

DAYALBAGH EDUCATIONAL INSTITUTE
DAYALBAGH, AGRA-282005

Notice Inviting Tenders

Limited tender No: DEI-Tech Col-AD-2017-18-TDR-16/Electronics Lab Equipment

Date: 16.06.2017

Sealed tenders are invited from the Manufacturers/ Suppliers/Authorized dealers/ agencies for the supply and installation of the following:-

Sl. No	Item	Quantity
1	Electronics Lab Equipment with Specifications as per Annexure-1	As in Annexure-1

The tenderer shall be required to submit the Earnest Money Deposit (EMD) for an amount of **Rs.34,500/-** by way of demand drafts/banker's cheque/FDRs which is refundable, and a non-refundable tender fee for an amount of **Rs. 200/- (Rupees two hundred only)** by Demand draft. The demand drafts (validity 45 days beyond final bid) for earnest money deposit & tender fee must be enclosed in the envelope containing the bid documents, super-scribed with tender number, due date of submission on the envelope and addressed to :

“The Registrar
Dayalbagh Educational Institute,
Dayalbagh, Agra – 282005,
Uttar Pradesh”

Note: Central Purchase Organization, Small Scale Industries/ National Small Scale Industries Corporation shall be exempted from payment of Earnest Money Deposit. Tenderer seeking exemption should enclose a self attested photocopy of valid registration certificate with NSIC.

(The Earnest Money will be liable to be forfeited if quotation is not honored or if contract is not signed with the Institute, after the award is made to the Tenderer)

1. Time and last date of submission of the Bid: 02.30 pm on 10.07.2017
2. Time of Bid Opening: 03.30 pm on 10.07.2017
3. Venue of Bid Opening: Conference Hall , CAO, Dayalbagh Educational Institute, in the presence of bidders who want to be present at the time of opening of bid.

Interested bidders may post (at the above address) or put the tender documents completed in all respect and other requisite documents in the tender box kept in the General Section, CAO, Dayalbagh Educational Institute, Dayalbagh, Agra- 282005. The bidders are also informed that they may come personally or send their representative to be present at the time of opening of bid. Please note that tender box shall be opened at the time mentioned above irrespective of whether bidders himself or any of their representative are present or not. The tenders shall not be entertained after this deadline under any circumstances what so ever. For more details please visit the Institute's website <http://www.dei.ac.in>. or contact Dr. Ankur Das, Head Electrical, Technical College, DEI (hod_elect@dei.ac.in), 9634288095

Registrar
Dayalbagh Educational Institute Dayalbagh, Agra-
282005

Note:- For full details of equipment please see attached Annexure -1

Kindly address the quotations to "**Registrar, Dayalbagh Educational Institute, Dayalbagh, Agra**" and dispatch in the properly sealed envelope at the following address or drop the tenders in the drop box kept in the Institute:

**Registrar,
Dayalbagh Educational Institute,
Dayalbagh, Agra 282005**

Bidders will have to submit Bills/Invoices on dispatch of stores, if ordered, to this office in triplicate duly pre-receipted (and stamped for amount over Rs. 5000/-) and supported by the relevant delivery documents for audit and payment directly in your bank account through RTGS/NEFT. The payment will be made on receipt of certificate from the Centre Incharges that the goods/items have been received by them and are in good conditions and installed, in the case where installation is required.

For any clarification you may contact the following:

Dr. Ankur Das, Head Electrical, Technical College, DEI (hod_elect@dei.ac.in), 9634288095

General Terms & Conditions

Note: Bidders must submit the following primary information/documents with the quotation. Bidders will have to indicate these particulars in their quote failing which the offer may be rejected. Please do produce the related documents whenever required by the Institute.

