MAHARSHI DAYANAND UNIVERSITY, ROHTAK
UNIVERSITY INSTITUTE OF ENGINEERING & TECHNOLOGY
TENDER NOTICE

Sealed tenders super scribing as “Tender for Electrical Engineering Equipments” are invited for the purchase of various lab equipments/items required for UIET latest by 17/11/2014 along with earnest money equal to 2% of involved value in the shape of DD in favor of Finance Officer, MDU, Rohtak. Detailed specifications of items, terms and conditions may be obtained from the office of the department of Electrical Engineering & Technology on any working day or can be downloaded from the website of University www.mdurohtak.com The tender received will be opened on 18/11/2014 at 2.30 P.M. in the Department of Electrical Engineering & Technology.

Registrar

Maharshi Dayanand University, Rohtak

TERMS AND CONDITIONS OF THE TENDERS FOR THE SUPPLY OF LAB EQUIPMENTS TO UIET

1. The tender received without earnest money, or after the due date shall not be entertained except with the special approval of the Registrar.
2. Supplies shall be executed within the time specified in the supply explaining reasons/circumstances due to which time limit could not be adhered to. In the event of the supplier failing to supply the material within time, he shall be liable to pay as compensation an amount equal to one percent or such small amount as the Registrar may decide on the said amount of the contract, for every day that the quantity remains incomplete, provided that the entire amount of compensation shall not exceed 10 percent of the total amount of contract. An appeal against these orders shall however lie with the Vice-Chancellor whose decision shall be final.
3. In case the supplier backs out of his contract, the earnest money deposited by him shall be forfeited besides any other action as may be considered necessary by the Vice-Chancellor.
4. All the charges including packing, forwarding and installation, taxes and other levies should be specified in the tender. The charges etc. not specified in the tender shall not be paid.
5. The quantity of material/supplies shall be subject to increase or decrease on the tendered rates. This increase or decrease shall be communicated by the University within …… days of acceptance of the tender.
6. Supplies shall be made as per the schedule and within such time as is indicated in the supply order.
7. Guarantee period for equipment/machines should be clearly specified.
8. 100% payment will be made on receipt and inspection of goods to ensure the specifications and their good conditions. Or
   90% payment will be made through State Bank of India, M.D. University, Rohtak if the documents are received through Bank. Balance payment of 10% will be made on receipt of materials/goods and their inspection by the University Inspection Unit. This payment is subject to the acceptance of goods by the Inspection Unit.
9. The rates accepted by the University shall be applicable upto …….. and the supplier shall have to make supply during the period as and when required.
10. The tenders shall be opened by the Committee in the presence of contractor/supplier and the committee reserves the right for negotiation thereafter if considered necessary.
11. Demonstration of the items is required before the placing the supply order.
12. The Registrar reserves the right to reject or accept any offer without assigning any reason.
13. All disputes subject to Rohtak Jurisdiction.

DIRECTOR (UIET)

Data Communication lab

S.no.	Name of item	Specification	Qty	
01.	To study Different types of Transmission media, & serial & Parallel interface	Data Communication Trainer : Pin to pin study of serial and parallel port Different methods of serial & Parallel communication Wireless communication (IR/RF) Full duplex fiber optics communication FSK modem communication PC-PC Serial Communication using RS-232 cable Software & hardware based data flow controls Study of Protocols of parallel port & Serial Port High speed data transmission Visual indication by LED's for displaying data, status & control pins of port Printer interface ;Windows based operating software Switch faults in both hardware & software Serial Communication : Two RS 232 ports Parallel Communication : Two 25 pin LPT ports Transmitter : Two numbers. Fiber optic LED's having Peak wave length of emission 660nm Receiver : Two numbers. Fiber Optic photo detector Core type : Step indexed multimode PMMA plastic cable Baud rate : 115200 bps ; Fiber length : 0.5 & 1m Infrared Transmitter : IR LED Infrared Receiver : Direct TTL output Baud rate : 2400 bps Carrier Frequency **:** 38 KHz/40KHz Modem Communication : Modem type : Data ; Interface type : Serial-RJ 11 Connector RJ 11 Connector : Two ; Modulation : FSK Modulation Mark Frequency : 340 KHz ; Space Frequency : 280 KHz Demodulation : PLL Detector Mark Frequency : 340 KHz ; Space Frequency : 280 KHz Baud Rate : 57600 bps ; Test Points : 74 nos Accessories to be supplied : RS 232 Serial cable-2nos. ; DB25 Parallel Port cable-2nos. RJ11 - RJ11 Connector cable-1no. ;Plastic Fiber cable-2nos. Power Supply-1no. ;Patch cords16” (2mm)-18nos. Patch cords8” (2mm)-10nos.;Mains cord-1no. Should be supplied with : 70 MHz /IGs/s RTS/50 GS/s ETS 2 Channel Digital Storage oscilloscope ;Memory: 2 Mpts Display : 7 inches wide Colour TFT LCD Interface: USB Host & USB Device& RS 232 interface. 32 automatic measurements ,FFT & Math & Pass Fail function;20 setups & 20 waveforms storage Triggering Modes : Alternate / Edge /Pulse / Slope / Video. Split screen for FFT, Alternate & Delayed time base. 3 3.4 Digit DMM with embedded holster, Micro Ampere AC & DC current range ;Capacitance : 40nF to 100µF Frequency 10 HZ to 10 MHz ;Duty Cycle : 01. to 99 %. Display : LCD 63X31mm Backlit Accessories :Test leads, Test clips & manuals. Other Functions : Diode test, continuity ,relative measurement Data hold, sleep mode, low battery Indication	01	

