing System Mains Supply : 230V AC ±10%, 50Hz, Single Phase Variac : 230V/ 0-270V, High Voltage Source : 80kV, 20mA, HV</p>	01		

	<p>Brand ISI</p> <p>Dimension 15 x 24 x 18 cm</p>			
26.	<p>Parallel Operation of Two Single Phase Transformer Mains supply : Single Phase, 230V±10%, 50Hz Single Phase Transformer (2 Nos.) Rating : 1kVA Primary Voltage : 0-230V Secondary Voltage : 0-200-230V Rated Current : 5A</p> <p>Digital Meter Voltmeter: 500V (2 Nos.) Ammeter: 10A (2 Nos.) MCB (SP) : 10A Simulations Software All are necessary (Benn, Siemens, ABB, or Equivalent Make)</p> <p>Scope of Learning</p> <ul style="list-style-type: none"> ➤ Study of polarity test under two single phase transformers ➤ Study of parallel operation of two single phase transformers under equal voltage ratio ➤ Study of parallel operation of two single phase Transformers under unequal voltage ratio. <p>Technology learning software to provide Theoretical, Practical and Experimental training required for understanding the fundamentals of Electronics Electrical , software features should include interactive GUI, user friendly and easy navigation, detail theory, explanation of complex topics with animations and user interactive simulations makes it a powerful learning tool.</p> <p>Magnetism ,Electromagnetism, Alternating Current Circuits, Transformer Rectifier, Filter, Three Phase Circuits, Electrical Machines, DC Machine ,AC Machine Semiconductor Devices, Measuring Instruments ,Digital Electronic ,Basic Concepts , Voltage and Current ,Circuit Analysis ,Network Theorems</p>	01		
27.	<p>DC SHUNT MOTOR</p> <p>Features</p> <ul style="list-style-type: none"> ➤ Machine with Mechanical Loading Arrangement ➤ Provided with Digital Tachometer ➤ Machine with Class “B” Insulation ➤ Heavy Duty Base/Channel ➤ Brake-Drum/Pulley with heat suppression facility ➤ Designed by considering all the safety standards ➤ Diagrammatic representation for the ease of connections ➤ Exclusive and Compact Design ➤ Simulations Software ➤ Learning material CD ➤ 2 Year Warranty <p>Scope of Learning</p> <ul style="list-style-type: none"> ➤ Speed Control of DC Shunt Motor by Field Current and Armature Voltage Control ➤ Load Characteristics of DC Shunt Motor ➤ N-I Characteristics of DC Shunt Motor ➤ N-V Characteristics of DC Shunt Motor ➤ Study of self excited DC Shunt Motor ➤ Measurement of the moment of inertia of separately excited DC Shunt Motor using retardation test <p>Technical Specifications Operating Voltage Fixed DC output : 200V Variable DC output : 0 - 200V DC, Machine Type : Shunt</p>	01		

	<p>Rating : 3HP, Voltage Rating : 180V/200V, Speed : 1500 rpm Insulation : Class 'B' ,Loading arrangement : Mechanical Brake Drum/Pulley : Aluminum casted, Digital Meters Voltmeter : 300V, Ammeter : 1A, Ammeter : 5A Tachometer : 20,000 rpm Rheostat, 2.8A, 220Ω 3 Point Starter Stop Watch Dimensions (mm) Control Panel : W 600 x D 350 x H 450 Motor W 335 x D 400 x H 560 Weight Control Panel : 11kg (approximate) Motor 26kg (approximate) All are necessary (Benn, Siemens, ABB, or Equivalent Make) Technology learning software to provide Theoretical, Practical and Experimental training required for understanding the fundamentals of Electronics Electrical , software features should include interactive GUI, user friendly and easy navigation, detail theory, explanation of complex topics with animations and user interactive simulations makes it a powerful learning tool.</p> <p>Magnetism ,Electromagnetism, Alternating Current Circuits, Transformer Rectifier, Filter, Three Phase Circuits, Electrical Machines, DC Machine ,AC Machine Semiconductor Devices, Measuring Instruments ,Digital Electronic ,Basic Concepts , Voltage and Current ,Circuit Analysis ,Network Theorems</p>			
28.	<p>28. BRAKE TEST ON DC SERIES Features:-</p> <ul style="list-style-type: none"> ➤ Machine with Mechanical Loading Arrangement ➤ Provided with Digital Tachometer ➤ Machine with Class "B" Insulation ➤ Heavy Duty Base/Channel ➤ Brake Drum/Pulley with heat suppression facility ➤ Equipped with supply indication lamps ➤ Designed by considering all the safety standards ➤ Simulations Software ➤ Diagrammatic representation for the ease of connections ➤ Exclusive and Compact Design ➤ Learning material CD ➤ 2 Year Warranty ➤ Study of Operating Characteristics of DC Series Motor ➤ Study of Speed Control of DC Series Motor using Field Current Control ➤ Study of Speed Control of DC Series Motor using Armature Voltage Control <p>Technical Specifications DC Machine Type : Series Rating : 1HP Voltage rating : 200V (Please specification on machine) Speed : 1500 RPM (at load) Insulation : Class 'B' Loading Arrangement : Mechanical Brake Drum/Pulley : Aluminum Casted Digital Meters used Voltmeter: 1 Nos. Ammeter: 2 Nos. Tachometer : 20,000 RPM Dimensions (mm) : W 600 x D 350 x H 450 (Control Panel) W 335 x D 450 x H 560 (Motor) Weight : 11kg (approximate) (Control Panel) 40kg (approximate) (Motor) All are necessary (Benn, Siemens, ABB, or Equivalent Make) Technology learning software to provide Theoretical, Practical and Experimental training required for understanding the fundamentals of Electronics Electrical , software features</p>	01		

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29.	<p>DC SHUNT MOTOR-GENERATOR SET</p> <p>Features:-</p> <ul style="list-style-type: none"> ➤ Electrical Loading Arrangement ➤ Flexible Shaft Coupling Arrangement ➤ Simulations Software ➤ Provided with Digital Tachometer ➤ Machine with Class “B” Insulation ➤ Heavy Duty Base/Channel ➤ Terminals provided to use the optional externally ➤ Designed by considering all the safety standards ➤ Diagrammatic representation for the ease of connections ➤ Exclusive and Compact Design ➤ Online Learning material ➤ 2 Year Warranty <p>Scope of Learning</p> <ul style="list-style-type: none"> ➤ Study of No Load Characteristics of DC Shunt Motor ➤ Study of Load Characteristics of Separately Excited DC Shunt Generator ➤ Study of Speed Control of DC Shunt Motor by Field current control and Armature voltage control methods ➤ Study of Load Characteristics of Separately Excited DC Shunt Motor ➤ Study of Self Excited DC Shunt Motor <p>Technical Specifications:-</p> <p>DC Power Supply Input Mains : 230V AC ±10%, 50Hz Fixed DC output : 200V Variable DC output : 0 - 200V Machine Specifications: Both the machines are flexibly coupled & mounted on a “C” Channel base DC Machines (2 Nos.) Type : Shunt Rating : 3HP Voltage Rating : 180V/200V Speed : 1500 RPM (No Load) Rheostat, 2.8A, 220Ω 3 Point Starter Insulation : Class ‘B’</p> <p>Digital Meter Voltmeter :(2 Nos.) Ammeter 2 Nos Ammeter 2 Nos. Tachometer : 20,000 RPM Dimensions (mm) : W 600 x D 450 x H 600 (Control Panel) W 170 x D 750 x H 285 (MG Set) Weight : 17.5kg (approximate) (Control Panel) 42kg (approximate) (MG set) All are necessary (Benn, Siemens, ABB, or Equivalent Make) Technology learning software to provide Theoretical, Practical and Experimental training required for understanding the fundamentals of Electronics Electrical , software features should include interactive GUI, user friendly and easy navigation, detail theory, explanation of complex topics with</p>	01		

	<p>animations and user interactive simulations makes it a powerful learning tool.</p> <p>Magnetism ,Electromagnetism, Alternating Current Circuits, Transformer Rectifier, Filter, Three Phase Circuits, Electrical Machines, DC Machine ,AC Machine Semiconductor Devices, Measuring Instruments ,Digital Electronic ,Basic Concepts , Voltage and Current ,Circuit Analysis ,Network Theorems</p>			
30.	<p>Perform Swinburne's Test</p> <p>Features:-</p> <ul style="list-style-type: none"> ➤ Machine with Mechanical Loading Arrangement ➤ Provided with Digital Tachometer ➤ Machine with Class "B" Insulation ➤ Heavy Duty Base/Channel ➤ Simulations Software ➤ Brake-Drum/Pulley with heat suppression facility ➤ Equipped with supply indication lamps ➤ Designed by considering all the safety standards ➤ Diagrammatic representation for the ease of connections ➤ Learning material CD ➤ 2 Year Warranty <p>Technical Specifications DC Machine Specification Type : DC Shunt, Rating : 3HP, Voltage Rating : 200V RPM : 1500 (no load), Insulation : Class 'B', Loading Arrangement : Mechanical, Brake drum/Pulley : Aluminum Casted, Digital Meters used, Voltmeter : 1 Nos Ammeter : 2 nos, Dimensions (mm) : W 600 x D 350 x H 450 (Control Panel), W 335 x D 450 x H 560 (Motor), Weight : 11kg (approx.), (Control Panel): 40kg (approx.) (Motor) All are necessary (Benn, Siemens, ABB, or Equivalent Make) Scope of Learning Study and Determine the losses of DC Machine and correspondingly calculate the efficiency of DC Machine by Swinburne's Test Method Technology learning software to provide Theoretical, Practical and Experimental training required for understanding the fundamentals of Electronics Electrical , software features should include interactive GUI, user friendly and easy navigation, detail theory, explanation of complex topics with animations and user interactive simulations makes it a powerful learning tool.</p> <p>Magnetism ,Electromagnetism, Alternating Current Circuits, Transformer Rectifier, Filter, Three Phase Circuits, Electrical Machines, DC Machine ,AC Machine Semiconductor Devices, Measuring Instruments ,Digital Electronic ,Basic Concepts , Voltage and Current ,Circuit Analysis ,Network Theorems</p>	01		
31.	<p>Thyristorized DC Regulated Power Supply Compatible with Static and Rotating Devices</p> <ul style="list-style-type: none"> ➤ Separate sections for Fixed and Variable Supply ➤ Transformer based design ➤ Equipped with Meters to observe current and voltage ➤ Easy to Operate } ➤ Designed by considering all the safety standards ➤ Learning material CD ➤ 2 Year Warranty <p>Thyristorized DC Regulated Power Supply Input Mains : 415VAC ± 10%, 50Hz Rated Output Voltage : 230VDC (Fixed) ± 5%, Rated Output Current : 50 A DC</p>	01		