1. Trade License/Company Registration No.
2. VAT / Service Tax Regn. No.
3. Income Tax PAN No.
4. Firm's Bank A/c details
5. Bidders are requested to quote rate(s) per unit(s) only in the recognized Accounting units otherwise your quotation will not be accepted.
6. Cost of items shall include installation, support and troubleshooting.
7. Warranty and Support: for Hardware and Software should be explicitly mentioned.
8. Bidders should be OEM/Authorized partner/Authorized dealer of OEM.
9. Bidders should quote rates as per details/specifications mentioned in notice inviting Tender. The Institute reserves the right to place order for each job to single/separate vendor(s) if necessary. The quantity of the items may vary.
10. Bidders should quote rates on FOR/Free Delivery at the sites specified in the Notice inviting Tender, inclusive of all charges else should mention estimated cost of packing, forwarding, insurance and freight by Rail/Road/Post etc. as the case may be.
11. Bidders must indicate if their rate is inclusive of VAT/Sales Tax and /or Excise Duty.
12. In case opening date of Tender happens to be holiday, tender will be received and opened on the next working day at the same time and same place. Quotation received after the closing date will not be entertained and revision in the price will render the bid invalid. Quotation should indicate clearly the period of validity, preferably not less than 45 days.
13. In case of an offer for items having multiple options, you should clearly indicate item-specific price(s). Please quote separate item-wise rate(s), when quotation has been asked for so. For every offer, packing and forwarding charges, Sales/VAT/Service Tax etc. should be shown separately.
14. Bids will be evaluated after equated comparison of offers upon calculating all tax/duty/cess/surcharge/discount/packing/transportation costs, other charges with price and non-compliance of technical and commercial terms will render a bid liable for rejection.
15. Bidders will have to submit Bills/Invoices on dispatch of stores, if ordered, to this office in triplicate duly pre-receipted (and stamped for amount over Rs. 5000/-) and supported by the relevant delivery documents for audit and payment directly in your bank account through RTGS/NEFT. Generally, payments can be expected within one month and are made against acceptance of supplies/ jobs completed and in deserving cases, against shipment documents.
16. No insurance charges are allowed unless otherwise specified and agreed to by us. In the absence of any specific instructions, it will be the responsibility of the supplier to ensure a consignment against transit risk at his own expense if he so desires.
17. The Institute is not bound to accept the lowest rate or any other offer and the acceptance of the offer is entirely at the discretion of the Committee.
18. All purchases are subject to the approval of the Governing Body of the Institute.
19. The Institute reserves the right to select certain items in single or multiple units and reject the others or all as mentioned in the schedule and to revise or alter the specifications before acceptance of any tender and accept or reject any or all tenders, wholly or partly or close the tender without assigning any reason whatsoever.
20. The Bidder shall be required to submit the amount of **Earnest Money Deposit (EMD)** mentioned in the Notice Inviting Tender which is refundable, and a non-refundable **Tender Fee** for an amount of **Rs 200/-** (Rupees two hundred only) by way of demand drafts/banker's cheque/FDRs. The demand drafts shall be drawn in favor of **"Dayalbagh Educational Institute, Agra"** payable at **Agra**. The demand drafts (validity 45 days beyond final bid) for earnest money deposit & tender fee must be enclosed in the envelope containing the bid.

- a.) The firm(s) that are registered with the National Small Industries Corporation (NSIC)/or Small Scale Industries (SSI) are exempted from furnishing the EMD. Self-attested photocopy of the valid registration certificate must be enclosed with their bid.
 - b.) The demand drafts for EMD & tender fee must be enclosed in the envelope containing the technical/price bid and super-scribed with tender number and due date of submission on it. Any technical/price bid is found without the demand drafts of EMD and tender fee will be rejected. The Institute will not be liable to pay any interest on such an amount. The EMD shall be forfeited, if the Bidder withdraws its bid during the period of validity of Tender.
21. Arbitration and Laws: In case of any dispute or difference arising out of or in connection with the tender conditions / order and Contract, the Institute and the Supplier will address the dispute / difference for a mutual resolution and failing which, the matter shall be referred for arbitration to a sole Arbitrator to be appointed by the Institute. The Arbitration shall be held in accordance with the provisions of the Arbitration and Conciliation Act, 1996 and the venue of arbitration shall be at Agra only. The resolution of the Arbitrator shall be final and binding on both the parties.
22. Jurisdiction: The courts at Agra alone will have the jurisdiction to try any matter, dispute or reference between parties arising out of this tender/contract. It is specifically agreed that no court outside and other than Agra court shall have jurisdiction in the matter.

