<div dir="rtl">

مولانا آزاد نیشنل اُردو یونیورسٹی

</div>

मौलाना आज़ाद नेशनल उर्दू यूनिवर्सिटी

MAULANA AZAD NATIONAL URDU UNIVERSITY

(A Central University established by an Act of Parliament in 1998)

Hyderabad

MANUU Poytechnic Darbhanga Off Campus

No: *MANUU/Poly/DBG/MO/R4/2016-17/5*   **Date: 06.03.2017**

Cost of tender form: **Rs. 3,000/-** through DD in favour of MANUU payable at Hyderabad

(exemption of Tender cost/EMD will be considered on production of documentary proof)

TENDER DOCUMENT
TO SUPPLY AND INSTALLATION OF ELECTRONICS & COMMUNICATION ENGINEERING
LAB EQUIPMENTS FOR MANUU POLYTECHNIC DARBHANGA OFF CAMPUS

Last date & time of submission of technical and financial bids   **:**   *28.03.2017.*
                                                                                                                    at 1:00 p.m.

Date and time of opening of technical bids   **:**   *28.03.2017*
                                                                                                                   at 2:00 p.m.

1

Chapter-I : Instructions to the bidders

1. **Preface:** Maulana Azad National Urdu University (MANUU) is a Central University with headquarter at Hyderabad and other campuses, colleges and Regional Centres located all over India..

2. **Call for tender:** MANUU invites sealed tenders from original manufacturer / Govt. organizations / authorized dealers / reputed firms to supply and install best quality equipments for the university Off campus Darbhanga.

3. **Submission of tender:** The sealed tenders are invited for supply and installation of Electronics & Communication Engineering lab Equipments for MANUU Polytechnic Darbhanga Off campus of the University at Darbhanga Bihar under **two bid system** viz.

    1) **'Technical bid'** *(Annexure-III of trades) duly signed and stamped, consisting all technical details along with commercial terms and conditions and relevant documents, tender cost and EMD. The details of tender cost and EMD are given at S.No.6/Chapter-II: Terms & Conditions.*

    2) **'Financial bid'** *(indicating items-wise price for each category of the respective trade category in Annexure-IV. These two separate sealed covers should be kept in a third envelope on which it should be super scribed 'Tender for supply and installation of Electronics & Communication Engineering. lab equipments for MANUU Polytechnic Darbhanga Off campus "addressed to The Principal MANUU Polytechnic, Chandanpatti, Laheriasarai, Darbhanga Bihar-846001.*

4. **Quoting of items:** The vender may quote for all the items / part of items of Annexure-II and should agree to accept the part supply order as per the criteria of lowest bid for each item GoI rules will be considered. Unit prices are to be quoted both in figures and in words. In case of discrepancy, price quoted in words or figures whichever is less will be taken as valid.

5. **Opening of bids:** The Technical bids will be opened and scrutinized; the firm, who meets the basic requirement as per documents furnished, may be invited for full fledge display / demonstration. The committee of the University may visit the firm / show room items supplied at other organizations to ascertain the quality. The University may also ask the firm to submit the samples before opening of financial bid / execution of order. The University may shortlist and considers only three to four best quality equipments firms. The University will not bear any expenses for presentation of samples. The financial bid will be opened for those firms who qualify technically and whose sample has been agreed up to the satisfaction level of the University. The decision of the University will be final in this regard.

6. **Selection of firm:** The lowest quoted firm will be selected on item wise basis subject to satisfaction of the quality of the product. The decision of the committee will be final in this regard.

7. **Alteration in the bid:** Bidders will not be permitted to alter or modify their bids after expiry of the deadline of receipt of bids.

8. **Availability of tender form:** The tender document can be had from Purchase Section/ Principal Office MANUU Polytechnic Darbhanga on furnishing the DD (nonrefundable) for quotations of

Rs.3,000/- .Alternatively, tender document can be downloaded from the University's web site (www.manuu.ac.in). If downloaded, the DD drawn on MANUU, payable at Hyderabad cost of tender document for the required amount should be enclosed with the Technical bid.

9. **Cost:** The rates quoted should be inclusive of all taxes, levies, freight, insurance, transportation, installation etc. Rates are to be quoted in the financial bid as per tender document (Annexure-III), else it shall not be considered. The element of taxes is required to be shown separately and distinctly.

10. **Offices location:** The firm should have its office in and arround Bihar region to provide service after sale and to furnish the addresses of Service Centre with telephone number along with technical bid. The bidder may be required based on necessity to supply items to MANUU campus, colleges etc all over India at same rate basis.

11. **Repair and maintenance:** The firm selected will be required to undertake the repair and maintenance as and when required or at a regular intervals. The firm has to identify one single point for effective services and to attend within 24 hours from the time of booking the complaint.

12. **Validity period of quotation:** Firms tendering should note that their offers should remain open for acceptance up to 120 days; if the 120th day falls on holiday then last date will be the next working day from the date of opening of tender.

13. **Acceptance of tender:** The University does not pledge itself to accept the lowest or any tender and reserves to itself, the right to accepting the whole or any part of the tender or rejecting completely.

14. The firms registered under small scale / medium scale industries (NSIC, MSME, NCCF, Kendriya Bhandar etc.) claiming exemption for the tender cost or the EMD as per GoI norms shall produce the necessary certificate for consideration.

Chapter–II: Terms and Conditions

1. **Rejection of tender:** The conditional tenders, unsigned bids, without required EMD and cost of tender form (if downloaded form is used) shall not be accepted and any query / intimation will not be entertained on such bids.

2. **Specification:** The desired specifications and allied technical details are placed at Annexure-I. If required the same may be amended / up graded at the time of placing purchase order. These are basic specifications; the firm may quote the same or higher specifications as per enclosed Annexure only.

3. **Technical bid:** The technical bid must mention the specifications as per the Annexure–II and indicate that the firm is ready to supply items of the required specifications or upgraded by mentioning "Yes / No" in against each item. The firm has to quote as per the required specifications. However higher configuration / technically up graded can be considered by the University. Detailed specifications, catalogue / literature, of all the items quoted may be supplied with the technical bids. Incomplete Bid / in adequate specification etc., in any respect are liable to be rejected. In case, the firm intends to supply the item with a different specification, it should be specified invariably. The firm should do indicate the make / model / manufacturer of the item against each item.

4. **Date and place of submission of form:** The technical and financial bids should be submitted to the Principal, Maulana Azad National Urdu University Polytechnic, Darbhanga-846001, Bihar. by**1:00**

p.m. on 28.03.2017. Tenders received after due date and time will not be considered. The technical bid will be opened on the same day at **2:00 p.m.** in presence of vendors or their authorized representative. The representative should bring the authorization letter from their vendor for attending the tender opening committee meeting.

5. **Bid security / EMD:** The Bid security / EMD for the required amount for furnishing the quotations of Rs.65,000/-. The D.D. of EMD (refundable) drawn in favour of MANUU, payable at Hyderabad should be enclosed with the Technical bid (The DD of tender cost and Bid security/EMD shall not be clubbed). The Security bid of the successful bidder will be converted into Security Deposit and will be returned without interest after successful completion of warranty period / after submission of Bank guarantee / supply of items. Further, in case any firm is L-1 in some of the items, then the firm will be required to deposit the bid security / EMD amount equal to 10% amount of P.O. and the full bid security / EMD amount will be returned without interest. The cost of tender form and security bid / EMD amount is as follows:

6.

1.	**Tender cost of trade for furnishing the quotation (Annexure – I)**	
	(i) Annexure – I : Rs. 3,000/-	
2.	**Bid security / EMD of the trade for furnishing the quotations (Annexure-I)**	
	(i) Annexure-I: Rs. 65,000/-	

Note: Exemption of Tender Cost/EMD will be considered as per GOI rules on submission of documentary proof.

7. **Company profile:** The bidders must submit their company profile, make / brand of the items etc. supplying. A list of organizations / agencies to which items have been supplied previously may be submitted along with copies of supply order and enclosed to the technical bid.

8. **Bidders shall have to meet the following pre-qualification criteria:-**

a) Should have achieved the Average Annual Turnover of 30% of the value for which the Quotations are furnished, during the last three years.

b) In addition to this, the firm should have achieved any one of the following criteria, during the last 7 years.

c) (i) Should have supplied <u>three</u> purchase orders of the similar products worth 40% of the value for which the quotations are furnished
    or

(ii)Should have supplied <u>two</u> purchase orders of the similar products worth 50% of the value for which the quotations are furnished.

   or

(iii) Should have supplied <u>one</u> purchase order of the similar products worth 80% of the value for which the quotations are furnished.

9. **Repeat order:** This is a tender cum rate contract for a period of one year and the item offered in the tender can be re-ordered at the same rate, terms & conditions within a period of twelve (12) months.

10. Orders of different organizations booked during the last two years preceding may be attached.

11. **Delivery and Installation:** The firm shall deliver the softwares and equipments at MANUU Polytechnic, Chandanpatti, Laheriasarai, Darbhanga-846001, Bihar of the University and install the same within 30 **days** from the date of issue of Purchase Order.

12. **Warranty:** All the items should be with onsite comprehensive warranty for a minimum period of one year (as per OEM warranty period, whichever is later) after satisfactory installation and acceptance by the University. The firm should repair / replace the faulty items free of cost during the warranty period.

13. The firms should submit OEM/authorization certificate specific to this open tender or copy of authorized dealership Certificate.

14. **Payment terms:** No advance payment will be considered, Thepayment will be released in Indian rupees in the following order:

 (i) **90% payment against purchase order:** on satisfactory supply and installation of the material. The remaining 10% cost would be released on submission of performance Bank Guarantee for the equal amount from a scheduled Bank with the vaility upto 60 days beyond the warranty period. If the firm fails to furnish Bank Performance Bank Guarantee, the 10% cost would be retained by the University till the Tender obligations are completed

15. **Quantity:** The quantity mentioned in the tender can be increased or decreased at the discretion of the University and the decision of the University shall be final in all respects.

16. **Quality:** All steel parts shall be given antirust treatment and shall be coated with epoxy powder.

17. **Registration:** The firm should be registered with the government agency for sales tax and service tax, incorporation and the certificate of registration issued by appropriate government authority for required items to be enclosed.

18. **Submission of Integrity Pact:** The selected firm may be required to furnish the Integrity Pact as per the office Memorandum No.14 (12)/2008-E-II (A) dated 19.07.2011, Ministry of Finance, Government of India; the form is available with the University.

19. **Right of the University:** The University reserves the right to reject or accept any tender without assigning any reason or cancel before issuing Purchase Order. In case of cancellation of the tender the EMD will be returned without interest.

20. **Acceptance of terms and conditions:** All pages of the tender document are to be signed and stamped by the tendering firm as agreed by the terms and conditions of the tender and to be attached along with the technical bid.