	Regulation : Less than 5% at full load condition. Selector Switch to display three phase voltage at a time DC Voltmeter : 1 No. DC Ammeter : 1 No. All are necessary (Benn, Siemens, ABB, or Equivalent Make)			
32.	LOAD Single and Three Phase Resistive Load Voltage : 240V AC $\pm 10\%$, 50Hz Current : 15A Power : 3.5kW Loading steps : 15 MCBs Current rating : 10A (SP) Three Phase Star Operation Voltage : 415V AC $\pm 10\%$, 50Hz Current : 5A (per Phase) Power : 3.5kW Loading steps : 5 (per Phase) Three Phase Delta Operation Voltage : 415V AC $\pm 10\%$, 50Hz Current : 15A (per Phase) Power : 10.5kW Loading steps : 5 (per Phase) MCBs Current rating : 10A (SP) Switching Technique : Star/Delta Switch, 415V, 25A Mains MCB : 16A (TPN) Single and Three Phase Inductive Load Single Phase Operation Voltage : 240V AC $\pm 10\%$, 50Hz Current : 15A Power : 3.5KVAR Loading steps : 30 MCBs Current rating : 10A (SP) No. of MCBs : 30 Nos. Three Phase Star Operation Voltage : 415V AC $\pm 10\%$, 50Hz Current : 5A (per Phase) Power : 3.5KVAR Loading steps : 5 (per Phase) MCBs (acts as a switch) : 10A (SP) Three Phase Delta Operation Voltage : 415V AC $\pm 10\%$, 50Hz Current : 15A (per Phase) Power : 10KVAR Loading steps : 5 (per Phase) MCBs : 10A (SP) Star/Delta Switch : 415V, 25A MCB : 16A (TPN) Single and Three Phase Capacitive Load Mains Supply : 230V AC $\pm 10\%$, 50Hz (Single Phase) : 415V AC $\pm 10\%$, 50Hz (Three Phase) Current : 4.6A each phase (in Star connection) : 13A each phase (in Delta connection) Star/Delta Switch : 415V, 32A MCB : 16A (Four Pole) 1 No. : 10A (One Pole) 30 Nos. All are necessary (Benn, Siemens, ABB, or Equivalent Make)	01		
33.	Thyristor controlled system	01		

	<p>Rectifier: Rectifier AC set Thyristor Controlled Regulated Power Supply with close loop feedback and Isolation Transformer. With Regulation +/- 2.5 % . Input : 3 Phase / 415 V / 50 Hz. / AC Supply, Out Put : 230 V DC – 20 A All are necessary (Benn, Siemens, ABB, or Equivalent Make)</p>			
34.	<p>Synchronizing Panel</p> <ul style="list-style-type: none"> • Synchronizing Panel: Control Panel , Panel should be made of 16 SWG MS Sheet with printed PV facia & lamination in front for better look. Panel should highly laminated Siemens gray powder coated with proper gasket fitted door & locking system at back side of panel. Control Panel must be consisting, • Analog AC Ammeter 2 Nos. (AE, MECO, Rishabh or Equivalent Make) • Vibrating Reed type Frequency meter 440 V compatible (AE, MECO, Rishabh or Equivalent Make) • Analog AC Voltmeter 1 No. (AE, MECO, Rishabh or Equivalent Make) • Mechanical vane type Synchroscope 1 No. (AE, MECO, Rishabh or Equivalent Make) • Phase Sequence meter 1 No. (AE, MECO, Rishabh or Equivalent Make) • Lamps for Dark & Bright method synchronizing. • BTI 30 Terminals for easy connection & safety. (Elcom, Calyx, Prime or Equivalent Make). • 4 pole MCB 3Nos. (L&T, Hiksons or Equivalent Make). • All other Indicators, Fuses, Wires, Patch cords, Switches, etc. required of standard reputed make. • Operating manual provide in softcopy & hardcopy with detail experiment procedure, circuit diagram, observation table, Fault finding chart for panel & Machine, Sectional Drawing of machine with part list of material used. <ul style="list-style-type: none"> • Operating manual provide in softcopy & hardcopy with detail experiment Procedure, circuit diagram, observation table, Fault finding chart for panel & Machine, Sectional drawing of machine with part list of material used . 	01		
35.	<p>Parallel Operation of Three Phase Transformer Mains supply : Single Phase, 415V±10%, 50Hz Single Phase Transformer (2 Nos.) Rating : 1kVA, Primary Voltage : 415V, Secondary Voltage :230V, Rated Current : 4A, All other indicators, switches, wires etc, Digital Meter Voltmeter: 500V (2 Nos.), Ammeter: 10A (2 Nos.), MCB (SP) : 10A, Three Phase Varic 10 A, Three Phase Resistive load Simulations Software, All are necessary (Benn, Siemens, ABB, or Equivalent Make), Dimension in mm W 600 x D 450 x H 600, Scope of Learning</p> <ul style="list-style-type: none"> • Three Phase Configuration • Open circuit test on three phase transformer • Short circuit test on three Phase transformer • Study of parallel operation of two single phase transformers under equal voltage ratio • Study of parallel operation of two single phase Transformers under unequal voltage ratio. • Load test on and correspondingly determine efficiency and Regulation on three phase transformer <p>Features:-</p> <ul style="list-style-type: none"> • Standalone operation. • Graphical LCD for highest display resolution. • Flexibility used Star and delta Configuration. • Equipped with supply with lamp. • Facility to display entire parameter in single shot. 	01		

	<ul style="list-style-type: none"> • Designed by considering all the safety standards. • Diagrammatic representation for the ease connection. • Online and offline both product tutorials necessary • Learning material CD <p>Technology learning software to provide Theoretical, Practical and Experimental training required for understanding the fundamentals of Electronics Electrical , software features should include interactive GUI, user friendly and easy navigation, detail theory, explanation of complex topics with animations and user interactive simulations makes it a powerful learning tool.</p>			
36.	<p>THREE PHASE INDUCTION MOTOR TRAINER</p> <p>Features:-</p> <ul style="list-style-type: none"> ➤ Machine with Mechanical Loading Arrangement ➤ Provided with Digital Tachometer ➤ Machine with Class “B” Insulation ➤ Heavy Duty Base/Channel ➤ Simulations Software ➤ Brake-Drum/Pulley with heat suppression facility ➤ Equipped with supply indication lamps ➤ Designed by considering all the safety standards ➤ Diagrammatic representation for the ease of connections ➤ Exclusive and Compact Design ➤ Learning material CD ➤ Technical Specifications ➤ Online and offline both product tutorials necessary <p>Mains Supply : Three Phase, 415V ±10%, 50Hz Three Phase Induction Motor Type : Squirrel Cage Rating : 3HP Voltage Rating : 415V Speed : 1440 RPM (No Load) Insulation : Class ‘B’ Loading arrangement : Mechanical Brake Drum/Pulley : Aluminum Casted</p> <p>Digital Meter</p> <p>Wattmeter: 2 Nos. Voltmeter : 1 Nos, Ammeter : 1 Nos MCB (TPN) : 10A, Tachometer : 20,000 RPM, Dimensions (mm) :, W 600 x D 350 x H 450 (Control Panel) W 250 x D 400 x H 600 (Motor), Weight : 14.5kg (approximate) (Control Panel) 22kg (approximate) (Motor)</p> <p>All are necessary (Benn, Siemens, ABB, or Equivalent Make)</p> <ul style="list-style-type: none"> ➤ Study of Running and Reversing of Three Phase Induction Motor ➤ Study of No Load Test performed in a Three Phase Induction Motor ➤ Study of Block Rotor Test performed in a Three Phase Induction Motor ➤ Measurement of Slip in a Three Phase Induction Motor ➤ Study of Speed-Torque characteristics in a Three Phase Induction Motor S <p>Technology learning software to provide Theoretical, Practical and Experimental training required for understanding the fundamentals of Electronics Electrical , software features should include interactive GUI, user friendly and easy navigation, detail theory, explanation of complex topics with animations and user interactive simulations makes it a powerful learning tool.</p>	01		
37.	<p>THREE PHASE SYNCHRONOUS GENERATOR LAB</p> <p><u>Three Phase Synchronous Generator Lab</u></p> <p>The experimental setup should have following features:</p> <ul style="list-style-type: none"> ➤ Electrical Loading Arrangement ➤ Flexible Shaft Coupling Arrangement ➤ Provided with Digital Tachometer ➤ Machine with Class “B” Insulation ➤ Heavy Duty Base/Channel ➤ Simulations Software ➤ Equipped with supply indication lamps 	01		

	<ul style="list-style-type: none"> ➤ Terminals provided to use the optional externally ➤ Equipped with supply indication lamps ➤ Designed by considering all the safety standards ➤ Diagrammatic representation for the ease of connections ➤ Exclusive and Compact Design ➤ On line / off line detailed learning materials ➤ Learning material CD <p>The experimental setup should have following Technical Specifications:</p> <p>DC Power Supply Input Mains : 230V AC, 50Hz, Fixed DC output : 200V Variable DC output : 0 - 200V, Machines Specification (2 Nos.), Both the Machines are Flexibly Coupled and Mounted on a, M.S. channel Base</p> <p>DC Machine (acts as Prime Mover) Type : Shunt, Rating : 2HP, Voltage Rating : 200V Speed : 1500 RPM (no load), Insulation : Class 'B'</p> <p>Three Phase Synchronous Motor (acts as Generator) Type : Salient Pole, Rating : 3HP, Voltage rating : 415V ±10% Speed : 1500 RPM (no load), Insulation : Class 'B', Excitation Voltage : 120V Digital Meter, DC Voltmeter : 300V, DC Ammeter: 1 Nos., AC Ammeter : 1 Nos, AC Voltmeter: 2 Nos. All are necessary (Benn, Siemens, ABB, or Equivalent Make)</p> <p>The experimental setup should perform following experiments</p> <ul style="list-style-type: none"> ➤ To study the short circuit characteristics (SCC) of three Phase Synchronous Generator ➤ To study the Open Circuit Characteristics (OCC) of Three Phase Synchronous Generator <p>Technology learning software to provide Theoretical, Practical and Experimental training required for understanding the fundamentals of Electronics Electrical , software features should include interactive GUI, user friendly and easy navigation, detail theory, explanation of complex topics with animations and user interactive simulations makes it a powerful learning tool.</p>			
38.	<p>Synchronous Machine Training System</p> <p><u>Synchronous Machine Training System</u></p> <p>The experimental setup should have following features:</p> <ul style="list-style-type: none"> • Two Identical Motor Generator Set • Electrical Loading Arrangement • 240 x 128 Graphical LCD Display • RISC Microcontroller based design for measurement • High resolution ADC for accurate measurement • High sensitive to change in reading for better controlling • Inbuilt Digital Phase Sequence Indicator • Equipped with Synchroscope • Simulation software for connection of control panel • Inbuilt Multifunction Meter for AC & DC Measurement • Lamps are provided on front panel for synchronization • Designed considering all the safety standards • Provided with shaft protection cover • Equipped with supply indication lamps • Heavy Duty Base/Channel • Machine with Class "B" Insulation • Diagrammatic representation for the ease of connections • On line / off line detailed learning materials <p>The experimental setup should have following Technical Specifications:</p> <p>DC Power Supply Input mains : 230V AC ±10%, 50Hz, Fixed DC output : 200V</p>	01		