S.no.	Name of item	Specification	Qty	
02	To study To Study !6 Quadrature Amplitude Modulation/Demodulation	**16 QAM Trainer .** Modulation: 16-QAM Modulation with I & Q Channel Constellation (Vector / XY) View User Selectable Hardware / Real-Time Software Mode With Real-time Software, User should be able to control as well as analyze Digital signals, Analog signals, Mixed signals and XY mode Provision for User selectable step variable clock frequency Provision for User Selectable 8 / 16 / 32 / 64 bit Data Digitally Synthesized Sine & Cosine Wave of Maximum 19.2KHz. External Trigger Out ; More than 25 Test Points On board Digitally Synthesized Sine and Cosine wave Generator with Variable Step Frequencies On board Clock Generator with Step Variable Frequencies (150Hz, 300Hz, 600Hz, 1.2 KHz, 2.4 KHz, 4.8 KHz and 9.6 KHz and 19.2 KHz). On board Data generator with Step Variable data length (8, 16, 32, 64bits) Encoding Technique (4 bits encoding with Symbol Mapper, Gray to Binary Encoder) Modulation Technique (16QAM Modulation with I & Q Channel) Numerical Control Oscillator (on board NCO for demodulator) Decoding Techniques (4 bits decoding with Symbol Demapper, Binary to Gray Decoder) Power Supply : 110-220 V ±10%, 50 Hz Parallel Port Mode: Standard Port Type Accessories: Software CD ;Parallel Port Cable with two 25 pin male to male connectors Cabinet Housing : Enclosed on a plastic box with a cover No components on the top of the Trainer only block diagram to be provided Should be supplied with : 70 MHz /IGs/s RTS/50 GS/s ETS 2 Channel Digital Storage oscilloscope ;Memory: 2 Mpts Display : 7 inches wide Colour TFT LCD Interface: USB Host & USB Device& RS 232 interface. 32 automatic measurements ,FFT & Math & Pass Fail function;20 setups & 20 waveforms storage Triggering Modes : Alternate / Edge /Pulse / Slope / Video. Split screen for FFT, Alternate & Delayed time base. 3 3.4 Digit DMM with embedded holster, Micro Ampere AC & DC current range ;Capacitance : 40nF to 100µF Frequency 10 HZ to 10 MHz ;Duty Cycle : 01. to 99 %. Display : LCD 63X31mm Backlit Accessories :Test leads, Test clips & manuals. Other Functions : Diode test, continuity ,relative measurement Data hold, sleep mode, low battery Indication	01	