21. **Penalty clause:**The supply and installation of items has to be completed within stipulated time period indicated in Purchase Orders, in case of delay the University reserves the right to impose penalty, as follows:

(i) **Liquidated Damages:** If the firm fails to supply and install the itemsof desired quality and quantity or part of it or unable to perform the service within specified periods for reasonable cause, the University shall, without prejudice to its other remedies under the contract / order may deduct from the contract price, as liquidated damages, a sum equivalent to 2% per week of the value of undelivered service of the goods or unperformed services limited to a maximum of 10% value of the purchase order / left over cost. Once the maximum is reached, the University may consider termination of the contract / order without any notice and further serious action may be initiated. Late supply to the maximum of 10% will be deducted from the bill after which the order will remain cancelled and Bid Security / Earnest Money deposit will be forfeited.

(ii) **Termination for default**: The University may, without prejudice to any other remedy for breach of contract / order, by written notice of default sent to the firm, terminate the contract / order in whole or part at the risk and cost of the defaulting firm.

(a) If the firm fails to execute the supply of all the material specified in the order with in the period(s) of desired quality and quantity specified in the order, or within any extension therefore granted by the University, or

(b) If the supplier fails to perform any other obligation(s) under the contract / order.

(c) If any defects are observed in the items, the University will have the right to reduce the payment to be made to the firm and take any other suitable action against the firm, and the University decision will be final in this regard.

22. **Settlement of Dispute:** In case of any dispute, Darbhanga will be the Jurisdiction and the Registrar, Maulana Azad National Urdu University, Hyderabad shall decide the issue and his decision will be final and shall be binding on the parties as per following terms:

(i) The Purchaser and the Supplier shall make every effort to resolve by direct negotiation any disagreement or dispute arising between them under or in connection with the contract.
(ii) If the parties have failed to resolve their dispute of difference by such consultation, then either the Purchaser or the Supplier may give notice to the other party of its intention to settle the issue by arbitration, as herein provided, as to the matter in dispute. No arbitration in respect of the matter be commenced unless such notice is given in accordance with this clause for the final settlement of the matter. Arbitration may be commenced prior to or after delivery of the Goods under the Contract.
(iii) All questions, disputes and differences arising shall be referred by the Vice Chancellor, MANUU to the sole arbitrator for arbitration under the provision of the Arbitrations and Conciliation Act, 1996.

23. **Obligation during Arbitrations:** Notwithstanding any reference to arbitration (a) the parties shall continue to perform their respective obligations under the Contract unless they otherwise agree; and (b) the Purchaser shall pay any amount due to the Supplier.

Sd/-
Registrar

Place**:** Hyderabad   Maulana Azad National Urdu University
Date: 06.03.2017   Hyderabad

Encl: (i)   Annexure –I (Specification: 11 pages)
    (ii)   Annexure-II (Technical Qualification: 01 pages)
    (iii)   Annexure-III to III A(Technical bid:13 pages)
    (iv)   Annexure-IV to IV A (Financial bid: 14 pages)

Chapter – III: Requirement and specification of the all items

S.N	Description of items	Specification/model	Qty. Req.

1	Amplitude Modulation & Demodulation Kit	Audio signal: sinusoidal
		Frequency range: 200 Hz to 3.4 Khz
		Amplitude : 0 – 5 V variable
		Carrier Source : 1 MHz
		DC Source: 0 – 5 V variable
		Power Supply : 110 -220 V, ± 10%, 50 / 60 Hz
		Operating Conditions : 0-40 C, 85% RH
		The kit should perform and demonstrate the following experiments:
		   1- Amplitude modulation and demodulation of a signal.
		   2- Calculation of Modulation Index of the modulated wave.
		   3- Calculation of the bandwidth of the modulated wave
		Note: The Kit should include all the necessary accessories required to conduct the experiment. (e.g. line chord, patch chords, manuals etc.)
			05

2	Frequency Modulation & Demodulation Kit	Audio Signal: Sinusoidal
		Frequency range : 0- 3.4 KHz
		Amplitude : 0 – 5 V variable
		DC Source: 0 – 5 V variable
		Power Supply : 110 -220 V, ± 10%, 50 / 60 Hz
		Operating Conditions : 0-40 C, 85% RH
		The kit should perform and demonstrate the following experiments:
		   1- Frequency modulation and demodulation of a signal.
		   2- Calculation of Modulation Index of the modulated wave.
		   3- Calculation of the bandwidth of the modulated wave
		Note: The Kit should include all the necessary accessories required to conduct the experiment. (e.g. line chord, patch chords, manuals etc.)
			05

3	Radio Receiver Trainer kit/Super heterodyne Receiver Kit	The kit should perform and demonstrate the following experiments: • Super heterodyne Receiver - Test Audio Amplifier Section of Super Heterodyne Receiver. • Measurement of Sensitivity, Selectivity of Radio Receiver using field strength meter)	04
4	Maximum Power Transfer Theorem Kit	The trainer kit should have inbuilt DC Power Supply : + 12V, + 5V, 500 mA Constant Current Source :3.1 mA Should have Voltmeter and Ammeter Verification of maximum power theorem should be done on	03

		the trainer kit	
5	Superposition Theorem Kit	The trainer kit should have inbuilt DC Power Supply : + 12V, + 5V, 500 mA Constant Current Source :3.1 mA Should have Voltmeter and Ammeter Verification of Superposition theorem should be done on the trainer kit	03
6	Thevenin's Theorem Kit	The trainer kit should have inbuilt DC Power Supply : + 12V, + 5V, 500 mA Constant Current Source :3.1 mA Should have Voltmeter and Ammeter Verification of Thevenin's theorem should be done on the trainer kit	02
7	Differentiator/Integrator Kit	The trainer kit should have Fixed DC Power Supply : $\pm12V$ & $\pm5V$ Variable DC Power Supply : $\pm1.5V$ to $\pm10V$ Mains Power Supply : 90-270 V AC, 50Hz Frequency generator Sine Wave : 1 KHz to 100 KHz (0-5Vpp) Triangular Wave : 1 KHz to 100 KHz (0-5Vpp) Square Wave : 1 KHz to 100 KHz (5Vpp fixed In-built variable DC Power Supply and frequency generator desired	03
8	ASK/FSK/PSK Modulator and Demodulator Kit	The trainer kit should have **- Carrier Mod/Transmitter** Data formats : NRZ (L), NRZ (M), RZ, AMI, RB, Biphase (Manchester), Biphase (Mark). Carrier modulation : ASK, FSK, PSK, QPSK **Carrier Demodulation/Receiver** Input: From Data Formatting and Carrier Modulation/Transmitter Data formats: 7 different data reconditioning formats NRZ (M), NRZ(L) ,RZ, AMI, RB, Biphase (Manchester), Biphase (Mark). Carrier Demodulation : ASK,FSK, PSK and QPSK Note: The trainer kit should include all the accessories to setup the experiment (patch cords, manual, Power supply, etc.) Desired: Teaching and simulation software along with the trainer kit.	04
9	PCM Modulator/Demodulator Kit	The trainer kit should have -On Board Analog Signal : 2 KHz, 4 KHz (sine wave synchronized to sampling pulse Adjustable amplitude and separate variable DC level) Input Channels : Two Modulation : Pulse Code Modulation Desired: Error checking: Odd- Even Hamming Note: The Kit should include all the necessary accessories	04

		required to conduct the experiment. (e.g. line chord, patch chords, manuals etc.). **Receiver- Demodulation** Demodulation: Pulse code Demodulation Interconnection: 2 mm	
10	Antenna Trainer Kit	**Antenna Training System should have** • Adjustable RF Generator • Tone Generator : 1 KHz approx. (adjustable) • Directional Coupler : Forward & Reverse (selectable) • Antenna Rotation : 0-360 deg. Resolution 1 deg. The training system should demonstrate measurement of Radiation pattern of different antennas	01
11	Time division multiplexing and demultiplexing	The trainer kit should have Analog Input channel : 4 Multiplexing : TDM On-board Analog Signal preferably : 250Hz, 500Hz, 1 KHz , 2KHz Sampling Rate: 16 KHz/Channel Note: The Kit should include all the necessary accessories for required to conduct the experiment. (e.g. line chord, patch chords, manuals etc.) Desired: Multiplexing with modulation	03
12	Resonance Trainer kit	The trainer should demonstrate series and parallel resonance.	03
13	Fiber Optic Trainer Kit Optical Transmitter Trainer Kit LASER Diode Trainer kit	Specifications: Data transmission through fiber optic link, Setting of fiber optics voice link using AM Modulation, Optical Transmitter using analogue modulation, PI Characteristics of LASER Diode)	02
14	Colour television demo set with DTH.	Training System TV with built in DTH receiver The complete set/arrangement should demonstrate complete LCD/LED-DTH TV Technology The Functional block diagram should be indicated on main board	01
15	Public Addressing System	Power Output : 100W RMS at 10% THD Line output : 1V/ 1KW Frequency Response : 65 Hz to 15 KHz +/- 3dB Tone Controls : Bass, Treble, Master Control Speaker Outputs : 4W, 8W, 16W, 70-100V Speakers : 2 nos Microphones : 2 nos (Dynamic) Mains Supply : 230V AC ± 10%, 50/60Hz(110V AC on request)	01
16	INTEL 8085 Microprocessor Trainer kit with power supply, manual and serial	On board EPROM programmer On board ADC and DAC ROM : 8 K RAM : 8 K	05

		Input : ASCII Keyboard Display : LCD Mains supply : 90 - 230 V AC,50 Hz Desired: Facility of downloading and uploading the files from PC.	
	interface cable.		
17	INTEL 8086 Microprocessor Trainer kit with power supply, manual and serial interface cable	On board ADC and DAC RAM : 16 K ROM : 16 K Display : LCD Input : ASCII Keyboard Mains supply : 90 - 230V AC, 50 Hz Desired: Facility of downloading and uploading the files from PC	<u>05</u>
18	Programmable serial communication interface	Programmable serial communication interface	05
19	DAC interface board	2 Channel 8 Bit DAC card compatible with 8085/8086	05
20	Programmable timer interface (or) frequency counter	8253 study card compatible with 8085/8086	05
21	ADC interface board	8 Channel 8 Bit ADC card compatible with 8085/8086	05
22	8255 programmable peripheral interface	8255 study card compatible with 8085/8086	05
23	Seven segment LED Display interface	Seven segment LED Display interface	05
24	Stepper motor interface	Stepper Motor Controller card compatible with 8085/8086	05
25	Programmable interrupt controller	programmable interrupt controller	05
26	Hex keyboard interface	Hex keyboard interface	05
27	Traffic light controller	Traffic Light Controller card compatible with 8085/8086	05
28	Digital I/O interface	Digital I/O interface	05
29	LCD interface	LCD interface	05
30	DC motor interface	DC Motor Controller card compatible with 8085/8086	05
31	Keyboard/Display controller (INTEL 8279) interface	Keyboard /display controller 8279	05
32	Microcontroller (8051) trainer kit with LCD display.	8051Microcontroller development board with programmer On board programmer for 8051 Master Reset/Restart Key for hardware reset Input/Output& test points should be provided on board On board breadboard Desired: On board DC and AC power supply provided with sample project code, Programmer software & useful documents and USB interface to PC for programming Serial communication : USB Port Power supply : 230 V, 50 Hz	05