	<p>Variable DC output : 0-200V, AC Measurement Unit Voltage : 50 [500V, Current : 0.2 [10A, Power : 20[2000W Power Factor : 0.99 Lead, Lag, Frequency : 45 [55Hz DC Measurement Unit, Voltage : 25 [500V, Current : 0.2 [10A Phase Sequence Indicator : For both generators Machines Specification Both the M-G Sets are Flexibly Coupled and Mounted on a “C” channel Base DC Machine, Type : Shunt, Voltage Rating : 200V, Rating : 2 HP, Speed : 1500 RPM (no load) Insulation : Class “B”, Three Phase Synchronous Machine Type : Salient Pole, Rating : 3 HP, Voltage rating : 415V AC Speed : 1500 RPM (no load), Excitation Voltage : 120V Insulation : Class “B”, All are necessary (Benn, Siemens, ABB, or Equivalent Make), The experimental setup should perform following experiments: Synchronization of two Three Phase Alternators by a) Synchro scope method b) Three dark lamp method c) Two bright one dark lamp method 1. Regulation of Three Phase Alternator by a) Open Circuit test b) Short Circuit test Study & Analysis of V-Curve & Inverse V-Curve of Synchronous Motor Technology learning software to provide Theoretical, Practical and Experimental training required for understanding the fundamentals of Electronics Electrical , software features should include interactive GUI, user friendly and easy navigation, detail theory, explanation of complex topics with animations and user interactive simulations makes it a powerful learning tool.</p> <p>Magnetism ,Electromagnetism, Alternating Current Circuits, Transformer Rectifier, Filter, Three Phase Circuits, Electrical Machines, DC Machine ,AC Machine Semiconductor Devices, Measuring Instruments ,Digital Electronic ,Basic Concepts , Voltage and Current ,Circuit Analysis ,Network Theorems</p>			
39.	<p>THREE PHASE SYNCHRONOUS MOTOR LAB <u>Three Phase Synchronous Motor Lab</u></p> <p>The experimental setup should have following features:</p> <ul style="list-style-type: none"> • Attractive and Compact Design • Digital Panel Meters • Flexible Shaft Coupling Arrangement • Centre-Tapped Wattmeter being used for better precision • Equipped with supply indication lamps • Provided with Digital Tachometer • Machine with Class “B” Insulation • Heavy Duty Base/Channel • Designed by considering all the safety standards • Diagrammatic representation for the ease of connections • Exclusive and Attractive Design • On line / off line detailed learning materials <p>The experimental setup should have following Technical Specifications: Mains Supply : Three Phase, 415V±10%, 50Hz Machines Specification (2 Nos.) Both the Machines are flexibly coupled and mounted on a M.S. channel Base Three Phase Synchronous Motor Type : Salient Pole, Rating : 3 HP, Voltage rating : 415V ±10%</p>	01		

	<p>Speed : 1500 RPM, Insulation : Class 'B', Excitation Voltage : 120V</p> <p>DC Machine (Acts as generator) Type : Shunt, Rating : 2 HP, Voltage Rating : 200V Speed : 1500 RPM (no load), Insulation : Class 'B'</p> <p>Digital Meter AC Ammeter (MI type) : 10A, DC Ammeter (MC Type) : 2A AC Voltmeter (MI type) : 500V, DC Voltmeter (MC Type) : 300V Wattmeter : 1500 - 0- 1500W (2 Nos.),MCB (TPN) : 10A All are necessary (Benn, Siemens, ABB, or Equivalent Make)</p> <p>The experimental setup should perform following experiments</p> <ul style="list-style-type: none"> • To study the Inverse V curve of the Three Phase Synchronous Motor • To study the V curve of Three Phase Synchronous Motor <p>Technology learning software to provide Theoretical, Practical and Experimental training required for understanding the fundamentals of Electronics Electrical , software features should include interactive GUI, user friendly and easy navigation, detail theory, explanation of complex topics with animations and user interactive simulations makes it a powerful learning tool.</p> <p>Magnetism ,Electromagnetism, Alternating Current Circuits, Transformer Rectifier, Filter, Three Phase Circuits, Electrical Machines, DC Machine ,AC Machine Semiconductor Devices, Measuring Instruments ,Digital Electronic ,Basic Concepts , Voltage and Current ,Circuit Analysis ,Network Theorems</p>			
40.	<p>SINGLE PHASE INDUCTION MOTOR LAB</p> <p style="text-align: center;"><u>Single Phase Induction Motor Lab</u></p> <p>The experiment setup should have following features :</p> <ul style="list-style-type: none"> ▪ Exclusive and attractive designed panel ▪ Stand alone operation ▪ Designed by considering all the safety standards ▪ High quality meters ▪ Diagrammatic representation ▪ Easy connections ▪ Manual with operating instructions , theoretical and practical details • On line / off line detailed learning materials <p>The experiment setup should have following Technical Specifications :</p> <p>Mains Supply : 230 V ±10%, 50 Hz Induction Motor Type : Capacitor start Phase : Single Current type : AC Rating : 1 HP Voltage rating : 230 V ± 10% Meters Used Voltmeter : 0-300 V Ammeter : 0-10 A Wattmeter : 1000 W MCB : 10 A</p> <p>All are necessary (Benn, Siemens, ABB, or Equivalent Make)</p> <p>The experiment setup should performed following experiments :</p> <ul style="list-style-type: none"> ▪ Study of Single Phase Induction Motor ▪ Study of Running and Reversing of Single Phase Induction Motor ▪ Study of the No-Load Test in a Single Phase Induction Motor 	01		

	<ul style="list-style-type: none"> ▪ Study of the Blocked Rotor Test in a Single Phase Induction Motor ▪ Study of Load Test of a Single Phase Induction Motor <p>Technology learning software to provide Theoretical, Practical and Experimental training required for understanding the fundamentals of Electronics Electrical , software features should include interactive GUI, user friendly and easy navigation, detail theory, explanation of complex topics with animations and user interactive simulations makes it a powerful learning tool.</p> <p>Magnetism ,Electromagnetism, Alternating Current Circuits, Transformer Rectifier, Filter, Three Phase Circuits, Electrical Machines, DC Machine ,AC Machine Semiconductor Devices, Measuring Instruments ,Digital Electronic ,Basic Concepts , Voltage and Current ,Circuit Analysis ,Network Theorems</p>			
41.	<p>Speed Control of 3 Phase Induction Motor by Cascade Connection, Rotor Resistance Control 1.0 HP / 415 V Stator & Rotor / 3 Phase / 4 Pole / 1420 RPM /Double shaft extended / Slip ring Induction Motor @ non drive end coupled with 1.0/2.0 HP – 1420/2880 RPM, 4/2 Pole, 3Phase, Sq. Cage Induction Motor with Dhalandar winding for pole changing operation @ drive end of SLIM Mechanical loading arrangement will be provided. (Cumulative cascade 4+2 = 6pole i.e. 1000 RPM will be available with cascade connection.</p>	01		
42.	<p>DEVICE CHARACTERISTIC TRAINER Trainer for studying characteristics of different types of power semiconductor devices like, SCR, TRIAC, DIAC, MOSFET, IGBT etc. Trainer includes:</p> <ul style="list-style-type: none"> - Power Semiconductor devices: SCR, TRIAC, DIAC, MOSFET, and IGBT. - Power circuit for studying characteristic of SCR and TRIAC. - Power circuit for studying characteristic of DIAC. - Power circuit for studying characteristic of MOSFET and IGBT. - Power section for oscilloscope observation of characteristic of SCR and TRIAC. - Power section to study switching characteristics of MOSFET and IGBT. - Power section to improve switching characteristics of MOSFET and IGBT using snubber circuit. <p>Specifications:</p> <ul style="list-style-type: none"> - Trainer providing all general-purpose semiconductor devices with an arrangement to study their characteristics. - Issues related to high frequency switching of MOSFET and IGBT (switching characteristics) are studied. PWM pulse generator of 5 kHz, stray inductance and snubber circuit is provided. - The kit should work directly with 230 V, 50 Hz, AC supply and other low power supplies required for the operation is derived internally. - Trainer incorporates necessary power supplies (12V DC, 40V DC, 30V AC) and measuring instruments (03 Multimeters) for deriving the characteristics. - Proper isolation between control and power circuit is provided <p>List of Experiments:</p> <ul style="list-style-type: none"> - Study of IGBT, MOSFET, SCR, TRIAC, DIAC Devices. - Study of IGBT V-I Characteristic and Transfer Characteristic. 	01		

	<ul style="list-style-type: none"> - Study of MOSFET V-I Characteristic and Transfer Characteristic. - Study of SCR V-I Characteristic. - Study of TRIAC V-I Characteristic in both quadrants. - Study of DIAC V-I Characteristic. - Study of MOSFET Switching and Transient Characteristic. - Oscilloscope view of SCR and TRIAC V-I characteristic. 			
43.	<p>GATE/BASE TRIGGERING CIRCUIT TRAINER Trainer for studying gate or base drive circuit for different types of power semiconductor devices (SCR / MOSFET). Trainer includes:</p> <ul style="list-style-type: none"> - Different types of triggering circuits for SCR: DC Triggering, R Triggering, RC Triggering, UJT Triggering. - Power Section with SCR, source and load for checking SCR triggering circuits. - Triggering circuit for MOSFET demonstrating PWM (Pulse Width Modulation), Optical Isolation and driving circuit. - Power Section with MOSFET, source and load for checking MOSFET triggering circuits. <p>Specifications:</p> <ul style="list-style-type: none"> - Different types of triggering circuits for latching devices like SCR are provided. - Triggering circuits for voltage-controlled devices with electrical isolation is provided. - Oscillator with switching frequency 5 kHz, PWM circuit and optical isolation using IC 6N 137 is provided. - Analogue as well as digital implementation of gate or base drive circuit is demonstrated. - Both triggering circuit and a small rated power circuit are provided for experimentation. - Power circuit of SCR working with 30 V AC supply connected to resistive load of 100 E is provided. - Power circuit of MOSFET working with 20 V DC supply connected to resistive load of 100 E is provided. - The kit works directly with 230 V 50 Hz AC supply and other low power supplies required for the operation are derived internally. - Proper isolation between control and power circuit is provided. <p>List of Experiments:</p> <ul style="list-style-type: none"> - Study of DC triggering circuit for SCR, - Study of R triggering circuit for SCR, - Study of R-C triggering circuit for SCR, - Study of UJT triggering circuits for SCR, - Study of Microcontroller based triggering circuit, - Study of PWM triggering circuit, - Study of Optically isolated triggering circuit. 	01		
44.	<p>SINGLE PHASE RECTIFIER TRAINER Trainer for studying different configurations of single phase controlled rectifier. Trainer includes:</p> <ul style="list-style-type: none"> - Power section for controlled and uncontrolled rectifier - Power section for half-wave and full-wave rectifier. - Power section for fully controlled and half controlled rectifiers - Different types of loading arrangements: R Load, R-L Load, R-L-D Load and provision to connect E externally. - Gate pulse generating circuit with a provision to study all intermediate stage waveforms. <p>Specifications:</p> <ul style="list-style-type: none"> - Controlled (SCR based) as well as uncontrolled (Diode based) rectification. 	01		