S.no.	Name of item	Specification	Qty	
03	**Wireless LAN Trainer**	PC to PC communication with IEEE 802.3 Peer to Peer network ,Client - Server network Design of Star topology using 100Base-Tx Design of Bus topology using 10Base-2 Design of Ring topology using DB9 Simulation of Distance Vectors and Link State Algorithms Socket Programming exercise for LINUX; Encryption/Decryption Technique ;Facility to send any file over LAN. Detailed introduction to TCP/IP Model (4 Layer Model) Video Tutorials for software operation Network design using RJ45 & DB9 connectors Socket programming and processing Wireless LAN with 803.11b/g Various LAN Protocols ; Data rate up to 100Mbps Variable packet size & Variable packet delay Error generation (Manual and Auto) Color coded real time graphical representation of entire transmission & reception Graphical Analysis of LAN performance with various parameters and protocols Save / Print option for graphs ,User friendly software Switch faults in both hardware & software Exhaustive course material & references Hardware : PC to PC using RJ-45 Connector ,Star topology using RJ45 Connector ,Bus topology by using end terminator Ring topology using DB9 Connector Data transmission speed: 10/100 Mbps 4 wireless Nodes Software: Star, Bus & Ring selection Protocols: CSMA/CD, CSMA/CA, Stop N Wait, Go back to N, Selective repeat, Sliding Window, Token Bus, Token Ring Packet size: 128, 256, 512, 1024, 2048, 4096, 8192, 16384 Inter Packet delay: 1000 – 5000 ms Error generation: Acknowledgment lost, bad packet, auto error generation Graphical Representation: Real time Graphic representation of data on s/w screen with packet details Network details: Indication of computer name, IP address, MAC address, Port number, status of network. Network & protocol analysis: Indication of packet serial number, file name, file size, file number, receiver name, receiver IP address , total packets, packet length, time out, protocol, topology, receiver, MAC address, port number, file send start time, file sent completion time, transmission time data rate(Mbps),percentage error. Trainer should have no components on the top of the board & should be encased in a plastic moulded case with cover on the top. Should be supplied with : 70 MHz /IGs/s RTS/50 GS/s ETS 2 Channel Digital Storage oscilloscope ;Memory: 2 Mpts Display : 7 inches wide Colour TFT LCD Interface: USB Host & USB Device& RS 232 interface. 32 automatic measurements ,FFT & Math & Pass Fail function;20 setups & 20 waveforms storage Triggering Modes : Alternate / Edge /Pulse / Slope / Video. Split screen for FFT, Alternate & Delayed time base. 3 3.4 Digit DMM with embedded holster, Micro Ampere AC & DC current range ;Capacitance : 40nF to 100µF Frequency 10 HZ to 10 MHz ;Duty Cycle : 01. to 99 %. Display : LCD 63X31mm Backlit ;Accessories :Test leads, Test clips & manuals. Other Functions : Diode test, continuity ,relative measurement Data hold, sleep mode, low battery Indication	01	

S.no.	Name of item	Specification	Qty	
04	QPSK Modulation & demodulation Trainer	**Data Formatting and Carrier Mod/Transmitter Trainer** On-board Unipolar to Bipolar conversion.& data inverter. On-board 8-bit Data Source & Clock Source Data formats : NRZ (L), NRZ (M), RZ, AMI, RB, Biphase(Manchester), Biphase (Mark). Carrier modulation : ASK, FSK, PSK, DPSK, QPSK On-board carrier : Sine waves synchronized to transmitted data at 1.6 MHz, 960 KHz, (0 deg. phase) 960 KHz, (90 deg. phase) Test Points : 43 or more ; Interconnection: 2 mm ; Sufficient Nos of stackable patch cords . Mains Supply : : 110-220 V AC ±10%, 50Hz Accessories : e Manual, Set of patch cord, Power supply. **Data Reformatting and Carrier Demodulation Receiver Trainer** On - Board Biphase Clock recovery , data squaring & Differential decoder circuit.On - Board 4th Order Butterworth filters & 8 bit Data Receiver Input : From Data Formatting and Carrier Modulation/Transmitter Trainer Data formats: 7 different data reconditioning formats NRZ (M), NRZ(L) ,RZ, AMI, RB, Biphase (Manchester), Biphase (Mark). Carrier Demodulation : ASK - Rectifier Diode ,FSK PLL Detector PSK /DPSK- Square Loop Detector QPSK -Fourth Power Loop Detector Biphase Clock Recovery : By PLL Test points: 35Nos ; Interconnection: 2 mm sockets & Sufficient Nos of stackable patch cords Mains Supply : : 110-220 V AC ±10%, 50Hz Accessories : e Manual, Set of patch cord, Power cord. Cabinet Housing : Enclosed on a plastic box with a cover No components on the top of the Trainer only block diagram to be provided Software : Should be supplied with teaching & simulation software for digital communication. Theory Part on digital communication should also be covered in software. Software should be a licensed version & should be supplied with hardware lock. Should be supplied with : 70 MHz /IGs/s RTS/50 GS/s ETS 2 Channel Digital Storage oscilloscope ;Memory: 2 Mpts Display : 7 inches wide Colour TFT LCD Interface: USB Host & USB Device& RS 232 interface. 32 automatic measurements ,FFT & Math & Pass Fail function;20 setups & 20 waveforms storage Triggering Modes : Alternate / Edge /Pulse / Slope / Video. Split screen for FFT, Alternate & Delayed time base. 3 3.4 Digit DMM with embedded holster, Micro Ampere AC & DC current range ;Capacitance : 40nF to 100µF Frequency 10 HZ to 10 MHz ;Duty Cycle : 01. to 99 %. Display : LCD 63X31mm Backlit ;Accessories :Test leads, Test clips & manuals. Other Functions : Diode test, continuity ,relative measurement Data hold, sleep mode, low battery Indication	01	