33	8279 LCD Display and key board	8279 LCD Display and key board	05
34	RS232 cable	RS232 cable	05
35	USART 8251	USART 8251	05
36	8259 PIC interface	8259 PIC interface	05
37	8237 DMA controller	8237 DMA controller	05
38	8255 PPI	8255 PPI	05
39	Digital IC trainer	Digital IC Trainer kit The trainer kit should have Operating and Experimental Manual which covers all the basic concepts and fundamentals of Digital Electronics (Digital number system,Boolean Algebra & Logic Circuits,Digital Logic Gates,Simplification of Boolean Functions,Digital Combinational Logic,Combinational Arithmetic Circuits,Sequential Circuits and Digital Logic Families) Desired: Teaching and Simulation Software	04
40	Universal (digital/analog) IC tester	Universal IC Tester The instrument should have following features : Test a wide range of Digital IC's such as 74 Series Test Microprocessors 8085, 8086 Test Peripherals like 8255, 8279, 8253, 8259, 8251, 8155 Test 7 segment display of common cathode & common anode type Power: 230 V AC, 50Hz.	01
41	Flip Flop Trainer	A complete system to study the Flip-Flops The instrument should have following Technical Specifications : Input : +5V DC Logic levels : +5V : HIGH(Logic 1) 0V : LOW (Logic 0) The trainer should performed following experiments : • 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	01
42	BCD to seven segment Display kit	The trainer kit should demonstrate the Binary Coded Decimal Conversion and display on seven segment display	01
43	A to D converter	Analog to Digital Conversion Signal Source : Unipolar & Bipolar DC voltages 0/P Indication : By LEDs separate for each type Power Supply : 110-220 V, ±10%, 50/60 Hz	01
44	D to A converter	D/A Conversion : 2.4 bit R-2R ladder network Signal Source :DC Supply with toggle switches O/P Indication :On DMM or Oscilloscope Power Supply :110-220 V ±10%, 50/60 Hz	01
45	Multiplexer kit (4:1) and DE-Multiplexer (1:4)	The trainer should have following features : • A complete system to study the Multiplexer &Demultiplexer	01

		• Easy illustration of Multiplexer and Demultiplexer • LEDs for visual indication of inputs and outputs status The trainer should have following Technical Specifications: Input : +5V DC Logic levels : +5V : HIGH (Logic 1) 0V : LOW (Logic 0) LED Indication : LED will ON (glow) for 1 state and will be OFF for 0 state. The trainer should performed following experiments: • Study and verification of the Truth Table of 4-to-1 Line Multiplexer • Study and verification of the Truth Table of 1-to-4 Line DeMultiplexer	
46	Encoder and Decoder kit	Encoder and Decoder The trainer should have following features: • A complete system to study the Encoder & Decoder • Easy illustration of Encoder and Decoder • LEDs for visual indication of inputs and outputs status The trainer should have following Technical Specifications: Input : +5V DC Logic levels : +5V : HIGH (Logic 1) 0V : LOW (Logic 0) LED Indication : LED will be ON (glow) for 1 state and will be OFF for state The trainer should performed following experiments: • 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.	01
47	Counter kit	DC Power Supply : +5 V DC Logic levels : +5 V : High (Logic 1) 0 V : Low (Logic 0) LED Indication : for logic High and logic Low The trainer kit should demonstrate the function of counter (ICs like 7490,7493, 74160)	01
48	Comparator kit	The trainer kit should demonstrate the verification of truth table of digital comparator using IC 7485	01
49	Shift resistor kit	DC Power Supply : +5V Logic levels : +5 V High (Logic 1) 0 V Low (Logic 0) LED Indication : for logic High and logic Low The trainer kit should demonstrat the function of shift register (ICs like 7495, 74194 etc.)	01
50	Half adder/Subtractor kit	Adders and Subtractors	03

		A complete system to study & illustrate Binary Adders and Subtracters Input : +5 V DC Logic levels : +5 V : HIGH(Logic 1) 0 V : LOW (Logic 0) The trainer should performed following experiments : • Study of Binary Half Adder • Study of Binary Full Adder using two Half Adders • Study of Binary Half Subtractor / Full Subtractor	
51	DC regulated power supply	Power Supply should have 30V/2A, 5V/2A, 15V/1A Multiple Power Supply Current Limit: 100mA-2A continuously adjustable for (0-30V & 5V) 100mA- 1A continuously adjustable for (+15V) Display : 3 digit for voltage & 3 digit for current LED indication for voltage and current Power Supply : 220V ± 10% , 50Hz/60Hz Operating Conditions : 0-40%degree C	03
52	Function generator	Sine, square, Triangle, Ramp, Pulse and TTL It should have following features: • Sine, Square, Triangle, Ramp & Pulse • Serial Data & TTL • Frequency Resolution 1mHz • 20Vpp Output (O.C.) • High Accuracy • Low Distortion • DC Offset • Character LCD Display • 50 MHz Frequency Counter Main Supply : 230 V AC ± 10%, 50Hz Operating Conditions : 0-40˚C	05
53	Multimeter (digital)	3 ¾ digit (4000 counts) Digital Multimeter DC voltage range : 400 mv to 1000volts. AC voltage range : 4 V to 750volts. DC Current range : 400 µA to 10 A. AC Current range : 400 µA to 10 A. Resistance range : 400 Ω to 40 M Ω Capacitance range : 40nF to 100µF Frequency range : 10 Hz to 10 MHz Display : LCD	10
54	Full wave/Half wave Rectifier kit	A complete system to study the Rectifier The trainer should have following Technical Specifications: Transformer Rating: 9 V center tapped (300 mA) approx. Mains Supply: 230 V, ±10%, 50 Hz Half wave Rectifier output: + 4 V DC approx. Center-Trapped Rectifier: +8 V DC approx. Bridge Rectifier Output: + 8 V DC approx. **The trainer should perform following experiments :**	03

		• Study of Half-wave Rectifier	
		• Study of Full-wave Center-tapped Rectifier	
		• Study of Full-wave Bridge Rectifier	
		• Calculation of Ripple Factor and Efficiency of various Rectifier.	
55	UJT characteristics kit	Features:- Should have Generalized design Should have Inbuilt fixed and variable power supply Should have Inbuilt Ammeter and Voltmeter Should have inbuilt Resistance bank Mains Supply : 90-230V, 50Hz Voltmeter : 0-200V Ammeter : 0-200mA Trainer should perform following experiments; • To study and plot the Drain Characteristics of n channel MOSFET • To study and plot the V-I characteristics of JFET • Evaluation of following parameters of JFET: -DC Drain resistance -Transconductance -Amplification factor • To plot the VI characteristics of UJT	03
56	RC coupled amplifier kit	The trainer kit should demonstrate the frequency response of RC coupled Amplifier	03
57	Transformer coupled amplifier kit	The trainer kit should demonstrate the frequency response of Transformer coupled Amplifier	03
58	Negative feedback voltage amplifier kit	The trainer kit should demonstrate the operation and characteristics of negative feedback voltage amplifier	03
59	Photo diode ,photo transistor kit	The trainer kit should demonstrate the operation and characteristics of photo diode and photo transistor.	02
60	Push pull power amplifier class B kit	It Should have following features: In-built variable DC power supply In-built constant DC power supply In-built sine wave generator Mains power supply : 230V ±10%, 50Hz Constant DC power supply : ±12V, ±5V Variable DC power supply : 0 to 1V Sine wave generator Frequency **:** Variable, 800 Hz to 8 kHz Amplitude **:** Variable, 0 to 2 Vpp The trainer should demonstrate the function of push pull power amplifier class B	02
61	Operational amplifier kit	It should have following features: In-built variable DC Power Supply In-built fixed DC Power Supply In-built Frequency Generator Mains Power Supply : 90-270 V AC, 50Hz Fixed DC Power Supply : ±12V & ±5V	02

		Variable DC Power Supply **:** ±1.5V to ±10V Frequency generator Sine Wave **:** 1 KHz to 100 KHz (0-5Vpp) Triangular Wave **:** 1 KHz to 100 KHz (0-5Vpp) Square Wave **:** 1 KHz to 100 KHz (5Vpp fixed) The trainer should demonstrate the function of operational amplifier.	
62	RC phase shift oscillator kit	The trainer should performed following experiments : Study of design and functioning of RC phase shif Oscillator	03
63	Wein bridge oscillator kit	The trainer should have following features : • A complete system to study the Wein Bridge Oscillator • Inbuilt power supply The trainer should have following Technical Specifications: Biasing Voltage : +12V, -12V DC The trainer should performed following experiments : Study of design and functioning of Wein Bridge Oscillator	03
64	Hartley/colpitt oscillator kit	The trainer should have following features: • A complete system to study the Hartley and Colpitt Oscillators • Inbuilt power supply The trainer should have following Technical Specifications: Biasing Voltage: +12V DC The trainer should performed following experiments : • Study of design and functioning of Hartley Oscillator • Study of design and functioning of Colpitt Oscillator	03
65	Monostablemultivibrator using 555 IC/Astablemultivibrator using 555 IC	The trainer should have following features : • A complete system to study the Astable&MonostableMultivibrater • In-built pulse generator for triggering the monostable circuit. The trainer should have following Technical Specifications : Mains Supply : 230V ±10%, 50Hz DC Bias Voltage : +5V Frequency of Trigger : 1KHz Frequency Range : 600Hz – 3.2KHz of AstableMultivibrator (approx.) Frequency Range : 350Hz – 1KHz of BistableMultivibrator (approx.) Output Voltage : 5 Vpp (approx.) The trainer should performed following experiments : • To study the IC 555 as a MonostableMultivibrator • To study the IC 555 as an AstableMultivibrator	03
66	SCR/DIAC/TRIACcharacteristics kit	Mains power supply : 90 - 270V ±10%, 50Hz Fixed DC power supply : +15V, +35V, -35V Regulated Should have following features	03