	<ul style="list-style-type: none"> - Various experimentation on single-phase rectifiers with a provision of observing current waveform. - Trainer includes step down power supply, control circuit, power circuit and different types of loads. - The kit works directly with 230 V, 50 Hz, AC supply and other low power supplies required for the operation is derived internally. - Step down supply voltage of 30 V, Load resistance of 200 E, Load inductance 100 mH is provided. - Proper isolation between control and power circuit is provided. <p>The setup consists of following cards:</p> <p>1. Controller Card:</p> <ul style="list-style-type: none"> - SST89E516RD 8-bit MCU clocked @18.432MHz - Buffered I/O Ports using 74HC573 - 5 Interface Keys - 16x2 LCD (JHD162A) display - UART section (IC Max 232) <p>2. Thyristor firing card:</p> <ul style="list-style-type: none"> - ZCD and -ZCD using diodes π - on board 5 kHz carrier using RC circuit - Pulse Transformer based driving - Gate resistor with anti-parallel diode <p>3. Power card:</p> <ul style="list-style-type: none"> - SCR 25TT12 (10A, 1200V) (4 Nos.) - Diode 1N5408 (4 Nos.) - Snubber circuit List of Experiments: - Single-phase half-wave uncontrolled rectifier with different types of load. - Single-phase full-wave uncontrolled rectifier with different types of load. - Single-phase half-wave controlled rectifier with different types of load. - Single-phase full-wave controlled rectifier with different types of load. - Single-phase full-wave half-controlled rectifier with different types of load. - Single phase SCR's Gate Pulses and other control signals. 			
45.	<p>THREE PHASE RECTIFIER TRAINER</p> <p>Trainer for studying different configurations of three-phase controlled rectifier.</p> <p>Trainer includes:</p> <ul style="list-style-type: none"> - Power section for controlled, semi controlled and uncontrolled rectifier. - Power section for half-wave and full-wave rectifier. - Power section for fully controlled and half controlled rectifiers - Different types of inbuilt loading arrangements: R Load, R-L Load, R-L-D Load and provision to connect E externally. - Gate pulse generating circuit with a provision to observe all intermediate stage waveforms. <p>Specifications:</p> <ul style="list-style-type: none"> - Controlled (SCR based) as well as uncontrolled (Diode based) rectifier. - Various experimentation on three-phase rectifiers with a provision of observing current waveform. - Trainer includes step down power supply, control circuit, power circuit and different types of load internally. - The kit works directly with 415 V, 50 Hz, AC supply and other low power supplies required for the operation are derived internally. - Step down three-phase supply voltage of 30 V, load 	01		

	<p>resistance of 200 E and load inductance of 100 mH are provided.</p> <ul style="list-style-type: none"> - Proper isolation between control and power circuit is provided. The setup consists of following cards: <ol style="list-style-type: none"> 1. Three phase firing card <ul style="list-style-type: none"> - On board three ZCD transformers - Delay generating circuit - Carrier frequency multiplication - TCA785 synchronize with ZCD - TIP 122 Transistor - 06 numbers of Pulse transformer based driver stage 2. Three phase power card <ul style="list-style-type: none"> - SCR 25TT12 (10A, 1200V) (6 Nos.) - Diode 1N5408 (6 Nos.) - Snubber circuit <p>List of Experiments:</p> <ul style="list-style-type: none"> - Three-phase half-wave uncontrolled rectifier with different types of load. - Three-phase full-wave uncontrolled rectifier with different types of load. - Three-phase half-wave controlled rectifier with different types of load. - Three-phase full-wave controlled rectifier with different types of load. - Three-phase semi-converter with different types of load. - Three-phase SCR's gate pulses generation and their control signals. 			
46.	<p>CHOPPER TRAINER Trainer for studying different types of chopper circuits (Type A, B, C, D, E and step-up chopper). Trainer includes:</p> <ul style="list-style-type: none"> - Power circuit for Type A, B, C, D, E and Step-up chopper - Different types of inbuilt loading arrangements: R Load, R-L Load, R-L-D Load and provision to connect E externally. - Control circuit with Frequency control and Duty ratio control methods. - Step-up chopper operation. - Powering and regeneration operation is demonstrated. - Gate pulse generating circuit with a provision to observe all intermediate stage waveforms. <p>Specifications:</p> <ul style="list-style-type: none"> - Various experimentation on different chopper configurations with a provision of observing current waveforms. - Trainer includes step down power supply, control circuit, power circuit and different types of load internally. - The kit works directly with 230 V, 50 Hz, AC supply and other low power supplies required for the operation are derived internally. - Proper isolation between control and power circuit is provided. - Loading arrangements for experimentation as a part of trainer with R Load and R-L Load are provided. - Step down supply voltage of 24 V DC, Load resistance of 100 E, Load inductance 100 mH are provided. - 12 V battery is provided for demonstrating regeneration mode. - Microcontroller based control circuit with LCD and keyboard interfacing is provided for selecting 	01		

	<p>different operating modes. The setup will consist of following cards:</p> <ol style="list-style-type: none"> 1. Controller Card: <ul style="list-style-type: none"> - SST89E516RD 8-bit MCU clocked @18.432MHz - Buffered I/O Ports using 74HC573 - 5 Interface Keys - 16x2 LCD (JHD162A) display - UART section (IC Max 232) 2. MOSFET based inverter card: <ul style="list-style-type: none"> - Buffer input through 7414 - Optical Isolation through 6N137 - Boot-strapping based firing using IR2130 - MOSFET IRF840 (400V, 8A) (6 Nos.) - Diode MUR580 - 15 V AC excitation supply On board over current trip circuit 3. 24V, 2.1A DC supply using SMPS <p>List of Experiments:</p> <ul style="list-style-type: none"> - Study of different chopper controlling methods. - Study of gate pulses generation required for Class A/B/C1/C2/D/E. - Study of First quadrant / Type A Chopper with different types of Load. - Study of two-quadrant chopper with different loads. - Study of four-quadrant chopper with different loads. - Study of step-up chopper with different loads. - Study of regeneration technique with four-quadrant chopper. 			
47.	<p>SINGLE PHASE AC VOLTAGE CONTROLLER TRAINER Trainer for studying different configurations of single-phase AC voltage controller circuits.</p> <p>Trainer includes:</p> <ul style="list-style-type: none"> - Power section for half-wave and full-wave AC voltage circuit. - Different types of loading arrangements: R Load and R-L Load, - Gate pulse generating circuit with a provision to observe all intermediate stage waveforms. <p>Specifications:</p> <ul style="list-style-type: none"> - Various experimentation on single-phase AC voltage controller circuit. - Single phase half controlled and fully controlled configurations are possible. - Trainer includes step down power supply, control circuit, power circuit and different types of load internally. - The kit works directly with 230V; 50Hz, AC supply and all measuring meters connected externally. - Step down supply voltage of 30 V, Load resistance of 200 E, Load inductance 100 mH are provided. - Proper isolation between control and power circuit is provided. <p>The setup will consist of following cards:</p> <ol style="list-style-type: none"> 1. Controller Card: <ul style="list-style-type: none"> - SST89E516RD 8-bit MCU clocked @18.432MHz - Buffered I/O Ports using 74HC573 - 5 Interface Keys - 16x2 LCD (JHD162A) display - UART section (IC Max 232) 2. Thyristor firing card: <ul style="list-style-type: none"> - +ZCD and -ZCD using diodes - on board 5 kHz carrier using RC circuit - Pulse Transformer based driving - Gate resistor with anti-parallel diode 	01		

	<p>3. Power card:</p> <ul style="list-style-type: none"> - SCR 25TT12 (10A, 1200V) (03 Nos.) - Diode 1N5408 (01 Nos.) - Snubber circuit <p>List of Experiments:</p> <ul style="list-style-type: none"> - Study of AC voltage controller controlling methods. - Study of gate pulses generation for AC voltage controller. - Single-phase half-wave AC Voltage controller with different types of loads. <p>Single-phase full-wave AC Voltage controller with different types of loads.</p>			
48.	<p>THREE PHASE AC VOLTAGE CONTROLLER TRAINER Trainer for studying different three-phase AC voltage controller configurations.</p> <p>Trainer includes:</p> <ul style="list-style-type: none"> - Power section for half-wave and full-wave AC voltage configurations. - Provision to connect SCR pair in Star and Delta π Different types of three phase loading arrangements: R Load and R-L Load. - Gate pulse generating circuit with a provision to observe all intermediate stage waveforms. <p>Specifications:</p> <ul style="list-style-type: none"> - Various experimentation on three-phase AC voltage controller. - All possible configurations of three-phase AC voltage controller are experimented. - The kit works directly with three-phase 440V; 50Hz AC supply and all measuring meters connected externally. - Step down three-phase supply voltage of 30 V AC, three load resistance of 200 E and three-phase load inductance of 100 mH are provided. Proper isolation between control and power circuit should be provided. - Test points for observing intermediate waveforms of gate pulse generation are provided for observation. <p>The setup will consist of following cards:</p> <ol style="list-style-type: none"> 1. Three phase firing card <ul style="list-style-type: none"> - On board three ZCD transformers - Delay generating circuit - Carrier frequency multiplication - TCA785 synchronize with ZCD - TIP122 Transistor π 06 numbers of Pulse transformer based driver stage - Gate resistor with anti-parallel diode 2. Three phase power card <ul style="list-style-type: none"> - SCR 25TT12 (10A, 1200V) (6 Nos.) - Diode 1N5408 (6 Nos.) - Snubber circuit <p>List of Experiments:</p> <ul style="list-style-type: none"> - Study of gate pulse generation and their control methods. - Three-phase, four-wire line controlled AC voltage controller with star loads - Three- phase AC voltage controller with inside delta controlled loads. . - Study of Three-phase, three-wire line controlled AC voltage controller with star loads, - Three phase line controlled AC voltage controller with delta loads, 	01		
49.	<p>SINGLE PHASE INVERTER TRAINER Trainer for studying different types of single-phase inverter circuits. The kit provides platform for various experimentation</p>	01		

	<p>on single-phase inverters.</p> <p>Trainer includes:</p> <ul style="list-style-type: none"> - Power circuit for single phase half-bridge inverter configuration - Power circuit for single phase full-bridge inverter configuration - Different types of loads: R Load and R-L Load - Microcontroller based control circuit for gate pulse generation - Different control techniques: Square Wave, Quasi Square Wave, Sine PWM ω In Quasi Square wave technique provision to eliminate 3rd, 5th or 7th harmonic is provided. - Provision for current waveform observation. <p>Specifications</p> <ul style="list-style-type: none"> - Popularly used basic controlling methods like square wave mode, quasi square wave mode and sinusoidal PWM is experimented. - Trainer includes step down power supply, control circuit, power circuit and different types of load internally. - The kit works directly with 230 V, 50 Hz AC supply and other low power supplies required for the operation are derived internally. - Proper isolation between control and power circuit with DC link fuse is provided. - Step down supply voltage of 24 V DC, Load resistance of 100 Ω, Load inductance 100 mH are provided. ω Experiment with R Load and R-L Load are provided. - Microcontroller based control circuit with LCD and keyboard interfacing is provided for selecting different operating modes. <p>The setup will consist of following cards:</p> <ol style="list-style-type: none"> 1. Controller card: <ul style="list-style-type: none"> - SST89E516RD 8-bit MCU clocked @18.432MHz - Buffered I/O Ports using 74HC573 - 5 Interface Keys - 16x2 LCD (JHD162A) display - UART section (IC Max 232) 2. MOSFET based inverter card: <ul style="list-style-type: none"> - Buffer input through 7414 - Optical Isolation through 6N137 - Boot-strapping firing using IR2130 - MOSFET IRF840 (400V, 8A) (4 Nos.) - Diode MUR580 (4 Nos.) - 15 V AC excitation supply - On board over current trip circuit 2. 40 V DC supply <p>List of Experiments:</p> <ul style="list-style-type: none"> - Study of gate pulses generation for different types of inverter Modes. - Study of single-phase half bridge inverter with different types of loads. - Study of single-phase full bridge inverter with different types of loads. - Study of square wave inverter. - Study of Quasi Square Wave (QSW) inverter. <p>Study of Sinusoidal Pulse Width Modulated (SPWM) inverter.</p>			
50.	<p>THREE PHASE INVERTER TRAINER</p> <p>Trainer for studying different types of three-phase inverters. The kit provides platform for Various experimentation on three-phase inverters.</p> <p>Trainer includes:</p>	01		