Electric drive lab

S.no.	Name of item	Specification	Qty	
1.	To study Single phase bridge converter drive & study ramp comparator firing circuit for same	Power Scope for isolation measurement Provided with DC Shunt Motor Three Phase low voltage Supply for gate circuit Three Phase Firing Circuit provided with pulse isolation Test terminals provided to analyze the waveforms Diagrammatic representation of circuits Motor Specification Type : DC Shunt Motor ; Rating : 0.5HP ; RPM : 1500 Power Scope : Isolated 1500Vmax SCR Rating : SCR TYN616, 600V/16A Diode Rating : 6A10, 1000V/6A ; Firing Angle Control : 30° to 180° Meter : DC Voltmeter : 300V ;DC Ammeter : 5A Single Phase MCB : 2A (SPN) ;Mains : 230 V± 10 % ,50 Hz Should be supplied with : 70 MHz /IGs/s RTS/50 GS/s ETS 2 Channel Digital Storage oscilloscope ;Memory: 2 Mpts Display : 7 inches wide Colour TFT LCD Interface: USB Host & USB Device& RS 232 interface. 32 automatic measurements ,FFT & Math & Pass Fail function;20 setups & 20 waveforms storage Triggering Modes : Alternate / Edge /Pulse / Slope / Video. Split screen for FFT, Alternate & Delayed time base. 3 3.4 Digit DMM with embedded holster, Micro Ampere AC & DC current range ;Capacitance : 40nF to 100µF Frequency 10 HZ to 10 MHz ;Duty Cycle : 01. to 99 %. Display : LCD 63X31mm Backlit Accessories :Test leads, Test clips & manuals. Other Functions : Diode test, continuity ,relative measurement Data hold, sleep mode, low battery Indication	01	
2.	To study Single phase Half converter drive & study ramp comparator firing circuit for same	Power Scope for isolation measurement Provided with DC Shunt Motor Three Phase low voltage Supply for gate circuit Three Phase Firing Circuit provided with pulse isolation Test terminals provided to analyze the waveforms Diagrammatic representation of circuits Motor Specification Type : DC Shunt Motor ; Rating : 0.5HP ; RPM : 1500 Power Scope : Isolated 1500Vmax SCR Rating : SCR TYN616, 600V/16A Diode Rating : 6A10, 1000V/6A Firing Angle Control : 30° to 180° Meter : DC Voltmeter : 300V ;DC Ammeter : 5A Single Phase MCB : 2A (SPN) Mains supply: 230 V± 10 % ,50 Hz Should be supplied with : 70 MHz /IGs/s RTS/50 GS/s ETS 2 Channel Digital Storage oscilloscope ;Memory: 2 Mpts Display : 7 inches wide Colour TFT LCD Interface: USB Host & USB Device& RS 232 interface. 32 automatic measurements ,FFT & Math & Pass Fail function;20 setups & 20 waveforms storage Triggering Modes : Alternate / Edge /Pulse / Slope / Video. Split screen for FFT, Alternate & Delayed time base. 3 3.4 Digit DMM with embedded holster, Micro Ampere AC & DC current range ;Capacitance : 40nF to 100µF Frequency 10 HZ to 10 MHz ;Duty Cycle : 01. to 99 %. Display : LCD 63X31mm Backlit Accessories :Test leads, Test clips & manuals. Other Functions : Diode test, continuity ,relative measurement Data hold, sleep mode, low battery Indication	01	