		• Demonstration of VI Characteristic of DIAC, TRIAC & SCR • Provided with inbuilt Regulated Power supply of +15, +35V & -35V • Generalized design • Resistor bank of different values • Should have precise Voltmeter & Ammeter.	
67	Study of transducer kit	The trainer kit should demonstrate the study of Different Transducers	02
68	Study of simple inverter kit	Home inverter trainer Trainer should have facility to understand the function of Inverter in presence of main supply and understand the charging of battery, working of Relay,To study the AC Mains sensing circuit of Inverter & troubleshooting of different faults in Inverter circuit. Power Supply : 230 V ±10%,single phase, 50 Hz Battery : 12 V DC /7.5 Ah /12 Hours LED Indicators : Inverter ON, mains ON, charging ON Insulated sleeves on test points for safety	02
69	SCS,SUS,SBS characteristics kit	SCS, SBS, SUS characteristics	02
70	Study of simple servomotor and system kit	Study of a simply Servomotor & System	02
71	PN junction diode characteristics kit	**The trainer should have following features :** • A complete system to study the diode characteristics • Forward and reverse characteristics experiment • Silicon, Zener and Germanium diode • Ammeter and Voltmeter for measurement **The trainer should have following Technical Specifications :** On Board DC power supply : +12V DC On board Ammeter and Voltmeter With Display: 3½ digit Mains power : 230V AC ±10% The trainer should perform following experiments: • Study of V-I characteristics of Silicon Diode • Study of V-I characteristics of Zener Diode • Study of V-I characteristics of Light Emitting Diode (LED)	03
72	Zener diode characteristics kit	Zener Diode Voltage Regulator A complete system to study the diode characteristics The trainer should perform following experiments: • Study of Zener Diode as a Voltage Regulator, when input voltage, Vin is fixed while load resistance RL is variable. • Study of Zener Diode as a Voltage Regulator, when input voltage, Vin is variable while load resistance RL	03

| 73 | Transistor characteristics kit | **The trainer should have following features :**
• A complete system to study the Transistor characteristics
• On board DC power supplies
• In-built Ammeter and Voltmeter
• Different test points
• Three important characteristics of a Transistor
• Input characteristic
• Output characteristic
• Constant current transfer characteristic
Voltmeter & Ammeter with display: 3½ digit
Mains: 230 V AC ±10%
The trainer should performed following experiments :

• Study of the characteristics of PNP transistor in Common Base Configuration and to evaluate - Input resistance, Output resistance and Current gain.
• Study of the characteristics of PNP transistor in Common Collector Configuration and to evaluate - Input resistance, Output resistance and Current gain.
• Study the characteristics of NPN transistor in common Emitter Configuration and to evaluate - Input resistance, Output resistance and Current gain.
• Study of the characteristics of NPN transistor in Common Base configuration and to evaluate - Input resistance, Output resistance and Current gain.
• Study of the characteristics of NPN transistor in Common Collector configuration and to evaluate - Input resistance, Output resistance and Current gain.
• Study the characteristics of PNP transistor in Common Emitter Configuration and to evaluate - Input resistance, Output resistance and Current gain. | 03 |

Place: Hyderabad

Date: 06/03 / 2017

Sd/-.
Registrar
Maulana Azad National Urdu University
Hyderabad

Chapter–IV: Technical Qualification **Annexure–II**

1.	Name of the firm	M/s.
2.	Details of Tender Cost (Exemption of Tender cost will be considered as per GOI rules on submission of documentary proof)	Rs.3,000 /- D.D. No._____ dated: _____ Bank _____
3.	Details of EMD (Exemption of EMD cost will be considered as per GOI rules on submission of documentary proof)	Rs.65,000/- D.D. No._____ dated: _____ Bank _____
4.	Contact Details	Postal Address ……………………………………………………. ……………………………………………………. ……………………………………………………. Tel No. Land Line Mobile: E-mail:
5.	Details of Registration with income tax and sales tax authorities *Enclose Copy / proof*	
6.	The firm should submit OEM and authorization certificate to this Open tender or copy of authorized dealership certificate for the individual items	
7.	PAN Details *Enclose Copy / proof*	
8.	Documentary proof for Pre Qualification Criteria as mentioned in the Tender (Sl. 8, Chapter II) 1) Average turnover for the last 3 years 2) Proof of documents against Chapter-II, Sl.8, b(i) or b(ii) or b(iii)	
9.	Whether signed copy of tender enclosed	
-	**Optional:**	
10.	Customer List with nature of work done (Enclose a list of minimum 10 customers)	

Declaration: It is hereby declared that the firm have carefully read and understood the tender and **agreed with all the clauses**, terms and conditions of the tender, Darbhanga jurisdiction etc and agreed that the decision of the University shall be final in all respect.

Place:

Date:......................2017

Authorized signature of the firm
along with seal

19

Chapter–IV: Technical bid: To be utilized by the firm to indicate that agreed to supply the item wise.

Annexure–III

(i)Requirement of Electronics & Communication Engineering Lab Equipments:

S.N0	DESCRIPTION OF ITEMS	QTY REQUIRED	Make & model	Agreed by firm (Yes / No)
1)	Amplitude Modulation & Demodulation Kit	5		
2)	Frequency Modulation & Demodulation Kit	5		
3)	Super heterodyne Receiver Kit	4		
4)	Maximum Power Transfer Theorem Kit	3		
5)	Superposition Theorem Kit	3		
6)	Thevenin's Theorem Kit	2		
7)	Differentiator/Integrator Kit	3		
8)	ASK/FSK/PSK modulator & Demodulator Kit	4		
9)	PCM Modulator Demodulator Kit	4		
10)	Antenna Trainer Kit	1		
11)	Time division multiplexing and demultiplexing	3		
12)	Resonance Trainer kit	3		
13)	Fiber optic Trainer kit, Optical transmitter trainer kit, Laser diode trainer kit	2		
14)	Colour television demo set with DTH.	1		
15)	Public Addressing System	1		
16)	INTEL 8085 Microprocessor Trainer kit with power supply, manual and serial interface cable.	5		
17)	INTEL 8086 Microprocessor Trainer kit with power supply, manual and serial interface cable	5		
18)	Programmable serial communication interface	5		
19)	DAC interface board	5		
20)	Programmable timer interface (or) frequency counter	5		
21)	ADC interface board	5		
22)	8255 programmable peripheral interface	5		
23)	Seven segment LED Display interface	5		
24)	Stepper motor interface	5		
25)	Programmable interrupt controller	5		
26)	Hex keyboard interface	5		
27)	Traffic light controller	5		
28)	Digital I/O interface	5		
29)	LCD interface	5		
30)	Dc motor interface	5		
31)	Keyboard/Display controller (INTEL 8279) interface	5		
32)	Microcontroller (8051) trainer kit with LCD display.	5		
33)	8279 LCD Display and key board	5		
34)	RS232 cable	5		
35)	USART 8251	5		
36)	8259 PIC interface	5		
37)	8237 DMA controller	5		
38)	8255 PPI	5		
39)	Digital IC trainer	4		
40)	Universal (digital/analog) IC tester	1		
41)	Flip Flop Trainer	1		

42)	BCD to seven segment Display kit	1		
43)	A to D converter	1		
44)	D to A converter	1		
45)	Multiplexer kit (4:1) & DE-Multiplexer (1:4)	1		
46)	Decoder kit & Encoder kit	1		
47)	Counter kit	1		
48)	Comparator kit	1		
49)	Shift resistor kit	1		
50)	Full/Half adder/Subtractor kit	3		
51)	Dc regulated power supply	3		
52)	Function generator	5		
53)	Multimeter (digital)	10		
54)	Full/Half wave Rectifier kit	3		
55)	UJT characteristics kit	3		
56)	RC couple amplifier kit	3		
57)	Transformer coupled amplifier kit	3		
58)	Negative feedback voltage amplifier kit	3		
59)	Photo diode ,photo transistor kit	2		
60)	Push pull power amplifier class B kit	2		
61)	Operational amplifier kit	2		
62)	RC phase shift oscillator kit	3		
63)	Wein bridge oscillator kit	3		
64)	Hartley/colpitt oscillator kit	3		
65)	Monostablemultivibrator using 555 IC/Astablemultivibrator using 555 IC kit	3		
66)	SCR/DIAC/TRIAC characteristics kit	3		
67)	Study of transducer kit	2		
68)	Study of simple inverter kit	2		
69)	SCS,SUS,SBS characteristics kit	2		
70)	Study of simple servomotor and system kit	2		
71)	PN junction diode characteristics kit	3		
72)	Zener diode characteristics kit	3		
73)	Transistor characteristics kit	3		

Declaration: It is hereby declared that the firm have carefully read and understood the tender and **agreed with all the clauses**, terms and conditions of the tender, Darbhanga jurisdiction etc and agreed that the decision of the University shall be final in all respect.

*Authorized signature of
he firm along with seal*

Place

Date:……………2017

(ii) Technical bid Specification of Electronics & Communication Engineering Lab Equipments:

S.N	Description of items	Specification/model	Qty. Req.
1	Amplitude Modulation & Demodulation Kit	Audio signal: sinusoidal Frequency range: 200 Hz to 3.4 Khz Amplitude : 0 – 5 V variable Carrier Source : 1 MHz DC Source: 0 – 5 V variable Power Supply : 110 -220 V, ± 10%, 50 / 60 Hz Operating Conditions : 0-40 C, 85% RH The kit should perform and demonstrate the following experiments: 4- Amplitude modulation and demodulation of a signal. 5- Calculation of Modulation Index of the modulated wave. 6- Calculation of the bandwidth of the modulated wave Note: The Kit should include all the necessary accessories required to conduct the experiment. (e.g. line chord, patch chords, manuals etc.)	05
2	Frequency Modulation & Demodulation Kit	Audio Signal: Sinusoidal Frequency range : 0- 3.4 KHz Amplitude : 0 – 5 V variable DC Source: 0 – 5 V variable Power Supply : 110 -220 V, ± 10%, 50 / 60 Hz Operating Conditions : 0-40 C, 85% RH The kit should perform and demonstrate the following experiments: 4- Frequency modulation and demodulation of a signal. 5- Calculation of Modulation Index of the modulated wave. 6- Calculation of the bandwidth of the modulated wave Note: The Kit should include all the necessary accessories required to conduct the experiment. (e.g. line chord, patch chords, manuals etc.)	05
3	Radio Receiver Trainer kit/Super heterodyne Receiver Kit	The kit should perform and demonstrate the following experiments: • Super heterodyne Receiver - Test Audio Amplifier Section of Super Heterodyne Receiver. • Measurement of Sensitivity, Selectivity of Radio Receiver using field strength meter)	04
4	Maximum Power Transfer Theorem Kit	The trainer kit should have inbuilt DC Power Supply : + 12V, + 5V, 500 mA Constant Current Source :3.1 mA	03

		Should have Voltmeter and Ammeter Verification of maximum power theorem should be done on the trainer kit	
5	Superposition Theorem Kit	The trainer kit should have inbuilt DC Power Supply : + 12V, + 5V, 500 mA Constant Current Source :3.1 mA Should have Voltmeter and Ammeter Verification of Superposition theorem should be done on the trainer kit	03
6	Thevenin's Theorem Kit	The trainer kit should have inbuilt DC Power Supply : + 12V, + 5V, 500 mA Constant Current Source :3.1 mA Should have Voltmeter and Ammeter Verification of Thevenin's theorem should be done on the trainer kit	02
7	Differentiator/Integrator Kit	The trainer kit should have Fixed DC Power Supply : ±12V & ±5V Variable DC Power Supply : ±1.5V to ±10V Mains Power Supply : 90-270 V AC, 50Hz Frequency generator Sine Wave : 1 KHz to 100 KHz (0-5Vpp) Triangular Wave : 1 KHz to 100 KHz (0-5Vpp) Square Wave : 1 KHz to 100 KHz (5Vpp fixed In-built variable DC Power Supply and frequency generator desired	03
8	ASK/FSK/PSK Modulator and Demodulator Kit	The trainer kit should have **- Carrier Mod/Transmitter** Data formats : NRZ (L), NRZ (M), RZ, AMI, RB, Biphase (Manchester), Biphase (Mark). Carrier modulation : ASK, FSK, PSK, QPSK **Carrier Demodulation/Receiver** Input: From Data Formatting and Carrier Modulation/Transmitter Data formats: 7 different data reconditioning formats NRZ (M), NRZ(L) ,RZ, AMI, RB, Biphase (Manchester), Biphase (Mark). Carrier Demodulation : ASK,FSK, PSK and QPSK Note: The trainer kit should include all the accessories to setup the experiment (patch cords, manual, Power supply, etc.) Desired: Teaching and simulation software along with the trainer kit.	04
9	PCM Modulator/Demodulator Kit	The trainer kit should have -On Board Analog Signal : 2 KHz, 4 KHz (sine wave synchronized to sampling pulse Adjustable amplitude and separate variable DC level) Input Channels : Two Modulation : Pulse Code Modulation	04