	<ul style="list-style-type: none"> - Power circuit for three phase full-bridge inverter - Different types of loads: R Load and R-L Load - Microcontroller based control circuit - Modulation techniques like SPWM (120° and 180° modes) and SVM - Provision for current waveform observation. <p>Specifications:</p> <ul style="list-style-type: none"> - Popularly used controlling methods like 120° mode, 180° mode sinusoidal PWM ,square and space vector modulation are experimented. - Cortex M4 32-bit Microcontroller based gate pulse generating circuit - Trainer includes step down power supply, control circuit, power circuit and different types of load internally. - The kit works directly with 230 V, 50 Hz AC supply and other low power supplies required for the operation are derived internally. - Proper isolation between control and power circuit with DC link fuse is provided. - Step down supply voltage of 24 V DC, Load resistance of three-phase 100 E, Load inductance three-phase 150 mH are provided. - Microcontroller based control circuit with LCD and keyboard interfacing is provided for selecting different operating modes. <p>The setup will consist of following cards:</p> <ol style="list-style-type: none"> 1. 32 bit ARM-Cortex controller card: <ul style="list-style-type: none"> - STM32F407VGT MCU @168MHz ꞵ Buffered I/O Ports using 74HC573 - 2 DAC outputs - 9 ADC input channels with buffering using LM324 IC - On board QEI (Quadrature Encoder Interface) section - 5 Keys push to ground - 16*2 LCD (JHD162A) display - UART section (RS-232)(IC Max 232) - RS-485 serial communication port 2. MOSFET based inverter card: <ul style="list-style-type: none"> - Buffer input through 74HC14 - Optical Isolation through 6N137 - Boot-strapping based firing using IR2130 - MOSFET IRF840 (400V, 8A) (6 Nos.) - Diode MUR580 (6 Nos.) - 15 V AC excitation supply - On board over current trip circuit 3. 24V, 2.1 A DC supply using SMPS <p>List of Experiments:</p> <ul style="list-style-type: none"> - Study of gate pulses for different control techniques. - Study of three-phase120-degree mode inverter with R load / R-L load. - Study of three-phase180-degree mode inverter with R load / R-L load. - Study of FFT analysis of 120/180 degree mode square wave inverter. - Study of Sinusoidal Pulse Width Modulated (SPWM) inverter. - Study of Space Vector modulated (SVM) inverter. 			
51.	<p>NON-ISOLATED SWITCHED MODE DC-DC CONVERTER TRAINER</p> <p>Trainer for studying basic topologies of non-isolated switched mode DC-DC conversion.</p> <p>Trainer includes:</p>	01		

	<ul style="list-style-type: none"> - Power circuit for Buck Converter - Power circuit for Boost Converter - Power circuit for Buck-Boost Converter - Different inductors for CCM and DCM operation. - Microcontroller based control circuit with switching frequency of 40 kHz. - Open loop and close loop operation <p>Provision for observing inductor voltage and current waveforms.</p> <p>Specifications:</p> <ul style="list-style-type: none"> - The trainer demonstrates basis three topologies of DC-DC conversion i.e. Buck, Boost, and Buck-Boost converter. - Switching frequency of 40 kHz. - Trainer includes step down power supply, control circuit, power circuit and different types of load - The kit works directly with 230 V, 50 Hz, AC supply and other low power supplies required for the operation are derived internally. - Proper isolation between control and power circuit is provided. - Step down supply voltage of 24 V DC, fixed load resistance of 200 E, variable load rheostat of 50 E, inductance of 5 mH for CCM and 0.5 mH are provided. - Loading arrangements as a part of trainer and experimentation for continuous current mode (CCM) and discontinuous current mode (DCM) operation are provided. <p>The setup will consist of following cards:</p> <ol style="list-style-type: none"> 1. 32 bit ARM- Cortex controller card: <ul style="list-style-type: none"> - STM32F407VGT MCU @168MHz - Buffered I/O Ports using 74HC573 - 2 DAC outputs - 9 ADC input channels with buffering using LM324 IC - On board QEI (Quadrature Encoder Interface) section - 5 Keys push to ground - 16*2 LCD (JHD162A) display - UART section (RS-232)(IC Max 232) - RS-485 serial communication port <p>2. IRF840 (400V, 8A) MOSFET</p> <p>3. 5 mH and 0.5 mH Inductor</p> <p>4. 24V, 4.1A DC supply</p> <p>List of Experiments:</p> <ul style="list-style-type: none"> - Study of gate pulse generation circuit for DC-DC converter. - Study of Buck converter designing. - Study of Buck converter circuit operation in CCM/DCM modes. - Study of Boost converter designing. - Study of Boost converter circuit operation in CCM/DCM modes. - Study of Buck-Boost converter designing - Study of Buck-Boost converter circuit operation in CCM/DCM modes. 			
52.	<p>MICROCONTROLLER BASED THREE PHASE INDUCTION MOTOR DRIVE</p> <p>Trainer for studying Sinusoidal Pulse Width Modulated (SPWM) as well as Space Vector Modulated (SVM) inverter fed variable frequency drive operation.</p> <p>Specifications:</p>	01		

	<ul style="list-style-type: none"> - The kit comprise of single phase uncontrolled rectifier, three phase inverter, 1 HP, 415 V, 50 Hz, 1440 RPM three phase induction motor with proximity as speed sensor and 32-bit Cortex M4 ARM Microcontroller based control circuit. - Microcontroller based control circuit with LCD and keyboard interface is provided for selecting different operating modes. - Observation of intermediate stage waveforms of gate pulse generation. - Both Digital and Analog mode of control is possible. External circuit interfacing through analog mode of control. - MATLAB utility for viewing and controlling speed of the motor from personal computer. - The kit works directly with 230 V, 50 Hz, AC supply. Proper isolation between control and power circuit is provided. - Observation of stator current through current transformers. <p>Motor Controller:</p> <ul style="list-style-type: none"> - STM32F407VGT6 ARM Cortex-M4 Board featuring 32-bit ARM Cortex-M4F core, 168 MHz, 1 MB Flash, 192 KB RAM in an LQFP100 package. - On-board ST-LINK/V2 with selection mode switch, Power supply: through USB bus or from an external. - 8 General purpose input lines, 8 General purpose output lines, 16x2 LCD interface, 5 keys interface. - 3 high speed digital outputs and 2 High speed digital input lines. 6 PWM outputs, 3 QEI inputs. - 9 Analog inputs are level shifted to 1.65V for AC signal interface. List of Experiments: - Study of principle of Variable Frequency Drive (VFD). ∞ Study of SPWM control technique. - Study of Relationship between Control Voltage, Modulation Index, frequency and Inverter Output Voltage in SPWM Inverter. (Digital/Analog Mode Control). - V/f control of Induction Motor with SPWM Inverter. - Study of SVM control technique. - Study of Relationship between Control Voltage, Modulation Index, frequency and Inverter Output Voltage in SVM Inverter. (Digital Mode / Analog Mode Control). - V/f control of Induction Motor with SVM Inverter. - To study harmonic spectrum and THD of output waveforms. - Comparison of SPWM and SVM control techniques. 			
53.	<p>UNIVERSAL MOTOR DRIVE Trainer for studying Universal motor drive operation.</p> <p>Specifications:</p> <ul style="list-style-type: none"> - The kit comprise of a fraction HP universal motor, control module consist of single phase thyristor controlled rectifier, single phase AC voltage controller, selector switch to run motor with AC/DC supply and thyristor gate pulse controller. 	01		

	<ul style="list-style-type: none"> - Observation of intermediate stage waveforms of gate pulse generation. - The kit works directly with 230 V, 50 Hz, AC supply. - Proper isolation between control and power circuit is provided. <p>Power card:</p> <ul style="list-style-type: none"> - Rating 300V, 5A - SCR 25TT12 (10A, 1200V) - Diode 1N5408 (4 Nos.) - Snubber circuit <p>List of Experiments:</p> <ul style="list-style-type: none"> - Study of single phase controlled rectifier operation with R-load. - Study of single phase AC voltage controlled operation with R-load. - Study of Relationship between control voltage, firing angle, and output voltage of Motor. - Controlling of Universal Motor with single phase controlled rectifier. - Controlling of Universal Motor with single phase AC voltage controller. - Study of gate pulse generation circuit for controlled rectifier and ac voltage controller. <p>MICROCONTROLLE</p>			
54.	<p>8051 MICROCONTROLLER TRAINER KIT WITH PERIPHERAL CARD</p> <p>Key Features of 8051 Lab Trainer Kit</p> <p>Devices : 80C51(Intel)</p> <p>Operating Frequency : 10MHz crystal</p> <p>40-pin IC base 40pin-ZIF Socket (optional) for MCU</p> <p>32KB-SRAM for user Data</p> <p>32KB-EEPROM for Monitor Program</p> <p>2x16 Char LCD display</p> <p>24 I/O Pins for (8255)</p> <p>32 I/O Pins for 8051 (MCU-P89V51RD2)</p> <p>40-Pin FRC connector for Bus Extension</p> <p>20-Pin FRC connector Add-on Interface from 8255</p> <p>9-pin DB connector for UART (RS232) interface</p> <p>ISP Programming for (MCU-P89V51RD2)</p> <p>101 PC Type keyboard to enter user address/data commands</p> <p>Separate Jumper for INT/EXT memory selection</p> <p>P89V51RD2 (NXP) - 64K FLASH (OPTIONAL)</p> <p>2X16 LCD</p> <p>Baud rate(Seven different selectable Baud rates from 150 to 9600)</p> <p>Monitor Functions</p> <p>Built in line by line Assembler / Disassembler</p> <p>Block move</p> <p>Go Command</p> <p>Break point facility</p> <p>Compatible Add on Cards for 8051 Trainer Kit</p> <p>4x4 Matrix Keypad</p> <p>7 Segment Display Board -8 Nos</p> <p>7 Segment Display Board</p> <p>LCD Interface Card</p> <p>DAC 0800 Interface Card</p> <p>Thermal Printer Interface Card</p> <p>ADC 0809 Interface Card</p> <p>Traffic Light Controller Interface Card</p> <p>LCD & GLCD Interface Card</p> <p>Stepper Motor Interface card</p>	01		