S.no.	Name of item	Specification	Qty	
3	To study Single phase AC motor control drive by anti parallel SCR & DIAC –TRIAC configuration.	Power Scope for isolation measurement Provided with Three Phase Induction Motor Three Phase low voltage Supply for gate circuit Three Phase Firing Circuit provided with pulse isolation Test terminals provided to analyze the waveforms Diagrammatic representation of circuits Three Phase MachineType : Squirrel Cage Induction Motor Rated Power : 1HP ; Rated Voltage : 415V Power Scope : Isolated 1500Vmax SCR Rating : SCR TYN616, 600V/16A Firing Angle Control : 30° to 150° Meters Used : AC Voltmeter : 0-500V ;AC Ammeter : 0-5A Three Phase MCB : 5A (TPN) ;Mains : 415 V± 10 % ,50 Hz Should be supplied with : 70 MHz /IGs/s RTS/50 GS/s ETS 2 Channel Digital Storage oscilloscope ;Memory: 2 Mpts Display : 7 inches wide Colour TFT LCD Interface: USB Host & USB Device& RS 232 interface. 32 automatic measurements ,FFT & Math & Pass Fail function;20 setups & 20 waveforms storage Triggering Modes : Alternate / Edge /Pulse / Slope / Video. Split screen for FFT, Alternate & Delayed time base. 3 3.4 Digit DMM with embedded holster, Micro Ampere AC & DC current range ;Capacitance : 40nF to 100µF Frequency 10 HZ to 10 MHz ;Duty Cycle : 01. to 99 %. Display : LCD 63X31mm Backlit Accessories :Test leads, Test clips & manuals. Other Functions : Diode test, continuity ,relative measurement Data hold, sleep mode, low battery Indication	01	
4	Speed control of FHP synchronous motor using Three phase Cyclo-converter . to observe current and voltage waveform at different frequency	Salient pole three phase FHP (60W/100V/phase) synchronous motor .The panel must have Three phase full bridge cylcoconverter comprising 36 SCR's (600V/12A) , Three step down transformers(fractional KVA) in star-delta formation. Variable frequency control potentiometer (8-25Hz) Cosine wave modulation, Control circuitry based on precision comparators. High frequency carrier gated pulse isolation for thyristors. Three low frequency reference signals(sine)generator. The panel must have digital Backlit LCD display for speed. The panel must have observation sockets should provided for reference wave, output voltage & current for study on CRO. Motor must be fitted on insulated board with speed sensor. Block diagram should be printed on panel an supplied with necessary patch cords to conduct the expt.BS 10 type sockets should be used for safety. Should be supplied with : 70 MHz /IGs/s RTS/50 GS/s ETS 2 Channel Digital Storage oscilloscope ;Memory: 2 Mpts Display : 7 inches wide Colour TFT LCD Interface: USB Host & USB Device& RS 232 interface. 32 automatic measurements ,FFT & Math & Pass Fail function;20 setups & 20 waveforms storage Triggering Modes : Alternate / Edge /Pulse / Slope / Video. Split screen for FFT, Alternate & Delayed time base. 3 3.4 Digit DMM with embedded holster, Micro Ampere AC & DC current range ;Capacitance : 40nF to 100µF Frequency 10 HZ to 10 MHz ;Duty Cycle : 01. to 99 %. Display : LCD 63X31mm Backlit Accessories :Test leads, Test clips & manuals. Other Functions : Diode test, continuity ,relative measurement Data hold, sleep mode, low battery Indication	01	