		Desired: Error checking: Odd- Even Hamming Note: The Kit should include all the necessary accessories required to conduct the experiment. (e.g. line chord, patch chords, manuals etc.). **Receiver- Demodulation** Demodulation: Pulse code Demodulation Interconnection: 2 mm	
10	Antenna Trainer Kit	**Antenna Training System should have** • Adjustable RF Generator • Tone Generator : 1 KHz approx. (adjustable) • Directional Coupler : Forward & Reverse (selectable) • Antenna Rotation : 0-360 deg. Resolution 1 deg. The training system should demonstrate measurement of Radiation pattern of different antennas	01
11	Time division multiplexing and demultiplexing	The trainer kit should have Analog Input channel : 4 Multiplexing : TDM On-board Analog Signal preferably : 250Hz, 500Hz, 1 KHz , 2KHz Sampling Rate: 16 KHz/Channel Note: The Kit should include all the necessary accessories for required to conduct the experiment. (e.g. line chord, patch chords, manuals etc.) Desired: Multiplexing with modulation	03
12	Resonance Trainer kit	The trainer should demonstrate series and parallel resonance.	03
13	Fiber Optic Trainer Kit Optical Transmitter Trainer Kit LASER Diode Trainer kit	Specifications: Data transmission through fiber optic link, Setting of fiber optics voice link using AM Modulation, Optical Transmitter using analogue modulation, PI Characteristics of LASER Diode)	02
14	Colour television demo set with DTH.	Training System TV with built in DTH receiver The complete set/arrangement should demonstrate complete LCD/LED-DTH TV Technology The Functional block diagram should be indicated on main board	01
15	Public Addressing System	Power Output : 100W RMS at 10% THD Line output : 1V/ 1KW Frequency Response : 65 Hz to 15 KHz +/- 3dB Tone Controls : Bass, Treble, Master Control Speaker Outputs : 4W, 8W, 16W, 70-100V Speakers : 2 nos Microphones : 2 nos (Dynamic) Mains Supply : 230V AC ± 10%, 50/60Hz(110V AC on request)	01
16	INTEL 8085 Microprocessor Trainer	On board EPROM programmer On board ADC and DAC	05

	kit with power supply, manual and serial interface cable.	ROM : 8 K RAM : 8 K Input : ASCII Keyboard Display : LCD Mains supply : 90 - 230 V AC,50 Hz Desired: Facility of downloading and uploading the files from PC.	
17	INTEL 8086 Microprocessor Trainer kit with power supply, manual and serial interface cable	On board ADC and DAC RAM : 16 K ROM : 16 K Display : LCD Input : ASCII Keyboard Mains supply : 90 - 230V AC, 50 Hz Desired: Facility of downloading and uploading the files from PC	<u>05</u>
18	Programmable serial communication interface	Programmable serial communication interface	05
19	DAC interface board	2 Channel 8 Bit DAC card compatible with 8085/8086	05
20	Programmable timer interface (or) frequency counter	8253 study card compatible with 8085/8086	05
21	ADC interface board	8 Channel 8 Bit ADC card compatible with 8085/8086	05
22	8255 programmable peripheral interface	8255 study card compatible with 8085/8086	05
23	Seven segment LED Display interface	Seven segment LED Display interface	05
24	Stepper motor interface	Stepper Motor Controller card compatible with 8085/8086	05
25	Programmable interrupt controller	programmable interrupt controller	05
26	Hex keyboard interface	Hex keyboard interface	05
27	Traffic light controller	Traffic Light Controller card compatible with 8085/8086	05
28	Digital I/O interface	Digital I/O interface	05
29	LCD interface	LCD interface	05
30	DC motor interface	DC Motor Controller card compatible with 8085/8086	05
31	Keyboard/Display controller (INTEL 8279) interface	Keyboard /display controller 8279	05
32	Microcontroller (8051) trainer kit with LCD display.	8051Microcontroller development board with programmer On board programmer for 8051 Master Reset/Restart Key for hardware reset Input/Output& test points should be provided on board On board breadboard Desired: On board DC and AC power supply provided with sample project code, Programmer software & useful documents and USB interface to PC for programming	05

		Serial communication : USB Port Power supply : 230 V, 50 Hz	
33	8279 LCD Display and key board	8279 LCD Display and key board	05
34	RS232 cable	RS232 cable	05
35	USART 8251	USART 8251	05
36	8259 PIC interface	8259 PIC interface	05
37	8237 DMA controller	8237 DMA controller	05
38	8255 PPI	8255 PPI	05
39	Digital IC trainer	Digital IC Trainer kit The trainer kit should have Operating and Experimental Manual which covers all the basic concepts and fundamentals of Digital Electronics (Digital number system,Boolean Algebra & Logic Circuits,Digital Logic Gates,Simplification of Boolean Functions,Digital Combinational Logic,Combinational Arithmetic Circuits,Sequential Circuits and Digital Logic Families) Desired: Teaching and Simulation Software	04
40	Universal (digital/analog) IC tester	Universal IC Tester The instrument should have following features : Test a wide range of Digital IC's such as 74 Series Test Microprocessors 8085, 8086 Test Peripherals like 8255, 8279, 8253, 8259, 8251, 8155 Test 7 segment display of common cathode & common anode type Power: 230 V AC, 50Hz.	01
41	Flip Flop Trainer	A complete system to study the Flip-Flops The instrument should have following Technical Specifications : Input : +5V DC Logic levels : +5V : HIGH(Logic 1) 0V : LOW (Logic 0) The trainer should performed following experiments : • 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	01
42	BCD to seven segment Display kit	The trainer kit should demonstrate the Binary Coded Decimal Conversion and display on seven segment display	01
43	A to D converter	Analog to Digital Conversion Signal Source : Unipolar & Bipolar DC voltages 0/P Indication : By LEDs separate for each type Power Supply : 110-220 V, ±10%, 50/60 Hz	01
44	D to A converter	D/A Conversion : 2.4 bit R-2R ladder network Signal Source :DC Supply with toggle switches O/P Indication :On DMM or Oscilloscope Power Supply :110-220 V ±10%, 50/60 Hz	01
45	Multiplexer kit (4:1) and	The trainer should have following features :	01

	DE-Multiplexer (1:4)	• A complete system to study the Multiplexer &Demultiplexer • Easy illustration of Multiplexer and Demultiplexer • LEDs for visual indication of inputs and outputs status The trainer should have following Technical Specifications: Input : +5V DC Logic levels : +5V : HIGH (Logic 1) 0V : LOW (Logic 0) LED Indication : LED will ON (glow) for 1 state and will be OFF for 0 state. The trainer should performed following experiments: • Study and verification of the Truth Table of 4-to-1 Line Multiplexer • Study and verification of the Truth Table of 1-to-4 Line DeMultiplexer	
46	Encoder and Decoder kit	Encoder and Decoder The trainer should have following features: • A complete system to study the Encoder & Decoder • Easy illustration of Encoder and Decoder • LEDs for visual indication of inputs and outputs status The trainer should have following Technical Specifications: Input : +5V DC Logic levels : +5V : HIGH (Logic 1) 0V : LOW (Logic 0) LED Indication : LED will be ON (glow) for 1 state and will be OFF for state The trainer should performed following experiments: • 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.	01
47	Counter kit	DC Power Supply : +5 V DC Logic levels : +5 V : High (Logic 1) 0 V : Low (Logic 0) LED Indication : for logic High and logic Low The trainer kit should demonstrate the function of counter (ICs like 7490,7493, 74160)	01
48	Comparator kit	The trainer kit should demonstrate the verification of truth table of digital comparator using IC 7485	01
49	Shift resistor kit	DC Power Supply : +5V Logic levels : +5 V High (Logic 1) 0 V Low (Logic 0) LED Indication : for logic High and logic Low The trainer kit should demonstrat the function of shift register (ICs like 7495, 74194 etc.)	01

50	Half adder/Subtractor kit	Adders and Subtractors
		A complete system to study & illustrate Binary Adders and Subtracters
		Input : +5 V DC
		Logic levels : +5 V : HIGH(Logic 1)
		                      0 V : LOW (Logic 0)
		The trainer should performed following experiments :
		   • Study of Binary Half Adder
		   • Study of Binary Full Adder using two Half Adders
		   • Study of Binary Half Subtractor / Full Subtractor
			03

51	DC regulated power supply	Power Supply should have 30V/2A, 5V/2A, 15V/1A Multiple Power Supply Current Limit: 100mA-2A continuously adjustable for (0-30V & 5V) 100mA- 1A continuously adjustable for (+15V) Display : 3 digit for voltage & 3 digit for current LED indication for voltage and current Power Supply : 220V $\pm$ 10% , 50Hz/60Hz Operating Conditions : 0-40%degree C	03
52	Function generator	Sine, square, Triangle, Ramp, Pulse and TTL It should have following features: • Sine, Square, Triangle, Ramp & Pulse • Serial Data & TTL • Frequency Resolution 1mHz • 20Vpp Output (O.C.) • High Accuracy • Low Distortion • DC Offset • Character LCD Display • 50 MHz Frequency Counter Main Supply : 230 V AC $\pm$ 10%, 50Hz Operating Conditions : 0-40˚C	05
53	Multimeter (digital)	3 ¾ digit (4000 counts) Digital Multimeter DC voltage range : 400 mv to 1000volts. AC voltage range : 4 V to 750volts. DC Current range : 400 µA to 10 A. AC Current range : 400 µA to 10 A. Resistance range : 400 Ω to 40 M Ω Capacitance range : 40nF to 100µF Frequency range : 10 Hz to 10 MHz Display : LCD	10
54	Full wave/Half wave Rectifier kit	A complete system to study the Rectifier The trainer should have following Technical Specifications: Transformer Rating: 9 V center tapped (300 mA) approx. Mains Supply: 230 V, $\pm$10%, 50 Hz Half wave Rectifier output: + 4 V DC approx.	03