	<p>Relay & Buzzer Digital Switch & LED Interface Card 8259 Interrupt Interface Card 8279 Keyboard and display Interface Card 8251 & 8253 Interface Card 8255-Programmable Peripheral interface Card Benefits of 8051 Trainer Kit</p> <p>Supports Embedded C(AT89V51Rd2), ASM Evaluate Real Time Applications ISP Programming Facility to interface external modules 8051 Trainer Kit Includes</p> <p>Intel 8051 Trainer Kit(INTEL – 8051) Power Adaptor RS232 Cable PC104 Keyboard User Guide: HW/SW CD Contains: Code Programmer Datasheets</p>			
55.	<p>Transmission Line Training System 1 Phase Technical Specification:- Mains Supply : 230V ±10%, 50Hz Single Phase Variac Input : 230V Output : 0-270V Current : 0-2A Display Measurement Voltage : ±25V Current : ±0.2A Active Power : ±20W [2000W Reactive Power : ±20VAR [2000VAR Apparent Power : ±20VA [2000VA Loads Resistor : 700Ω/ 100W Inductor : 800mH/ 0. 5A Capacitor : 12.5μF/ 450V Dimension (mm) : W 830 x D 355 x H 630 Weight : 52kg (approximate) Scope of Learning To study Short Circuit, Medium, Long Transmission Line Determine the ABCD, H, Z and Image parameters of Short Transmission, Line Determine the ABCD, H, Z and Image parameters of Medium Transmission Line For T network For π network Determine the ABCD, H, Z and Image parameters for Long Transmission Line Measure the receiving end voltage of each line under no load or lightly load condition to understand Ferranti effect} Features:-240 x 128 Graphical LCD Display RISC Microcontroller based design for measurement Simultaneous display of sending and receiving parameters Highly sensitive to change in reading for better controlling High Resolution ADC for accurate measurement Inbuilt Single Phase Variac to regulate supply Equipped with fixed R, L and C Load Facility to configure Short, Medium and Long Transmission Line,using multiple value of R, L and C Designed by considering all the safety standards Diagrammatic representation for the ease of connections Understand the performance of transmission line under different loads Technology learning software to provide Theoretical, Practical and Experimental training required for understanding the</p>	01		

	<p>fundamentals of Electronics Electrical , software features should include interactive GUI, user friendly and easy navigation, detail theory, explanation of complex topics with animations and user interactive simulations makes it a powerful learning tool.</p> <p>Magnetism ,Electromagnetism, Alternating Current Circuits, Transformer Rectifier, Filter, Three Phase Circuits, Electrical Machines, DC Machine ,AC Machine Semiconductor Devices, Measuring Instruments ,Digital Electronic ,Basic Concepts , Voltage and Current ,Circuit Analysis ,Network Theorems</p>			
56.	<p>Symmetrical and Unsymmetrical Fault Demonstrator Fast response time High quality meters Test terminals provided to analyze the waveforms Line Voltage and Phase Voltage selection facility Designed by considering all the safety precautions Diagrammatic representation for the ease of connections Online product tutorial, Technical Specifications Input Supply : 0- 415V AC $\pm 10\%$, 50Hz Auxiliary Supply : 0-230V AC $\pm 10\%$, Three Phase Transformer Rating : 1kVA, Primary Voltage : 415V AC (Line Voltage) Secondary Voltage : 240V AC (Line Voltage) Potential Transformer, Primary Voltage : 240V AC Secondary Voltage : 18V AC, Current : 500mA Current Transformer, Ratio : 1:1 and 1:2500 Current : 5A and 20A, Operating Voltage : 30V Fault Current : 5A, Meters Used, Voltmeter : 500V AC Ammeter : 5A AC, MCB : 10A, Dimension (mm) : W 800 x D 350 x H 600, Weight : 50kg (approximate) Scope of Learning, Line to Ground (L-G) Fault analysis of a Single Phase Transmission Line, Single Line to Ground Fault (L-G) analysis of a Three Phase Transmission Line Line to Line Fault (L-L) analysis of Three Phase Transmission Line Double Line to Ground Fault (L-L-G) analysis of Three Phase Transmission Line Symmetrical L-L-L Fault analysis of Three Phase Transmission Line Symmetrical L-L-L-G Fault analysis of Three Phase Transmission Line</p>	01		
57.	<p>Earth Tester General Specifications Earth Resistance Tester Range 0-20/200/2000Ω Display Large Backlit LCD with Dual Display Multimeter function Range 200k Ω, 750V/ACV, 1000V/DCV. Sampling Rate 2.5 times per second Zero Adjustment Automatic. Over Range Indicator Number 1 of highest digit is displayed. Low Battery Indication The “ “ id Displayed when the battery Voltage drop below the Operating voltage. Data Hold To freeze the Displayed data Lock Facility For continuous hands free operation Operating Temperature 0°C to 40°C(32°F to 104°F); <80% RH Storage Temperature -10°C to 60°C(14°F to 140°F); <70% RH Power Source DC 9V(6x1.5V Size “AA” battery or Equivalent) Dimension 200(L)x92(W) x 50(H)mm</p>	01		

	<p>Weight Approx 700g include Battery</p> <p>Accessories 4 sets Test kits ,4pcs iron rods, 6pcs battery, Hard Carrying Case, manual.</p> <p>Optional Accessories Re-Chargeable Battery and battery Charger</p> <p>Electrical Specifications Accuracies are Specified in the way :±(...% of reading +Digits) at 23°C ±523°C, below 80% RH.</p>			
58.	<p><u>Digital Insulation Tester</u></p> <p>(1)Low Power Consumed CMOS Double integral A/D Converter IC, auto Zero.</p> <p>(2)3-½ Digits LCD</p> <p>(3) Data Hold with Symbol</p> <p>(4) LED Indication shows high voltage is generated</p> <p>(5) Low battery indicated</p> <p>(6) Output short current is over 1.5mA.</p> <p>(7) Range: 0-20GΩ, Auto Range</p> <p>(8) Perfect Circuit Protect</p> <p>(9) Size of LCD: 67 x 28mm (Height of Character is 20mm)</p> <p>(10) Power : R6P (AA) (1.5V) 6</p> <p>(11) Size: 150 x 100 x 70mm</p> <p>(12) Weight: 680g (Including Batteries)</p> <p>(13)Environment</p> <p>Working Temperature: 0-40°, relative humidity<80%</p> <p>Storage Temperature: -10-50° relative humidity<85%</p> <p>Temperature to ensure precision: 23°C±5°C, relative humidity<75%</p> <p>TECHNICAL SPECIFICATION:-</p> <p>Accuracy : (% of reading + counts)</p> <p>Environment temperature : 23°C± 5°C, Relative Humidity, 75%</p> <p>Testing Rating Voltage 250V/500V/1000V/2500V</p> <p>Output Voltage 90-110% Testing Rating Voltage</p> <p>Range 0-20GΩ</p> <p>Resolution 0.001MΩ</p> <p>Accuracy 0-200MΩ (3% of reading ±5 significant digits) 200MΩ-10GΩ (5% of reading ±5 significant digits) 10GΩ-20GΩ (10% of reading ±10 significant digits)</p>	01		
59.	<p>11 KV pin Insulator</p> <ul style="list-style-type: none"> • Description 11KV B/M • Type of Insulators B Type • Nominal System Voltage (KV) 11 KV • Highest System Voltage (KV) 12 KV • Minimum failing load (KN) 5 KN • Standard specification to which material shall conform As per IS: 731. (1971) • Dimensions (mm) <ul style="list-style-type: none"> (a)Over all height 130 mm (b)Diameter of Insulator 120 mm (c)Groove diameter: <ul style="list-style-type: none"> (i)Top 98-104 (ii)Neck 73 (±) 3 • Creep age distance (mm) 230 mm • Dry power frequency 1 Min. Withstand Voltage (KV) 45 KV • Wet power frequency 1 Min. Withstand Voltage (KV) 35 KV • Dry power frequency flashover voltage (KV) 50 KV • Wet power frequency flashover voltage (KV) 40 KV • Power frequency puncture withstand voltage (KV) 105 KV • Impulse flashover voltage: (a)+ Ve (KV) 95 KV (b)- Ve (KV) 95 KV • Impulse withstand voltage (KV) 75 KV • Visible discharge test voltage (KV) 9 KV • Thimble: <ul style="list-style-type: none"> (i)Type of material. Lead (ii)Type As per IS-2486 (PT.II) 	01		

	Furnished drawing no./other relevant information if any. BPPL-12-R												
60.	<p>33 KV string insulator</p> <ul style="list-style-type: none"> • Normal working voltage 33KV(rms) • High system voltage 36KV(rms) • Visible Discharge Voltage dry PF 27KV(rms) • Dry Power frequency 1 Minute withstand voltage 95KV(rms) • Wet Power frequency 1 Minute withstand voltage 75KV(rms) • Power Frequency puncture withstand voltage 180KV(rms) • Impulse withstand voltage 170 KV • Minimum failing load 10KN • Minimum creepage distance 580mm • Colour of glaze Brown • Weight per unit To be submitted by bidder • Size of Insulator <ul style="list-style-type: none"> (a) Height To be submitted by bidder (b) Diameter To be submitted by bidder • Material of thimble Lead • Steel head Large head 18 Standard IS: 731/1971 • Tolerance Tolerance will be allowed as per IS:731/1971 or latest amendments <p>if any. 20 Drawing & Sample To be submitted by</p>	01											
61.	<p>Cable crimping tool General Specification Application Connector : Crimping Output 18 Tons, Weight 6.5 Kgs, Length 650mm With Dies 35 50 70 95 120 150 185 240 300 400 500 630</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="3" style="text-align: center;">Crimping Range</th> </tr> <tr> <th style="width: 33%;">JIS mm²</th> <th style="width: 33%;">DIN mm²</th> <th style="width: 33%;">AWG/MCM</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">38-630</td> <td style="text-align: center;">35-630</td> <td style="text-align: center;">2/0-1200</td> </tr> </tbody> </table>	Crimping Range			JIS mm ²	DIN mm ²	AWG/MCM	38-630	35-630	2/0-1200	01		
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38-630	35-630	2/0-1200											
62.	<p>NUMERICAL RELAY PANEL WITH ALL PROTECTION MICOM P 220 Numerical Relay Panel for Induction Motor Protection without Motor</p> <p>1. Relay specifications:</p> <ol style="list-style-type: none"> 1) Make – ALSTOM/AREVA 2) Type – MiCOM P 220 (3-Phase Type Numerical Relay) 3) Auxiliary supply voltage – 100-240 V AC (To provide main power to relay) 4) Nominal operating frequency – 50 Hz 5) Current rating – 1 and 5 A (To match with CT Secondary Rating) 6) Voltage rating – 110 V (To match with PT Secondary Rating) <ol style="list-style-type: none"> 1) Modbus : Communication available through the front port RS232 communication port. 2) Protection functions – <ul style="list-style-type: none"> - Thermal overload (True RMS currents base) - Short circuit protection - Unbalance protection based on negative sequence currents - Earth fault protection - Loss of load protection - Limitation of number of starts - Time between two starts <p>2. Test setup (3-Phase Type):</p> <ul style="list-style-type: none"> - Test setup is equipped with 3-phase protection scheme to simulate protection of 3-phase induction motor. - Test setup provides facility to simulate ON and OFF control as well as protection of the motor at two different locations (locally and remotely) like operation 	01											