S.no.	Name of item	Specification	Qty	
5	Speed control of FHP synchronous motor using Three phase VSI Inverter . To observe current and voltage waveform at different frequency.	Salient pole three phase FHP (60W/100V/phase) synchronous motor . The panel must have Three phase bridge inverter comprising 6 VMOS FET (600V/8A), with polarized snubbers. Isolation transformers (fractional KVA). Variable frequency control potentiometer (10-100hz) . Digital control circuitry to generate three 120 degree displaced reference signals for power circuit . Variable DC source using controlled rectification for constant V/F ratio. The panel must have digital Backlit LCD display for speed. The panel must have observation sockets should provided for reference signals, drive signal, output voltage & current for study on CRO. Motor should be fitted on insulated board with speed sensor. BS 10 type sockets should be used for safety. Block diagram should be printed on panel an supplied with necessary patch cords to conduct the expt. Should be supplied with : 70 MHz /IGs/s RTS/50 GS/s ETS 2 Channel Digital Storage oscilloscope ;Memory: 2 Mpts Display : 7 inches wide Colour TFT LCD Interface: USB Host & USB Device& RS 232 interface. 32 automatic measurements ,FFT & Math & Pass Fail function;20 setups & 20 waveforms storage Triggering Modes : Alternate / Edge /Pulse / Slope / Video. Split screen for FFT, Alternate & Delayed time base. 3 3.4 Digit DMM with embedded holster, Micro Ampere AC & DC current range ;Capacitance : 40nF to 100µF Frequency 10 HZ to 10 MHz ;Duty Cycle : 01. to 99 %. Display : LCD 63X31mm Backlit Accessories :Test leads, Test clips & manuals. Other Functions : Diode test, continuity ,relative measurement Data hold, sleep mode, low battery Indication	01	
6	To obtain speed –torque characteristics of 1 H.P DC series motor in Open/close loop using IGBT/MOSFET and to observe current and voltage waveform at different duty factors	DC series motor should be mounted upon iron frame with brake & pulley arrangement(1H.P.) .DC source must have power rectifier with smoothing filter, capacitor(high ripple rated) Chopper (quad A) drive should be based upon MOSFET (600V/80A) or same rated IGBT with snubber circuit. The panel must have switched facility to convert open/close loop drive (0.4 to 0.6) ;Freewheeling diode 1200V/16A Chopper duty cycle should be 10 – 90% Soft start , Overload and current limit with indication. The panel must have Digital Backlit LCD display for volt & current .The panel must have observation sockets for gate pulse, load output voltage & current. BS 10 type sockets should be used for safety. Block diagram should be printed on panel an supplied with necessary patch cords to conduct the expt. Should be supplied with : 70 MHz /IGs/s RTS/50 GS/s ETS 2 Channel Digital Storage oscilloscope ;Memory: 2 Mpts Display : 7 inches wide Colour TFT LCD Interface: USB Host & USB Device& RS 232 interface. 32 automatic measurements ,FFT & Math & Pass Fail function;20 setups & 20 waveforms storage Triggering Modes : Alternate / Edge /Pulse / Slope / Video. Split screen for FFT, Alternate & Delayed time base. 3 3.4 Digit DMM with embedded holster, Micro Ampere AC & DC current range ;Capacitance : 40nF to 100µF Frequency 10 HZ to 10 MHz ;Duty Cycle : 01. to 99 %. Display : LCD 63X31mm Backlit Accessories :Test leads, Test clips & manuals. Other Functions : Diode test, continuity ,relative measurement Data hold, sleep mode, low battery Indication	01	

S.no.	Name of item	Specification	Qty	
7	To draw speed-torque char. Of Three phase Fully controlled rectifier fed 1 H.P separately excited DC motor at different firing angle and To observe current & voltage waveform at different firing angles	DC separately excited motor should be mounted upon iron frame with brake & pulley arrangement(1H.P.) Panel must have three phase full wave fully controlled bridge rectifier (1600V/16A), separate filed supply with field failure protection & indication. Soft start , Overload and current limit with indication. Cosine firing angle control scheme with comparators & flip flops. Pulse isolation using high frequency carrier pulse transformers. The panel must have digital Backlit LCD display for volt & current .The panel must have observation sockets for clock & flip flop , load output voltage & current. BS 10 type sockets should be used for safety. Block diagram should be printed on panel an supplied with necessary patch cords to conduct the expt. Should be supplied with : 70 MHz /IGs/s RTS/50 GS/s ETS 2 Channel Digital Storage oscilloscope ;Memory: 2 Mpts Display : 7 inches wide Colour TFT LCD Interface: USB Host & USB Device& RS 232 interface. 32 automatic measurements ,FFT & Math & Pass Fail function;20 setups & 20 waveforms storage Triggering Modes : Alternate / Edge /Pulse / Slope / Video. Split screen for FFT, Alternate & Delayed time base. 3 3.4 Digit DMM with embedded holster, Micro Ampere AC & DC current range ;Capacitance : 40nF to 100µF Frequency 10 HZ to 10 MHz ;Duty Cycle : 01. to 99 %. Display : LCD 63X31mm Backlit Accessories :Test leads, Test clips & manuals. Other Functions : Diode test, continuity ,relative measurement Data hold, sleep mode, low battery Indication	01	
8	To obtain speed –torque characteristics of 1 H.P DC series motor in open/close loop using single phase converter and to observe current & voltage waveform at different firing angles.	DC series motor should be mounted upon iron frame with brake & pulley arrangement (1H.P.) Panel must have single phase full wave fully controlled bridge converter (1600V/16A). Soft start , Overload and current limit with indication. Ramp & comparator firing angle control scheme Pulse isolation using high frequency carrier pulse transformers. The panel must have switched facility to convert open/close loop drive (cos□□□90 to 60 degree) Freewheeling diode 1200V/16A The panel must have digital The panel must have digital Backlit LCD display for volt & current The panel must have observation sockets for control circuit (min. 3 observation points), load output voltage & current. BS 10 type sockets should be used for safety. Block diagram should be printed on panel an supplied with necessary patch cords to conduct the expt. Should be supplied with : 70 MHz /IGs/s RTS/50 GS/s ETS 2 Channel Digital Storage oscilloscope ;Memory: 2 Mpts Display : 7 inches wide Colour TFT LCD Interface: USB Host & USB Device& RS 232 interface. 32 automatic measurements ,FFT & Math & Pass Fail function;20 setups & 20 waveforms storage Triggering Modes : Alternate / Edge /Pulse / Slope / Video. Split screen for FFT, Alternate & Delayed time base. 3 3.4 Digit DMM with embedded holster, Micro Ampere AC & DC current range ;Capacitance : 40nF to 100µF Frequency 10 HZ to 10 MHz ;Duty Cycle : 01. to 99 %. Display : LCD 63X31mm Backlit Accessories :Test leads, Test clips & manuals. Other Functions : Diode test, continuity ,relative measurement Data hold, sleep mode, low battery Indication	01	