		Center-Trapped Rectifier: +8 V DC approx. Bridge Rectifier Output: + 8 V DC approx. **The trainer should perform following experiments :** - Study of Half-wave Rectifier - Study of Full-wave Center-tapped Rectifier - Study of Full-wave Bridge Rectifier - Calculation of Ripple Factor and Efficiency of various Rectifier.	
55	UJT characteristics kit	Features:- Should have Generalized design Should have Inbuilt fixed and variable power supply Should have Inbuilt Ammeter and Voltmeter Should have inbuilt Resistance bank Mains Supply : 90-230V, 50Hz Voltmeter : 0-200V Ammeter : 0-200mA Trainer should perform following experiments; - To study and plot the Drain Characteristics of n channel MOSFET - To study and plot the V-I characteristics of JFET - Evaluation of following parameters of JFET: -DC Drain resistance -Transconductance -Amplification factor - To plot the VI characteristics of UJT	03
56	RC coupled amplifier kit	The trainer kit should demonstrate the frequency response of RC coupled Amplifier	03
57	Transformer coupled amplifier kit	The trainer kit should demonstrate the frequency response of Transformer coupled Amplifier	03
58	Negative feedback voltage amplifier kit	The trainer kit should demonstrate the operation and characteristics of negative feedback voltage amplifier	03
59	Photo diode ,photo transistor kit	The trainer kit should demonstrate the operation and characteristics of photo diode and photo transistor.	02
60	Push pull power amplifier class B kit	It Should have following features: In-built variable DC power supply In-built constant DC power supply In-built sine wave generator Mains power supply : 230V ±10%, 50Hz Constant DC power supply : ±12V, ±5V Variable DC power supply : 0 to 1V Sine wave generator Frequency **:** Variable, 800 Hz to 8 kHz Amplitude **:** Variable, 0 to 2 Vpp The trainer should demonstrate the function of push pull power amplifier class B	02
61	Operational amplifier kit	It should have following features: In-built variable DC Power Supply In-built fixed DC Power Supply	02

		In-built Frequency Generator Mains Power Supply : 90-270 V AC, 50Hz Fixed DC Power Supply : ±12V & ±5V Variable DC Power Supply **:** ±1.5V to ±10V Frequency generator Sine Wave **:** 1 KHz to 100 KHz (0-5Vpp) Triangular Wave **:** 1 KHz to 100 KHz (0-5Vpp) Square Wave **:** 1 KHz to 100 KHz (5Vpp fixed) The trainer should demonstrate the function of operational amplifier.	
62	RC phase shift oscillator kit	The trainer should performed following experiments : Study of design and functioning of RC phase shif Oscillator	03
63	Wein bridge oscillator kit	The trainer should have following features : • A complete system to study the Wein Bridge Oscillator • Inbuilt power supply The trainer should have following Technical Specifications: Biasing Voltage : +12V, -12V DC The trainer should performed following experiments : Study of design and functioning of Wein Bridge Oscillator	03
64	Hartley/colpitt oscillator kit	The trainer should have following features: • A complete system to study the Hartley and Colpitt Oscillators • Inbuilt power supply The trainer should have following Technical Specifications: Biasing Voltage: +12V DC The trainer should performed following experiments : • Study of design and functioning of Hartley Oscillator • Study of design and functioning of Colpitt Oscillator	03
65	Monostablemultivibrator using 555 IC/Astablemultivibrator using 555 IC	The trainer should have following features : • A complete system to study the Astable&MonostableMultivibrater • In-built pulse generator for triggering the monostable circuit. The trainer should have following Technical Specifications : Mains Supply : 230V ±10%, 50Hz DC Bias Voltage : +5V Frequency of Trigger : 1KHz Frequency Range : 600Hz – 3.2KHz of AstableMultivibrator (approx.) Frequency Range : 350Hz – 1KHz of BistableMultivibrator (approx.) Output Voltage : 5 Vpp (approx.) The trainer should performed following experiments : • To study the IC 555 as a MonostableMultivibrator • To study the IC 555 as an AstableMultivibrator	03
66	SCR/DIAC/TRIAC	Mains power supply : 90 - 270V ±10%, 50Hz	03

| | | characteristics kit | Fixed DC power supply :   +15V, +35V, -35V Regulated |

	characteristics kit	Fixed DC power supply : +15V, +35V, -35V Regulated Should have following features • Demonstration of VI Characteristic of DIAC, TRIAC & SCR • Provided with inbuilt Regulated Power supply of +15, +35V & -35V • Generalized design • Resistor bank of different values • Should have precise Voltmeter & Ammeter.	
67	Study of transducer kit	The trainer kit should demonstrate the study of Different Transducers	02
68	Study of simple inverter kit	Home inverter trainer Trainer should have facility to understand the function of Inverter in presence of main supply and understand the charging of battery, working of Relay,To study the AC Mains sensing circuit of Inverter & troubleshooting of different faults in Inverter circuit. Power Supply : 230 V ±10%,single phase, 50 Hz Battery : 12 V DC /7.5 Ah /12 Hours LED Indicators : Inverter ON, mains ON, charging ON Insulated sleeves on test points for safety	02
69	SCS,SUS,SBS characteristics kit	SCS, SBS, SUS characteristics	02
70	Study of simple servomotor and system kit	Study of a simply Servomotor & System	02
71	PN junction diode characteristics kit	**The trainer should have following features :** • A complete system to study the diode characteristics • Forward and reverse characteristics experiment • Silicon, Zener and Germanium diode • Ammeter and Voltmeter for measurement **The trainer should have following Technical Specifications :** On Board DC power supply : +12V DC On board Ammeter and Voltmeter With Display: 3½ digit Mains power : 230V AC ±10% The trainer should perform following experiments: • Study of V-I characteristics of Silicon Diode • Study of V-I characteristics of Zener Diode • Study of V-I characteristics of Light Emitting Diode (LED)	03
72	Zener diode characteristics kit	Zener Diode Voltage Regulator A complete system to study the diode characteristics The trainer should perform following experiments: • Study of Zener Diode as a Voltage Regulator, when input voltage, Vin is fixed while load resistance RL is	03

		variable. • Study of Zener Diode as a Voltage Regulator, when input voltage, Vin is variable while load resistance RL is fixed.	
73	Transistor characteristics kit	**The trainer should have following features :** • A complete system to study the Transistor characteristics • On board DC power supplies • In-built Ammeter and Voltmeter • Different test points • Three important characteristics of a Transistor • Input characteristic • Output characteristic • Constant current transfer characteristic Voltmeter & Ammeter with display: 3½ digit Mains: 230 V AC ±10% **The trainer should performed following experiments :** • Study of the characteristics of PNP transistor in Common Base Configuration and to evaluate - Input resistance, Output resistance and Current gain. • Study of the characteristics of PNP transistor in Common Collector Configuration and to evaluate - Input resistance, Output resistance and Current gain. • Study the characteristics of NPN transistor in common Emitter Configuration and to evaluate - Input resistance, Output resistance and Current gain. • Study of the characteristics of NPN transistor in Common Base configuration and to evaluate - Input resistance, Output resistance and Current gain. • Study of the characteristics of NPN transistor in Common Collector configuration and to evaluate - Input resistance, Output resistance and Current gain. • Study the characteristics of PNP transistor in Common Emitter Configuration and to evaluate - Input resistance, Output resistance and Current gain.	03

Authorized signature of
he firm along with seal

Place

Date:……………2017

Chapter–V: Financial bid: To be utilized by the bidder to quote their prices item wise.

Annexure – IV

(i) Requirement of Electronics & Communication Engineering Lab Equipments:

S.N0	DESCRIPTION OF ITEMS	QTY REQ.	Make & model	Unit Cost	**Total** (Including taxes & all charges etc)
1)	Amplitude Modulation & Demodulation Kit	5			
2)	Frequency Modulation & Demodulation Kit	5			
3)	Super heterodyne Receiver Kit	4			
4)	Maximum Power Transfer Theorem Kit	3			
5)	Superposition Theorem Kit	3			
6)	Thevenin's Theorem Kit	2			
7)	Differentiator/Integrator Kit	3			
8)	ASK/FSK/PSK modulator & Demodulator Kit	4			
9)	PCM Modulator Demodulator Kit	4			
10)	Antenna Trainer Kit	1			
11)	Time division multiplexing and demultiplexing	3			
12)	Resonance Trainer kit	3			
13)	Fiber optic Trainer kit, Optical transmitter trainer kit, Laser diode trainer kit	2			
14)	Colour television demo set with DTH.	1			
15)	Public Addressing System	1			
16)	INTEL 8085 Microprocessor Trainer kit with power supply, manual and serial interface cable.	5			
17)	INTEL 8086 Microprocessor Trainer kit with power supply, manual and serial interface cable	5			
18)	Programmable serial communication interface	5			
19)	DAC interface board	5			
20)	Programmable timer interface (or) frequency counter	5			
21)	ADC interface board	5			

22)	8255 programmable peripheral interface	5			
23)	Seven segment LED Display interface	5			
24)	Stepper motor interface	5			
25)	Programmable interrupt controller	5			
26)	Hex keyboard interface	5			
27)	Traffic light controller	5			
28)	Digital I/O interface	5			
29)	LCD interface	5			
30)	Dc motor interface	5			
31)	Keyboard/Display controller (INTEL 8279) interface	5			
32)	Microcontroller (8051) trainer kit with LCD display.	5			
33)	8279 LCD Display and key board	5			
34)	RS232 cable	5			
35)	USART 8251	5			
36)	8259 PIC interface	5			
37)	8237 DMA controller	5			
38)	8255 PPI	5			
39)	Digital IC trainer	4			
40)	Universal (digital/analog) IC tester	1			
41)	Flip Flop Trainer	1			
42)	BCD to seven segment Display kit	1			
43)	A to D converter	1			
44)	D to A converter	1			
45)	Multiplexer kit (4:1) & DE-Multiplexer (1:4)	1			
46)	Decoder kit & Encoder kit	1			
47)	Counter kit	1			
48)	Comparator kit	1			
49)	Shift resistor kit	1			
50)	Full/Half adder/Subtractor kit	3			
51)	Dc regulated power supply	3			
52)	Function generator	5			
53)	Multimeter (digital)	10			
54)	Full/Half wave Rectifier kit	3			
55)	UJT characteristics kit	3			
56)	RC couple amplifier kit	3			
57)	Transformer coupled amplifier kit	3			
58)	Negative feedback voltage amplifier kit	3			
59)	Photo diode ,photo transistor kit	2			
60)	Push pull power amplifier class B kit	2			
61)	Operational amplifier kit	2			
62)	RC phase shift oscillator kit	3			

63)	Wein bridge oscillator kit	3			
64)	Hartley/colpitt oscillator kit	3			
65)	Monostablemultivibrator using 555 IC/Astablemultivibrator using 555 IC kit	3			
66)	SCR/DIAC/TRIAC characteristics kit	3			
67)	Study of transducer kit	2			
68)	Study of simple inverter kit	2			
69)	SCS,SUS,SBS characteristics kit	2			
70)	Study of simple servomotor and system kit	2			
71)	PN junction diode characteristics kit	3			
72)	Zener diode characteristics kit	3			
73)	Transistor characteristics kit	3			

Declaration: It is hereby declared that the firm have carefully read and understood the tender and agreed with all the clauses, terms and conditions of the tender, Darbhanga jurisdiction etc and agreed that the decision of the University shall be final in all respect.