	<p>of the motor used in any thermal power plant or industry.</p> <ul style="list-style-type: none"> - Test setup provides facility to simulate various types of faults by varying current passing through the relay using 3-phase motor in conjunction with a rheostat. 			
63.	<p>ELECTROMECHANICAL EARTH FAULT RELAY Characteristic of Inverse Time Earth Fault Relay</p> <p>Relay Specifications:</p> <ul style="list-style-type: none"> • Single Phase Electromechanical Relay (AREVA, SCHNEIDER, ALSTOM Make) – 1No. • Nominal Operating frequency: 50 Hz • Rated Current- 1 Amp • Plug setting range – 20 to 80% of 1 Amp in seven equal steps of 10% • Time Multiplier Setting range – 0.1 to 1 in steps of 0.05 • Operating time – 0 to 3 seconds at 10 times current setting • Auxiliary contacts – 2 N/O contacts (self reset type) • Type of mounting – flush mounting • Protection function provided by test setup – Single Phase Earth Fault protection <p>Test Setup (Single Phase Type):</p> <ul style="list-style-type: none"> • Test setup is equipped with single-phase type electromechanical relay connected in series with single-phase supply and a rheostat • Test setup provides facility to vary current using a variac and a rheostat • Test setup provides facility to measure current passing through the relay and time of operation of the relay using digital ammeter and digital timer • Test setup provides facility to make the circuit ON, OFF and RESET by push button <p>Panel should be made of 16 SWG MS Sheet with printed Poly Vinyl facia & lamination in front for better look. Institute logo should be printed on top left corner of the panel. Panel should highly laminated with Siemens gray powder coated with proper gasket fitted door & locking system at back side of panel. External connections are made according to the circuit diagram with the help of patch cords 4 mm banana male connector.</p> <p>PANEL CONSISTING OF FOLLOWING</p> <ul style="list-style-type: none"> • Single Phase Electromechanical Relay – 1No. • Single Phase Auto Transformer: Input-230 Volts, Output- 0-270 volts / 4 Amp. – 1No. • Auxiliary Relay OMRON make, 230 V, AC, 5 Amp, 4 change-over contacts with base mounting – 1 No. • Contactor: 230 V, Single phase, A.C., 4 NO contacts, Rating: 10 Amp – 1No. • Push Button (23mm size) 230V with NO contact – 1No. • Push Button (23mm size) 230V with NC contact – 2Nos. • Digital 20 Amp. A.C. Ammeter, Accuracy Class 1, Size: 96 X 48 mm. Aux. supply 230V AC – 1No. • Digital Timer with Reset Switch, Size: 96 X 48 mm. Aux. Supply 230V AC – 1No. • BTI 30 Terminals for easy connection & safety. • Wire Wound Rheostat 185 Ω / 2.2 Amp., must be wound on ceramic tube – 1No. • Panel works on Single Phase 230V \pm10%, 50Hz. Only, DP MCB 16Amp. (L&T, Hager, Anchor, Axioo make) – 1No. • All other Fuses, Wires, Patch cords, Switches, etc. 	01		

	<p>required of standard reputed make.</p> <ul style="list-style-type: none"> Operating manual provide in softcopy & hardcopy with detail experiment procedure, circuit diagram, observation table 			
64.	VCB WITH OPERATION SIMULATION PANEL SUPPLY OF 3.6KV, 630A, VACCUM CIRCUIT BREAKER ALONGWITH DEMONSTRATION ONLY	01		
65.	<p>PANEL FOR BIASED DIFFERENTIAL PROTECTION OF TRANSFORMER</p> <p><u>Biased Differential protection of Transformer Relay Specifications:</u></p> <p>Model: DTH- 31 (Electromechanical Relay) (Quantity – 1 No.)</p> <ul style="list-style-type: none"> Current rating – 1 Amp Frequency – 50 Hz Basic setting – 15% Basic setting – 15% , 40%, 45% rated current of 1 A Operating time – 45 ms Harmonic restraint facility Auxiliary supply – 30 V DC Contact arrangement – Two change-over self-reset tripping contacts Bias setting – 20 – 80% Dual Slope Mounting – Flush type <p>PANEL CONSIST OF FOLLOWING ITEMS AND MADE OF MS SHEET WITH PODER COTED & PV FACIA</p> <ul style="list-style-type: none"> Relay type DTH-31 Three-phase Transformer: 440/220 volts, 2 KVA, star-star connection Contact: 230 V, single phase, A.C., NO contacts Rating: 20 Amp Auxiliary relay: 230 V, single phase, A.C., 4 (NO+NC) contacts, rating: 5 Amp, with base mounting. C.T., 10/5 Amp, class 1, 25 VA C.T., 20/5 Amp, class 1, 25 VA P.T., 220/110 V, class 1, 50 VA Digital ammeter: 20 Amp, A.C., panel type Digital voltmeter: 500 V, A.C., panel type Push buttons: Colors (Red, Green, Yellow) Neon bulbs: 230 V, A.C. Terminals 	01		
66.	<p>Current Transformer (Metering)</p> <p>LT Current transformers for metering -ring or window type</p> <ol style="list-style-type: none"> Class of Accuracy - 0.5 Rated Burden - 5.00 VA Power Frequency Withstand Voltage - 3 kV Highest System Voltage - 433 V Nominal System Voltage 400 V Frequency - 50 Hz Supply System - 3 Ph. Solidly grounded Neutral <p>Transformation ratio specified from the following standard ratings as per requirement : Ratio 50/5 150/5 300/5 400/5 1000/5</p>	01		
67.	<p>BUCHHOLZ RELAY</p> <p><u>Technical specification:</u> Input: 0-230V AC</p> <p><u>Component specification:</u> 1 No. Transformer tank, 1 No. Pressure Pump, 1 No. Tripping circuit, 1 No. Alarm, 1 No. Tripping indication lamp 1 No. Reset switch, 1 No. Buchholz Relay, Oil valves and other necessary fixtures</p> <p><u>Working Principle</u> The Buchholz relay comprises hinged float and mercury switch assembly for both the Alarm and trip circuits. The</p>	01		

	<p>entire assembly is in an Oil-proof case having two glass windows. When the oil level decreases from the desired level, the float switch will start moving down and upon achieving the lowest level, it will touch the contact. In case of major faults the gases generated in transformer tank due to decomposing of oil rush towards conservator tank through Buchholz relay. These gases pressurize the oil and reduce the oil level in Buchholz relay and the float switch goes down to close the trip circuit. While the oil level is getting reduced, the alarm will get activated. If the pressure is higher in the transformer tank, the tripping circuit will be activated to close the mercury switch and trip the power to transformer.</p> <ul style="list-style-type: none"> -Digital AC Ammeter and Voltmeter -Gas actuated Buchholz Relay -Gas compressor for Relay -Duly wired built in control and protection unit -Built in power on indicator trip status indicator -Terminals for all the relay and necessary patch chords required to perform the experiment 																															
68.	<p>Lux meter.</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20%;">Display</td> <td>3½ Digit, 13mm LCD</td> </tr> <tr> <td>Range</td> <td>0-2000, 0-20000 & 0-50000 Lux (3 Ranges)</td> </tr> <tr> <td>Resolution</td> <td>0-2000(1 Lux), 0-20000(10 Lux) & 0-50000(100 Lux), (3 Ranges)</td> </tr> <tr> <td>Range Selection</td> <td>By Switch</td> </tr> <tr> <td>Accuracy</td> <td>(5% + 2 Digit)</td> </tr> <tr> <td>Sensor</td> <td>Photo diode with color correction Filter & COS Correction</td> </tr> <tr> <td>Sampling Time</td> <td>0.4 times / Seconds</td> </tr> <tr> <td>Zero Adjustment</td> <td>Internal</td> </tr> <tr> <td>Over Range</td> <td>"1" indicated</td> </tr> <tr> <td>Operating Humidity</td> <td>Less than 80% RH</td> </tr> <tr> <td>Battery</td> <td>9V Battery</td> </tr> <tr> <td>Data Hold</td> <td>Provided</td> </tr> <tr> <td>Cabinet Size</td> <td>131 x 70 x 25 mm</td> </tr> <tr> <td>Carrying Case</td> <td>Provided</td> </tr> </table>	Display	3½ Digit, 13mm LCD	Range	0-2000, 0-20000 & 0-50000 Lux (3 Ranges)	Resolution	0-2000(1 Lux), 0-20000(10 Lux) & 0-50000(100 Lux), (3 Ranges)	Range Selection	By Switch	Accuracy	(5% + 2 Digit)	Sensor	Photo diode with color correction Filter & COS Correction	Sampling Time	0.4 times / Seconds	Zero Adjustment	Internal	Over Range	"1" indicated	Operating Humidity	Less than 80% RH	Battery	9V Battery	Data Hold	Provided	Cabinet Size	131 x 70 x 25 mm	Carrying Case	Provided	01		
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69.	<p>Electric toaster.</p> <p>Product description: control panel : integral type at r. H. type : deck resting type. outer body of ss/ms & inner body of al. Orss. heating element at top & bottom. temperature control by 3 heat control switch.</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">capacity</th> <th style="text-align: left;">kw</th> </tr> </thead> <tbody> <tr> <td>6-8 slice</td> <td>1. 5</td> </tr> <tr> <td>12 slice</td> <td>2. 0</td> </tr> <tr> <td>16 slice</td> <td>2. 5</td> </tr> <tr> <td>24 slice</td> <td>3</td> </tr> <tr> <td>32 slice</td> <td>3. 5</td> </tr> </tbody> </table>	capacity	kw	6-8 slice	1. 5	12 slice	2. 0	16 slice	2. 5	24 slice	3	32 slice	3. 5	01																		
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32 slice	3. 5																															
70.	Electric Oven	01																														