S.no.	Name of item	Specification	Qty	
9	Speed torque char. of Three phase VSI inverter fed FHP induction motor drive and to observe current and voltage waveform at different frequency.	Squirrel cage three phase FHP (60W/230V/phase) induction motor should be mounted upon insulated frame with brake & pulley arrangement. Three phase VSI inverter comprising 6 VMOS fets (600V/8A), with polarized snubbers. Isolation transformers (fractional KVA). Variable frequency control potentiometer (10-100hz) . Digital control circuitry to generate three 120 degree displaced reference signals for power circuit. Variable dc source using controlled rectification for constant V/F ratio. The panel must have digital The panel must have digital Backlit LCD display for speed and voltage. The panel must have observation sockets should provided for reference signals, drive signal, output voltage & current for study on CRO. Motor should be fitted on insulated board with speed sensor. BS 10 type sockets should be used for safety. Block diagram should be printed on panel an supplied with necessary patch cords to conduct the expt. Should be supplied with : 70 MHz /IGs/s RTS/50 GS/s ETS 2 Channel Digital Storage oscilloscope ;Memory: 2 Mpts Display : 7 inches wide Colour TFT LCD Interface: USB Host & USB Device& RS 232 interface. 32 automatic measurements ,FFT & Math & Pass Fail function;20 setups & 20 waveforms storage Triggering Modes : Alternate / Edge /Pulse / Slope / Video. Split screen for FFT, Alternate & Delayed time base. 3 3.4 Digit DMM with embedded holster, Micro Ampere AC & DC current range ;Capacitance : 40nF to 100µF Frequency 10 HZ to 10 MHz ;Duty Cycle : 01. to 99 %. Display : LCD 63X31mm Backlit Accessories :Test leads, Test clips & manuals. Other Functions : Diode test, continuity ,relative measurement Data hold, sleep mode, low battery Indication	01	
10	Speed torque char. of Three phase CSI inverter fed FHP induction motor drive and to observe current and voltage waveform at different frequency.	Squirrel cage three phase FHP (60W/230V/phase) induction motor should be mounted upon insulated frame with brake & pulley arrangement. Three phase CSI inverter comprising 6 VMOS fets (600V/8A), with polarized snubbers. Isolation transformers (fractional KVA). Variable frequency control potentiometer (10-100hz) . Digital control circuitry to generate three 120 degree displaced reference signals for power circuit . Variable DC source using controlled chopper with inductor. The panel must have digital The panel must have digital Backlit LCD display for speed and voltage. The panel must have observation sockets should provided for reference signals, drive signal, output voltage & current for study on CRO. Motor should be fitted on insulated board with speed sensor. BS 10 type sockets should be used for safety. Block diagram should be printed on panel an supplied with necessary patch cords to conduct the expt. Should be supplied with : 70 MHz /IGs/s RTS/50 GS/s ETS 2 Channel Digital Storage oscilloscope ;Memory: 2 Mpts Display : 7 inches wide Colour TFT LCD Interface: USB Host & USB Device& RS 232 interface. 32 automatic measurements ,FFT & Math & Pass Fail function;20 setups & 20 waveforms storage Triggering Modes : Alternate / Edge /Pulse / Slope / Video. Split screen for FFT, Alternate & Delayed time base. 3 3.4 Digit DMM with embedded holster, Micro Ampere AC & DC current range ;Capacitance : 40nF to 100µF Frequency 10 HZ to 10 MHz ;Duty Cycle : 01. to 99 %. Display : LCD 63X31mm Backlit Accessories :Test leads, Test clips & manuals. Other Functions : Diode test, continuity ,relative measurement Data hold, sleep mode, low battery Indication	01	