Place: Authorized signature of
Date: 2017   the firm along with seal

(ii) Financial bid Specification of Electronics & Communication Engineering Lab Equipments:

S.N	Description of items	Specification/model	Qty. Req.
1	Amplitude Modulation & Demodulation Kit	Audio signal: sinusoidal Frequency range: 200 Hz to 3.4 Khz Amplitude : 0 – 5 V variable Carrier Source : 1 MHz DC Source: 0 – 5 V variable Power Supply : 110 -220 V, ± 10%, 50 / 60 Hz Operating Conditions : 0-40 C, 85% RH The kit should perform and demonstrate the following experiments: 7- Amplitude modulation and demodulation of a signal. 8- Calculation of Modulation Index of the modulated wave. 9- Calculation of the bandwidth of the modulated wave Note: The Kit should include all the necessary accessories required to conduct the experiment. (e.g. line chord, patch chords, manuals etc.)	05
2	Frequency Modulation & Demodulation Kit	Audio Signal: Sinusoidal Frequency range : 0- 3.4 KHz Amplitude : 0 – 5 V variable DC Source: 0 – 5 V variable Power Supply : 110 -220 V, ± 10%, 50 / 60 Hz Operating Conditions : 0-40 C, 85% RH The kit should perform and demonstrate the following experiments: 7- Frequency modulation and demodulation of a signal. 8- Calculation of Modulation Index of the modulated wave. 9- Calculation of the bandwidth of the modulated wave Note: The Kit should include all the necessary accessories required to conduct the experiment. (e.g. line chord, patch chords, manuals etc.)	05
3	Radio Receiver Trainer kit/Super heterodyne Receiver Kit	The kit should perform and demonstrate the following experiments: • Super heterodyne Receiver - Test Audio Amplifier Section of Super Heterodyne Receiver. • Measurement of Sensitivity, Selectivity of Radio Receiver using field strength meter)	04
4	Maximum Power Transfer Theorem Kit	The trainer kit should have inbuilt DC Power Supply : + 12V, + 5V, 500 mA Constant Current Source :3.1 mA Should have Voltmeter and Ammeter Verification of maximum power theorem should be done on the trainer kit	03

5	Superposition Theorem Kit	The trainer kit should have inbuilt DC Power Supply : + 12V, + 5V, 500 mA Constant Current Source :3.1 mA Should have Voltmeter and Ammeter Verification of Superposition theorem should be done on the trainer kit	03
6	Thevenin's Theorem Kit	The trainer kit should have inbuilt DC Power Supply : + 12V, + 5V, 500 mA Constant Current Source :3.1 mA Should have Voltmeter and Ammeter Verification of Thevenin's theorem should be done on the trainer kit	02
7	Differentiator/Integrator Kit	The trainer kit should have Fixed DC Power Supply : $\pm12V$ & $\pm5V$ Variable DC Power Supply : $\pm1.5V$ to $\pm10V$ Mains Power Supply : 90-270 V AC, 50Hz Frequency generator Sine Wave : 1 KHz to 100 KHz (0-5Vpp) Triangular Wave : 1 KHz to 100 KHz (0-5Vpp) Square Wave : 1 KHz to 100 KHz (5Vpp fixed In-built variable DC Power Supply and frequency generator desired	03
8	ASK/FSK/PSK Modulator and Demodulator Kit	The trainer kit should have **- Carrier Mod/Transmitter** Data formats : NRZ (L), NRZ (M), RZ, AMI, RB, Biphase (Manchester), Biphase (Mark). Carrier modulation : ASK, FSK, PSK, QPSK **Carrier Demodulation/Receiver** Input: From Data Formatting and Carrier Modulation/Transmitter Data formats: 7 different data reconditioning formats NRZ (M), NRZ(L) ,RZ, AMI, RB, Biphase (Manchester), Biphase (Mark). Carrier Demodulation : ASK,FSK, PSK and QPSK Note: The trainer kit should include all the accessories to setup the experiment (patch cords, manual, Power supply, etc.) Desired: Teaching and simulation software along with the trainer kit.	04
9	PCM Modulator/Demodulator Kit	The trainer kit should have -On Board Analog Signal : 2 KHz, 4 KHz (sine wave synchronized to sampling pulse Adjustable amplitude and separate variable DC level) Input Channels : Two Modulation : Pulse Code Modulation Desired: Error checking: Odd- Even Hamming Note: The Kit should include all the necessary accessories required to conduct the experiment. (e.g. line chord, patch chords, manuals etc.). **Receiver- Demodulation**	04

		Demodulation: Pulse code Demodulation Interconnection: 2 mm	
10	Antenna Trainer Kit	**Antenna Training System should have** • Adjustable RF Generator • Tone Generator : 1 KHz approx. (adjustable) • Directional Coupler : Forward & Reverse (selectable) • Antenna Rotation : 0-360 deg. Resolution 1 deg. The training system should demonstrate measurement of Radiation pattern of different antennas	01
11	Time division multiplexing and demultiplexing	The trainer kit should have Analog Input channel : 4 Multiplexing : TDM On-board Analog Signal preferably : 250Hz, 500Hz, 1 KHz , 2KHz Sampling Rate: 16 KHz/Channel Note: The Kit should include all the necessary accessories for required to conduct the experiment. (e.g. line chord, patch chords, manuals etc.) Desired: Multiplexing with modulation	03
12	Resonance Trainer kit	The trainer should demonstrate series and parallel resonance.	03
13	Fiber Optic Trainer Kit Optical Transmitter Trainer Kit LASER Diode Trainer kit	Specifications: Data transmission through fiber optic link, Setting of fiber optics voice link using AM Modulation, Optical Transmitter using analogue modulation, PI Characteristics of LASER Diode)	02
14	Colour television demo set with DTH.	Training System TV with built in DTH receiver The complete set/arrangement should demonstrate complete LCD/LED-DTH TV Technology The Functional block diagram should be indicated on main board	<u>01</u>
15	Public Addressing System	Power Output : 100W RMS at 10% THD Line output : 1V/ 1KW Frequency Response : 65 Hz to 15 KHz +/- 3dB Tone Controls : Bass, Treble, Master Control Speaker Outputs : 4W, 8W, 16W, 70-100V Speakers : 2 nos Microphones : 2 nos (Dynamic) Mains Supply : 230V AC ± 10%, 50/60Hz(110V AC on request)	01
16	INTEL 8085 Microprocessor Trainer kit with power supply, manual and serial interface cable.	On board EPROM programmer On board ADC and DAC ROM : 8 K RAM : 8 K Input : ASCII Keyboard Display : LCD Mains supply : 90 - 230 V AC,50 Hz Desired: Facility of downloading and uploading the files from PC.	<u>05</u>

17	INTEL 8086 Microprocessor Trainer kit with power supply, manual and serial interface cable	On board ADC and DAC RAM : 16 K ROM : 16 K Display : LCD Input : ASCII Keyboard Mains supply : 90 - 230V AC, 50 Hz Desired: Facility of downloading and uploading the files from PC	<u>05</u>
18	Programmable serial communication interface	Programmable serial communication interface	05
19	DAC interface board	2 Channel 8 Bit DAC card compatible with 8085/8086	05
20	Programmable timer interface (or) frequency counter	8253 study card compatible with 8085/8086	05
21	ADC interface board	8 Channel 8 Bit ADC card compatible with 8085/8086	05
22	8255 programmable peripheral interface	8255 study card compatible with 8085/8086	05
23	Seven segment LED Display interface	Seven segment LED Display interface	05
24	Stepper motor interface	Stepper Motor Controller card compatible with 8085/8086	05
25	Programmable interrupt controller	programmable interrupt controller	05
26	Hex keyboard interface	Hex keyboard interface	05
27	Traffic light controller	Traffic Light Controller card compatible with 8085/8086	05
28	Digital I/O interface	Digital I/O interface	05
29	LCD interface	LCD interface	05
30	DC motor interface	DC Motor Controller card compatible with 8085/8086	05
31	Keyboard/Display controller (INTEL 8279) interface	Keyboard /display controller 8279	05
32	Microcontroller (8051) trainer kit with LCD display.	8051Microcontroller development board with programmer On board programmer for 8051 Master Reset/Restart Key for hardware reset Input/Output& test points should be provided on board On board breadboard Desired: On board DC and AC power supply provided with sample project code, Programmer software & useful documents and USB interface to PC for programming Serial communication : USB Port Power supply : 230 V, 50 Hz	05
33	8279 LCD Display and key board	8279 LCD Display and key board	05
34	RS232 cable	RS232 cable	05
35	USART 8251	USART 8251	05
36	8259 PIC interface	8259 PIC interface	05
37	8237 DMA controller	8237 DMA controller	05

38	8255 PPI	8255 PPI	05
39	Digital IC trainer	Digital IC Trainer kit The trainer kit should have Operating and Experimental Manual which covers all the basic concepts and fundamentals of Digital Electronics (Digital number system,Boolean Algebra & Logic Circuits,Digital Logic Gates,Simplification of Boolean Functions,Digital Combinational Logic,Combinational Arithmetic Circuits,Sequential Circuits and Digital Logic Families) Desired: Teaching and Simulation Software	04
40	Universal (digital/analog) IC tester	Universal IC Tester The instrument should have following features : Test a wide range of Digital IC's such as 74 Series Test Microprocessors 8085, 8086 Test Peripherals like 8255, 8279, 8253, 8259, 8251, 8155 Test 7 segment display of common cathode & common anode type Power: 230 V AC, 50Hz.	01
41	Flip Flop Trainer	A complete system to study the Flip-Flops The instrument should have following Technical Specifications : Input : +5V DC Logic levels : +5V : HIGH(Logic 1) 0V : LOW (Logic 0) The trainer should performed following experiments : • 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	01
42	BCD to seven segment Display kit	The trainer kit should demonstrate the Binary Coded Decimal Conversion and display on seven segment display	01
43	A to D converter	Analog to Digital Conversion Signal Source : Unipolar & Bipolar DC voltages 0/P Indication : By LEDs separate for each type Power Supply : 110-220 V, ±10%, 50/60 Hz	01
44	D to A converter	D/A Conversion : 2.4 bit R-2R ladder network Signal Source :DC Supply with toggle switches O/P Indication :On DMM or Oscilloscope Power Supply :110-220 V ±10%, 50/60 Hz	01
45	Multiplexer kit (4:1) and DE-Multiplexer (1:4)	The trainer should have following features : • A complete system to study the Multiplexer &Demultiplexer • Easy illustration of Multiplexer and Demultiplexer • LEDs for visual indication of inputs and outputs status The trainer should have following Technical Specifications: Input : +5V DC Logic levels : +5V : HIGH (Logic 1) 0V : LOW (Logic 0)	01