	<p>Warranty Summary 2 years manufacturer warranty Color Family Silver Power Features AC 230 V/50 Hz Capacity 18 L, Cooking Modes Grill, Unique Thing OTG Microwave Oven, Additional Features Thermostatic temperature control, Product Depth (cm) 0 Product Height (cm) 11.4, Product Width (cm) 10.6 Performance Features 1380 w heating element Control Type Mechanical Knob Interior Material Stainless Steel</p> <p>Additional Features</p> <table border="0"> <tr> <td>Unique Thing</td> <td>OTG Microwave Oven</td> </tr> <tr> <td>Additional Features</td> <td>Thermostatic temperature control</td> </tr> </table>	Unique Thing	OTG Microwave Oven	Additional Features	Thermostatic temperature control			
Unique Thing	OTG Microwave Oven							
Additional Features	Thermostatic temperature control							
71.	<p>Electric water heater. Electric water heater.</p> <ul style="list-style-type: none"> • Wattage: 1500 watts • To get hot water, simply dip the immersion water heater rod in a tub, bucket or container of water and switch on the rod. Ensure that the water level is kept between the specified 'minimum' and 'maximum' level only before turning on the rod • Anti-corrosive Material • Hairpin tubular elements • Consumes less energy • Best heating option at lowest cost • Warranty: 1 year on product 	01						
72.	<p>ANEMOMETER As per attached drawing and specifications</p>	01						
73.	<p>LUX METER As per attached drawing and specifications</p>	01						
74.	<p>TURBINE FLOW METER As per attached drawing and specifications</p>	01						
75.	<p>THERMOMETER (CONTACT / NON-CONTACT TYPE) As per attached drawing and specifications</p>	01						
76.	<p>TACHOMETER (CONTACT / NON-CONTACT TYPE) As per attached drawing and specifications</p>	01						
77.	<p>PRESSURE GAUGES DIGITAL PRESSURE METER As per attached drawing and specifications</p>	01						
78.	<p>AMMETER (AC / DC) Range : 1A to 30A (Any One Single Range) Moving Coil AC Rectifier Type Portable Meter</p>	01						
79.	<p>VOLTMETER (AC / DC) MANDATORY Range : 0-7.5, 15,30, 60, 75, 125, 150, 300, 500, 600V (Any One Single Range) Moving Coil AC Rectifier Type Portable Meter</p>	01						
80.	<p>POWER FACTOR METER, PORTABLE TYPE (Single Phase) (Single Phase) Range : 0.5/1A, 1/2A, 2.5/5A, 5/10A, 10/20A 62.5/125/250V, 75/150/300V, 125/250/500V,50/300/600V</p>	01						
81.	<p>TONG TESTER (DIGITAL AC/DC CLAMP METER) As per attached drawing and specifications</p>	01						
82.	<p>EARTH TESTER As per attached drawing and specifications</p>	01						
83.	<p>ENERGY METER Single Phase Energy 230V, 30A Three Phase Energy 440V, 60A</p>	01						
84.	<p>TRI-VECTOR METER As per attached drawing and specifications</p>	01						
85.	<p>STROBOSCOPE As per attached drawing and specifications</p>	01						

86.	LEAK DETECTOR REFRIGERANT GAS LEAKAGE DETECTOR As per attached drawing and specifications	01		
87.	Home Electrical Wiring Training System Technical specification:- Mains Supply : 230V AC \pm 10%, 50Hz Energy Meter Specifications Meter Constant : 1600 impulses /kWh Display Counter : 100 impulses /kWh Single Phase MCB : 6A Load specifications Tube Light : 20W, 220-240V Ceiling Fan : 50W, 220-240V Maximum Load Current : 4A Dimensions (mm) : W 900 x D 450 x H 670 (panel) W 250 x D 285 x H 340 (motor) Weight Panel : 26kg (approximate) Motor : 5kg (approximate) SCOPE OF LEARNING -To study the connection /measurement of - Energy Meter and Consumer Unit – Voltage - Current - MCB wiring - Tube Light wiring - Two-Way Switch wiring - Short Circuit Fault - Switchboard - Ceiling Fan - Series-Parallel Operation on load Features - Equipped with Multifunction meters with KWH display - Complete practical learning for wiring in Houses - Test points are provided to measure voltage at different points - Provided with house hold appliances like fan - Designed by considering all the Safety Standards - Diagrammatic representation for the ease of connections	01		
88.	Electrical Safety Demonstrator Features:- <ul style="list-style-type: none"> • Designed, considering all safety standards. • Exclusive design and attractive presentation of each block. • This trainer represents many essential safety precautions. • Unique demonstration & importance of Earthing. • Real time appearance of MCB to help the students to understand its mechanical arrangement. • Demonstration of Fuse in very easy way. • Provided with a manual containing coloured graphical representation of many safety standards and with very interesting activities which are to be performed by students. Purpose:- <ul style="list-style-type: none"> • The purpose of this board is to increase student's awareness of : • How to use the electricity safely in home and laboratories • The dangers associated with power lines and sub-stations. • The effects of electrocution on the body. • Strategies to avoid electrical accidents. Scope of Learning:- <ul style="list-style-type: none"> • Performing different electrical activities to avoid electrical hazards. • Study of importance of Earthing in any electrical device. • Study of role of Fuse in any electrical or electronic circuit. • Study of importance and working of Miniature Circuit Breaker (MCB). 	01		
89.	DOL STARTER Features:- <ul style="list-style-type: none"> • Designed, considering all safety standards. 	01		

	<ul style="list-style-type: none"> • Exclusive design and attractive presentation of each block. • This trainer represents many essential safety precautions. • Unique demonstration & importance of Earthing. • Real time appearance of MCB to help the students to understand its mechanical arrangement. • Demonstration of Fuse in very easy way. • Provided with a manual containing coloured graphical representation of many safety standards and with very interesting activities which are to be performed by students. <p>Purpose:-</p> <ul style="list-style-type: none"> • The purpose of this board is to increase student's awareness of : • How to use the electricity safely in home and laboratories • The dangers associated with power lines and sub-stations. • The effects of electrocution on the body. • Strategies to avoid electrical accidents. <p>Scope of Learning:-</p> <ul style="list-style-type: none"> • Performing different electrical activities to avoid electrical hazards. • Study of importance of Earthing in any electrical device. • Study of role of Fuse in any electrical or electronic circuit. Study of importance and working of Miniature Circuit Breaker (MCB). 			
90.	<p>STAR DELTA STARTER</p> <ul style="list-style-type: none"> • Star Delta Motor Starter consists of 3 EK-1 contactors, 1 thermal overload relay and 1 Star Delta timer. • Starter with double break bounce free contact gives long life and trouble free operation. This will save your motor from damage done by power problems. • Silver tips of contacts are made of advance powder metallurgy process gives robustness and long life. • Wide range of coil operating voltage range is available. • The enclosure is made of high quality sheet steel and its special design and powder coating makes starter more robust against adverse climatic conditions. • Earthing screws are provided to save user from electric shock. <p>Specification:-</p> <ul style="list-style-type: none"> • Range: Up to 15HP • Type: EK-1 (3 Phase 50Hz) • Current ratings : 15 A Thermal, 11A, AC 3 at 415 VAC 50Hz • Temperature Range : -5 °C to 55 °C • Degree of protection : IP42 	01		

All the suppliers are directed to scanned the following documents:-

- GST Registration.
- Latest Solvency Certificate 40% of Estimate cost within one year from the last date of tender Uploading.
- PAN Card.
- Tender EMD in form of FDR (Jointly) valid for 6 months i.e. (180 days) from the last date of tender uploading.
- Tender Fee in form of Demand Draft (Non Refundable).
- Experience certificate.
- Registration Certificate
- Labour License Registration.
- The documents prescribed in the NIT to be submitted along with bid.
- For supply items Authorized Dealers, Vendors, Suppliers, etc. can also bid for Tender.
- For Electrical works Electrical license is mandatory.

If the scanned copy of the above documents are not visible during opening of the tender the tender shall not be downloaded.

Quantities may vary according to the requirement.

TERMS & CONDITIONS

1. Eligibility:
 - i. The bidder should be registered under Sales Tax/VAT, GST.
 - ii. The bidder should have their support center at Diu or nearby.
2. Applicable Taxes will be deducted from payment as per applicable laws.
3. The Earnest Money Deposit (EMD) of Rs. 1,27,000/- (Rupees One Lakh Twenty Seven Thousand Only) is payable in the form of FDR/Demand Draft issued by Scheduled Bank in favor of **Daman & Diu Society for Technical Edu. & Higher Edu. (CENT)** payable at Diu. Tender received without Earnest Money Deposit will be treated as invalid.
4. The rate(s) quoted should be strictly for free door delivery at Diu Districts respectively & will be valid and operative for supply order issued on or before.
5. The rates should be quoted inclusive of all taxes, installation & commissioning charges.
6. No extra charge for packaging, forwarding and insurance, transportation etc. will be paid in addition to the rates quoted.

Financial Bid Cover.

1. The rates should be quoted only for the items specified in the list of requirement and should be for the items of given special make /manufacture.
2. Rates quoted for items other than the required specification/ make/manufacture may not be considered.
3. The decision of the Principal, Govt. Polytechnic-Diu for acceptance/rejection of any articles supplied including the decision for equivalent specifications, standard and quality etc. of articles shall be final.
4. The Purchase Committee will open the Tenders online in presence of tenderer(s) or their representatives, if any presents in the Office of the Principal, Govt. Polytechnic-Diu on **17/10/2019 at 03:00 pm.**
5. The Principal, Govt. Polytechnic-Diu will be at liberty to accept the tender for the entire quantity or the part thereof at the rates submitted by the Bidder or at reduced rate during the negotiations if any.
6. Rates tendered/offered in response to the concerned Tender Notice by the successful bidder shall be considered as acceptance of all above terms and conditions for supply for all legal purpose.
7. (a) The Successful Tenderer will have to pay an amount equal to 05% of the total value of articles mentioned in the supply order within 10 days from the date of the order as Security Deposit in form of FDR in favor of **Daman & Diu Society for Technical Edu. & Higher Edu. (CENT) for one year.** The successful bidder has to submit performance bank guarantee(here after referred to as Security Deposit) from any nationalized bank of **05% amount of his final offer towards performance security within 15 days from the date of issue of supply order for the duration of warranty period.**
(b) Non-receipt of Security Deposit within stipulated time limit will result in automatic cancellation of the order for supply without any intimation.
8. The Earnest Money(s)/Security Deposit(s) paid by the tenderer(s) earlier against any tender(s) or supply order(s) is/are not adjustable with Earnest Money or Security Deposit required as per conditions of this tender.
9. All bills should be in Triplicate and should invariably mention the number and date of supply order.
10. All bills for amount above Rs. 5,000/- should be pre-receipted on a Revenue Stamp of proper value. Bills for amount exceeding Rs. 5,000/- not pre-receipted on Revenue Stamp of proper value will not be accepted for payment.
11. Each bill in which Value Added Tax is charged must contain the following certificate on the body of the bill.
"CERTIFIED that the goods on which Value Added Tax has been charged have not been exempted under the Central Sale Tax Act or the Rules made there under and the amount charged on account of Value Added Tax on these goods is not more than what is payable under the provisions of relevant Act or Rules made there under".
12. In respect of any dispute given rise to the legal proceedings between the parties, the courts at Daman and Diu & DNH shall alone have the jurisdiction.
13. The tender can be submitted up-to **12:00 pm 17/10/2019** and shall be opened on same day at 03:00 hrs if possible in the office of the Principal, Govt. Polytechnic-Diu or in the office of the Hon'ble Collector, Diu in the presence of the Purchase committee and Tenderer(s) or their representative(s) if present.
14. Items should be covered by 'onsite warranty' for a period of One year (or mentioned in specification) from the date of installation and bidder must have service/support location at local level i.e. Diu or nearby.
15. The designated committee will check quality of the **Electrical Engineering Equipment's** supplied before installation at Principal, Govt. Polytechnic-Diu.

Sd/-
(N. G. Gajwani)
Principal
Govt. Polytechnic-
Diu.