S.no.	Name of item	Specification	Qty	
11	Regenerating and Breaking of DC motor using two Quadrant chopper with active load and to draw negative speed torque curve	**Object: Regenerating and Breaking of DC motor using two Quadrant chopper with active load and to draw negative speed torque curve** DC separately excited motor (1H.P.) should be mounted upon iron frame with active load in form of fly wheel DC source must have power rectifier with smoothing filter, capacitor(high ripple rated) .filed supply with filed failure protection & indication. Chopper (quad A) drive should be based upon mosfet (600V/80A) or same rated IGBT with snubber circuit. Freewheeling diode 1200V/16A Chopper duty cycle should be 50– 90% Soft start , Overload protection with indication. Second chopper (quad B) drive should be based upon mosfet (600V/80A) or same rated IGBT with snubber circuit. Freewheeling diode 1200V/16A Chopper duty cycle proportional to speed to regenerate constant power Lamp load 3x100W . The panel must have digital Backlit LCD display display for volt (V),current (I),RPM(N), regenerated voltage (E) The panel must have observation sockets for gate pulse, load output voltage & current. Three should be keys to operate motoring (mode A) or breaking (mode B) BS 10 type sockets should be used for safety. Block diagram should be printed on panel an supplied with necessary patch cords to conduct the expt. Should be supplied with : 70 MHz /IGs/s RTS/50 GS/s ETS 2 Channel Digital Storage oscilloscope ;Memory: 2 Mpts Display : 7 inches wide Colour TFT LCD Interface: USB Host & USB Device& RS 232 interface. 32 automatic measurements ,FFT & Math & Pass Fail function;20 setups & 20 waveforms storage Triggering Modes : Alternate / Edge /Pulse / Slope / Video. Split screen for FFT, Alternate & Delayed time base. 3 3.4 Digit DMM with embedded holster, Micro Ampere AC & DC current range ;Capacitance : 40nF to 100µF Frequency 10 HZ to 10 MHz ;Duty Cycle : 01. to 99 %. Display : LCD 63X31mm Backlit Accessories :Test leads, Test clips & manuals. Other Functions : Diode test, continuity ,relative measurement Data hold, sleep mode, low battery Indication	01	

DSP lab

S.no.	Name of item	Specification	Qty	
1.	Digital signal processing Development Board	No components on the top of the board only Detailed block diagram representation of DSP processor USB debugging comes with software which shows RTDX data ; Easily accessible peripherals like PPI Interface, Memory Expansion, Host Port Interface (HPI). Easily accessible Timers, External Interrupts, EMIF Controls, MCBSP Channels. CD Manual Should be Provided for more than 25 experiments ; IEEE 1284 compliant male-to-female cable Installation CD for Code Composer Studio Evaluation version should be supplied with setup. MPU : TMS320C6713DSP Operating frequency : 225 MHz USB : 1 port ; RS232 : 1 port ; GPIO : 32 Power : + 5V ; Communication : USB cable Test Point : 5 nos. ; Interconnection for module : FRC cable and Berg strip Power Supply : 100V - 240V AC, 50Hz **Included Accessories :** Learning Material (CD) : 1 ;BNC to Test Prod cable : 1 BNC to Crocodile cable : 1 ; Test Prod : 1 set Code Composer Studio DSK ; tools (CD) : 1 Interface Card : 1 ; External DSP Lab software for shown RTDX data : 1 (Spl. Designed software to perform different experiments in DSP. Graphical screens provided for display of signals & waveforms on PC in time domain. Option of 1, 2, & 3 screens displayed simultaneously Should be supplied with : 70 MHz /IGs/s RTS/50 GS/s ETS 2 Channel Digital Storage oscilloscope ;Memory: 2 Mpts Display : 7 inches wide Colour TFT LCD Interface: USB Host & USB Device& RS 232 interface. 32 automatic measurements ,FFT & Math & Pass Fail function;20 setups & 20 waveforms storage Triggering Modes : Alternate / Edge /Pulse / Slope / Video. Split screen for FFT, Alternate & Delayed time base. 3 3.4 Digit DMM with embedded holster, Micro Ampere AC & DC current range ;Capacitance : 40nF to 100µF Frequency 10 HZ to 10 MHz ;Duty Cycle : 01. to 99 %. Display : LCD 63X31mm Backlit Accessories :Test leads, Test clips & manuals. Other Functions : Diode test, continuity ,relative measurement Data hold, sleep mode, low battery Indication	05	