Registrar, DEI

Annexure -1

ELECTRONICS LAB EQUIPMENT

S.N	Particulars of items	No. of Units
1	30 MHz Duel Trace CRO	12
2	DC Power Supply (5V fix, 12V fix, 0 -35V/1A Variable)	10
3	Power Electronics Trainer with PE1 Panel	4
4	CRO Trainer Kit	4
5	VCD Trainer Kit	4
6	Universal IC Tester	5
7	Mobile Phone Trainer	4
8	Analog Digital Trainer	12
9	8085 Microprocessor Kit with 16 X 2 LCD Display & Power Supply	8
10	TLCC + Thumbwheel Interfacing Card	8
11	Power Scope	11
12	3MHz function Generator with Digital Display	12
13	AM Modulation / Demodulation Kit	7
14	FM Modulation / Demodulation Kit	7
15	PPM Modulation / Demodulation Kit, PWM Modulation / Demodulation Kit	7 each
16	Digital Multimeter	60
17	Semiconductor and Power Semiconductor Devices Experiment Panel	7
18	Oscillator and Multivibrator Experiment Panel	7
19	Operational Amplifier Experiment Panel	6
20	BNC Connector	30
21	CRO Probe	24
22	Soldering Iron	25
23	Soldering Wire	60
24	Flux	60
25	Single Stand Wire (R, B, G, Blue)	6
26	Potentiometer:- 5K, 10K, 15K, 100K, 470K	52
27	IC- 74181, IC- 74195, IC- 74193, IC- 7493, IC- 7473, IC- 7475, IC- 7476A, IC- 7495B, IC- 74190, IC- 741	30 each
28	Bread Board	30

Technical Specifications

1) 30 MHz Dual Trace CRO

1. Bandwidth : DC to 30 MHz,
2. No. of Channels : 02
3. Operating Modes: CH I/CHII/CH I & CH II,ALT OR CHOP (Freq 0.5 Mhz) Add or sub +/- ch I +/- ch II (with invert switch for booth channels X-Y Mode same sensitivity in both directions
4. Digital Readout with Backlit LCD for Volts/Div & Time/division 10 Magnification,20 ns max sweep speed, Stable Triggering up to 40 MHz
Alternate Triggering,Sharp Trace CRT & Auto focus

Desirable Specifications :

Cathode Ray Tube 140 mm rect flat face with internal graticule and Mu metal shielding, Phosphor P31 Display: 8 x 10 cm, Accelerating Voltage: 2 kV (approx), Trace Rotation on front panel
Z-modulation Max. + 5V (TTL)
Calibrator Square wave 0.2 V & 2 V \pm 1 %, 1 kHz for probe compensation
Power 220-240 V \pm 10%, 50 Hz, 40 VA (approx)
Operating Conditions 0- 49 deg C, 95 % RH

2) DC Power Supply

Desirable Specifications :