		LED Indication : LED will ON (glow) for 1 state and will be OFF for 0 state. The trainer should performed following experiments: • Study and verification of the Truth Table of 4-to-1 Line Multiplexer • Study and verification of the Truth Table of 1-to-4 Line DeMultiplexer	
46	Encoder and Decoder kit	<u>Encoder and Decoder</u> The trainer should have following features: • A complete system to study the Encoder & Decoder • Easy illustration of Encoder and Decoder • LEDs for visual indication of inputs and outputs status The trainer should have following Technical Specifications: Input : +5V DC Logic levels : +5V : HIGH (Logic 1) 0V : LOW (Logic 0) LED Indication : LED will be ON (glow) for 1 state and will be OFF for state The trainer should performed following experiments: • 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.	01
47	Counter kit	DC Power Supply : +5 V DC Logic levels : +5 V : High (Logic 1) 0 V : Low (Logic 0) LED Indication : for logic High and logic Low The trainer kit should demonstrate the function of counter (ICs like 7490,7493, 74160)	01
48	Comparator kit	The trainer kit should demonstrate the verification of truth table of digital comparator using IC 7485	01
49	Shift resistor kit	DC Power Supply : +5V Logic levels : +5 V High (Logic 1) 0 V Low (Logic 0) LED Indication : for logic High and logic Low The trainer kit should demonstrat the function of shift register (ICs like 7495, 74194 etc.)	01
50	Half adder/Subtractor kit	Adders and Subtractors A complete system to study & illustrate Binary Adders and Subtracters Input : +5 V DC Logic levels : +5 V : HIGH(Logic 1) 0 V : LOW (Logic 0) The trainer should performed following experiments : • Study of Binary Half Adder • Study of Binary Full Adder using two Half Adders	03

		• Study of Binary Half Subtractor / Full Subtractor	
51	DC regulated power supply	Power Supply should have 30V/2A, 5V/2A, 15V/1A Multiple Power Supply Current Limit: 100mA-2A continuously adjustable for (0-30V & 5V) 100mA- 1A continuously adjustable for (+15V) Display : 3 digit for voltage & 3 digit for current LED indication for voltage and current Power Supply : 220V ± 10% , 50Hz/60Hz Operating Conditions : 0-40%degree C	03
52	Function generator	Sine, square, Triangle, Ramp, Pulse and TTL It should have following features: • Sine, Square, Triangle, Ramp & Pulse • Serial Data & TTL • Frequency Resolution 1mHz • 20Vpp Output (O.C.) • High Accuracy • Low Distortion • DC Offset • Character LCD Display • 50 MHz Frequency Counter Main Supply : 230 V AC ± 10%, 50Hz Operating Conditions : 0-40˚C	05
53	Multimeter (digital)	3 ¾ digit (4000 counts) Digital Multimeter DC voltage range : 400 mv to 1000volts. AC voltage range : 4 V to 750volts. DC Current range : 400 µA to 10 A. AC Current range : 400 µA to 10 A. Resistance range : 400 Ω to 40 M Ω Capacitance range : 40nF to 100µF Frequency range : 10 Hz to 10 MHz Display : LCD	10
54	Full wave/Half wave Rectifier kit	A complete system to study the Rectifier The trainer should have following Technical Specifications: Transformer Rating: 9 V center tapped (300 mA) approx. Mains Supply: 230 V, ±10%, 50 Hz Half wave Rectifier output: + 4 V DC approx. Center-Trapped Rectifier: +8 V DC approx. Bridge Rectifier Output: + 8 V DC approx. **The trainer should perform following experiments :** • Study of Half-wave Rectifier • Study of Full-wave Center-tapped Rectifier • Study of Full-wave Bridge Rectifier • Calculation of Ripple Factor and Efficiency of various Rectifier.	03
55	UJT characteristics kit	Features:- Should have Generalized design Should have Inbuilt fixed and variable power supply Should have Inbuilt Ammeter and Voltmeter	03

		Should have inbuilt Resistance bank
		Mains Supply : 90-230V, 50Hz
		Voltmeter : 0-200V
		Ammeter : 0-200mA
		Trainer should perform following experiments;
		    • To study and plot the Drain Characteristics of n channel MOSFET
		    • To study and plot the V-I characteristics of JFET
		    • Evaluation of following parameters of JFET:
		-DC Drain resistance
		-Transconductance
		-Amplification factor
		    • To plot the VI characteristics of UJT	

56	RC coupled amplifier kit	The trainer kit should demonstrate the frequency response of RC coupled Amplifier	03
57	Transformer coupled amplifier kit	The trainer kit should demonstrate the frequency response of Transformer coupled Amplifier	03
58	Negative feedback voltage amplifier kit	The trainer kit should demonstrate the operation and characteristics of negative feedback voltage amplifier	03
59	Photo diode ,photo transistor kit	The trainer kit should demonstrate the operation and characteristics of photo diode and photo transistor.	02
60	Push pull power amplifier class B kit	It Should have following features: In-built variable DC power supply In-built constant DC power supply In-built sine wave generator Mains power supply : 230V ±10%, 50Hz Constant DC power supply : ±12V, ±5V Variable DC power supply : 0 to 1V Sine wave generator Frequency **:** Variable, 800 Hz to 8 kHz Amplitude **:** Variable, 0 to 2 Vpp The trainer should demonstrate the function of push pull power amplifier class B	02
61	Operational amplifier kit	It should have following features: In-built variable DC Power Supply In-built fixed DC Power Supply In-built Frequency Generator Mains Power Supply : 90-270 V AC, 50Hz Fixed DC Power Supply : ±12V & ±5V Variable DC Power Supply **:** ±1.5V to ±10V Frequency generator Sine Wave **:** 1 KHz to 100 KHz (0-5Vpp) Triangular Wave **:** 1 KHz to 100 KHz (0-5Vpp) Square Wave **:** 1 KHz to 100 KHz (5Vpp fixed) The trainer should demonstrate the function of operational amplifier.	02
62	RC phase shift oscillator kit	The trainer should performed following experiments : Study of design and functioning of RC phase shif Oscillator	03
63	Wein bridge oscillator kit	The trainer should have following features :	03

		• A complete system to study the Wein Bridge Oscillator • Inbuilt power supply The trainer should have following Technical Specifications: Biasing Voltage : +12V, -12V DC The trainer should performed following experiments : Study of design and functioning of Wein Bridge Oscillator	

64	Hartley/colpitt oscillator kit	The trainer should have following features:
		   • A complete system to study the Hartley and Colpitt Oscillators
		   • Inbuilt power supply
		The trainer should have following Technical Specifications:
		Biasing Voltage: +12V DC
		The trainer should performed following experiments :
		   • Study of design and functioning of Hartley Oscillator
		   • Study of design and functioning of Colpitt Oscillator
			03

65	Monostablemultivibrator using 555 IC/Astablemultivibrator using 555 IC	The trainer should have following features :
		   • A complete system to study the Astable&MonostableMultivibrater
		   • In-built pulse generator for triggering the monostable circuit.
		The trainer should have following Technical Specifications :
		Mains Supply : 230V ±10%, 50Hz
		DC Bias Voltage : +5V
		Frequency of Trigger : 1KHz
		Frequency Range : 600Hz – 3.2KHz
		of AstableMultivibrator (approx.)
		Frequency Range : 350Hz – 1KHz
		of BistableMultivibrator (approx.)
		Output Voltage : 5 Vpp (approx.)
		The trainer should performed following experiments :
		   • To study the IC 555 as a MonostableMultivibrator
		   • To study the IC 555 as an AstableMultivibrator
			03

66	SCR/DIAC/TRIAC characteristics kit	Mains power supply : 90 - 270V ±10%, 50Hz
		Fixed DC power supply : +15V, +35V, -35V Regulated
		
		Should have following features
		   • Demonstration of VI Characteristic of DIAC, TRIAC & SCR
		   • Provided with inbuilt Regulated Power supply of +15, +35V & -35V
		   • Generalized design
		   • Resistor bank of different values
		   • Should have precise Voltmeter & Ammeter.
			03

67	Study of transducer kit	The trainer kit should demonstrate the study of Different Transducers	02
68	Study of simple inverter kit	Home inverter trainer Trainer should have facility to understand the function of	02

		Inverter in presence of main supply and understand the charging of battery, working of Relay,To study the AC Mains sensing circuit of Inverter & troubleshooting of different faults in Inverter circuit. Power Supply : 230 V ±10%,single phase, 50 Hz Battery : 12 V DC /7.5 Ah /12 Hours LED Indicators : Inverter ON, mains ON, charging ON Insulated sleeves on test points for safety	
69	SCS,SUS,SBS characteristics kit	SCS, SBS, SUS characteristics	02
70	Study of simple servomotor and system kit	Study of a simply Servomotor & System	02
71	PN junction diode characteristics kit	**The trainer should have following features :** • A complete system to study the diode characteristics • Forward and reverse characteristics experiment • Silicon, Zener and Germanium diode • Ammeter and Voltmeter for measurement **The trainer should have following Technical Specifications :** On Board DC power supply : +12V DC On board Ammeter and Voltmeter With Display: 3½ digit Mains power : 230V AC ±10% The trainer should perform following experiments: • Study of V-I characteristics of Silicon Diode • Study of V-I characteristics of Zener Diode • Study of V-I characteristics of Light Emitting Diode (LED)	03
72	Zener diode characteristics kit	Zener Diode Voltage Regulator A complete system to study the diode characteristics The trainer should perform following experiments: • Study of Zener Diode as a Voltage Regulator, when input voltage, Vin is fixed while load resistance RL is variable. • Study of Zener Diode as a Voltage Regulator, when input voltage, Vin is variable while load resistance RL is fixed.	03
73	Transistor characteristics kit	**The trainer should have following features :** • A complete system to study the Transistor characteristics • On board DC power supplies • In-built Ammeter and Voltmeter • Different test points • Three important characteristics of a Transistor • Input characteristic • Output characteristic • Constant current transfer characteristic Voltmeter & Ammeter with display: 3½ digit Mains: 230 V AC ±10%	03

		The trainer should performed following experiments :	
		 • Study of the characteristics of PNP transistor in Common Base Configuration and to evaluate - Input resistance, Output resistance and Current gain. • Study of the characteristics of PNP transistor in Common Collector Configuration and to evaluate - Input resistance, Output resistance and Current gain. • Study the characteristics of NPN transistor in common Emitter Configuration and to evaluate - Input resistance, Output resistance and Current gain. • Study of the characteristics of NPN transistor in Common Base configuration and to evaluate - Input resistance, Output resistance and Current gain. • Study of the characteristics of NPN transistor in Common Collector configuration and to evaluate - Input resistance, Output resistance and Current gain. • Study the characteristics of PNP transistor in Common Emitter Configuration and to evaluate - Input resistance, Output resistance and Current gain.	

Declaration: It is hereby declared that the firm have carefully read and understood the tender and **agreed with all the clauses**, terms and conditions of the tender, Darbhanga jurisdiction etc and agreed that the decision of the University shall be final in all respect.

Authorized signature of
he firm along with seal

Place

Date:……………2017