DC REGULATED POWER SUPPLY constant Voltage & Current constant type supplies .
INPUT VOLTAGE : 230V \pm 10% AC 50 Hz
Fixed output : 5 VDC/2 Amp.
Fixed output: 15 VDC/ 2Amp.
OUTPUT VOLTAGE: 0 - 64V DC Continuously Variable with Coarse & Fine Control
OUTPUT CURRENT: 0 - 5A Settable with Coarse & Fine Control
Metering : 3 Digit DPM.
Meter Accuracy: \pm 3 counts.
Constant Voltage Mode: Regulation:
Line: \pm 0.01% \pm 2mV for \pm 10% change in line output.
Load: \pm 0.01% \pm 2mV for load change from zero to full load.
Ripple & Noise : 1mV rms max. 20Hz - 20MHz.
Constant Current Mode :Regulation :
Line : \pm 0.1% \pm 250 μ A for \pm 10% line change.
Load : \pm 0.1% \pm 250 μ A for change in output voltage from 0 Volts to maximum output voltage.
Ripple & Noise : 0.04% rms.
Mode Indication : LED indication for constant voltage / constant current operating mode.
Output Polarity : Floating w.r.t. ground.
Overload Protection : Automatic overload and short circuit protection.
Transient Response : 100 μ secs to within 10mV of set output voltage for load change from 10% to 90%.
Stability : Total drift within 8 hours, after warm-up. < \pm 0.2% plus 5mV in constant voltage mode. < \pm 0.5% plus 5mA in constant current mode with constant line, load and ambient temperature conditions. Operating Temperature : 0-50 C. Line Voltage : 230V AC \pm 10% 50Hz, single phase.

3) Power Electronics Trainer

DC Power Supply on board : + 5 V, - 5 V 500 mA,
+ 12 V, -12 V 500 mA
+ 15 V, 250 mA
+ 35 V, -35 V, 250 mA

AC Power Supply on Board : 18 V – 0 V – 18 V

0V-15V

Triggering Circuit on Board : 5 gate signal output.

Frequency range : 30 Hz to 900 Hz

Variable.

Amplitude : 12 V

PWM control of G1, G2, G3 and G4.

Duty cycle control of “Gate”

Signal 0 to 100%.

Single Phase Rectifier : Firing angle control 0° - 180° variables.

Firing Circuit on Board : Four gate signal output with isolation.

SCR Assembly : 4 SCRs 2P4M, 600 V, 2 A

Power Devices : IGBT-G4BC20S, MOSFET-IRF Z44N, SCR TYN 616

UJT-2N2646, DIAC-DB3, TRIAC-BT136, PUT-2N6027

Circuit Components on Board : MET CAP 0.1 μ F, 163 V

Electrolytic Capacitor 1 μ F, 63 V

Met. Capacitor 0.33 μ F, 63 V

Diode 1N4007,

Inductor 68 mH, 10 mH

Pulse transformer on Board : 2 nos. PT4502 1:1 and one is PT4503 1:1:1

Load selector : 6 load resistances – 47 Ω / 5 W, 1K / 1W, 1K/10 W, 270 Ω / 5 W, 120 Ω / 5 W, 2K2 / 2W

Test points : 10 nos.

Power Supply : 220 V \pm 10%, 50 Hz/60 Hz on request

- Teaching and SIMULATION Software with Hardware Lock which comprises of simulations, animations, along with mandatory theory to understand fundamental concepts of Power Electronics Devices, Thyristors, GATE Firing Circuit, Phase Controlled Rectifiers, Inverters, Choppers, Cycloconverters, AC Voltage Controller etc

4) CRO trainer Kit

Desirable Specifications :

CRO trainer kit having 20 Mhz Dual Channel CRO with Component Tester and extended PCB with the provision of at least 70 Test point to check the o/p on different stages

Cathode Ray Tube 140 mm rect flat face with internal graticule and Mu metal shielding, Phosphor P31 Display: 8 x 10 cm, Accelerating Voltage: 2 kV (approx), Trace Rotation on front panel

Z-modulation Max. + 5V (TTL)

Calibrator Square wave 0.2 V & 2 V \pm 1 %, 1 kHz for probe compensation

Power 220-240 V \pm 10%, 50 Hz, 40 VA (approx)

Operating Conditions 0- 49 deg C, 95 % RH

5) VCD Trainer Kit

Provision to:

- a) Study the specifications of DVD/CD player
- b) Study the block diagram and operating principle of DVD/CD player
- c) Study the functions of front panel controls/ keys of DVD/CD player
- d) Study of functions of controls on Remote
- e) Study of circuit description and functions of different sections
- f) Study and observation of waveforms/signals of different sections
- g) Study and measurement of voltages of different sections
- h) Study of switch faults and troubleshooting in different sections

Other features required:

1. PAL/NTSC Video Format
2. USB Reader
3. Complete block diagram of a DVD/CD Player on-board
4. The different circuit sections of DVD/CD Player exposed on PCB
5. Soldering free fault creation and troubleshooting
6. Test Point 40 Nos
7. Switch Faults 18 Nos

6) Universal IC tester

Should test:

- a) Digital IC's such as 74 Series, 40/45 Series of CMOS IC's,
- b) Microprocessor 8085, 8086, Z80,
- c) Peripherals like 8255, 8279, 8253, 8259, 8251, 8155, 6264, 62256, 8288, 8284,
- d) Opamp, 555, Transistor Arrays, Analog switches, Opto couplers and Others
- e) Seven segment display of common cathode & common anode type

Truth table/sequence table comparison.

Supply Input Voltage: 230V AC.

T.T.L. 74XXX series

7400 7401 7402 7403 7404 7405 7406 7407 7408 7409 7410 7411 7412 7413 7414 7415 7416 7417 7418 7419
7420 7421 7422 7423 7424 7425 7426 7427 7428 7430 7432 7433 7437 7438 7439 7440 7442 7443 7444 7445
7446 7447 7448 7449 7450 7451 7453 7454 7462 7464 7465 7470 7471 7472 7473 7474 7475 7476 7478 7483
7485 7486 7489 7490 7491 7492 7493 7495 7496 7497 74107 74109 74112 74113 74114 74116 74121 74122
74123 74125 74126 74128 74132 74133 74134 74135 74136 74137 74138 74139 74140 74141 74145 74147
74148 74150 74151 74152 74153 74154 74155 74156 74157 74158 74159 74160 74161 74162 74163 74164
74165 74166 74168 74169 74170 74172 74173 74174 74175 74176 74177 74180 74181 74182 74183 74184
74185 74189 74190 74191 74192 74193 74194 74195 74196 74197 74198 74200 74221 74238 74240 74241
74242 74243 74244 74245 74246 74247 74248 74249 74251 74253 74256 74257 74258 74259 74260 74266
74273 74279 74280 74283 74290 74293 74298 74299 74322 74340 74341 74344 74347 74348 74350 74351
74352 74353 74354 74365 74366 74367 74368 74373 74374 74375 74377 74378 74379 74381 74382 74386
74390 74393 74395 74398 74399 74412 74423 74425 74426 74445 74447 74490 74521 74534 74540 74541
74590 74591 74595 74543 74544 74563 74564 74573 74574 74575 74577 74580 74589 74596 74620 74621
74622 74623 74638 74639 28 Touch-keys Key pad with numerical & functional keys 74640 74641 74642 74643
74645 74646 74647 74648 74649 74652 74657 74668 74669 74670 74688 74689 74786 74800 74802 74804
74805 74808 74832 74841 74874 74901 74902 74903 74904 74906 74C923 74C925 74C926 74C927 74C928
74C929 74989 741244 741245 741623 741621 741639 741640 741641 741642 741643 741644 741645 743037
743038 74H01 74LS51 74H54 74LS4 74L71 74H71 74LS73 74LS76 74LS78 74L85 74L86 74C89 74L93 74L95
74LS107 8280 8281 8290 8291

CMOS (CD 4XXX SERIES)

4000 4001 4002 4006 4007 4008 4009 4010 4011 4012 4013 4014 4015 4017 4018 4019 4020 4021 4022 4023
4024 4025 4026 4027 4028 4029 4030 4031 4032 4033 4034 4035 4038 4040 4041 4042 4043 4044 4046 4047
4048 4049 4050 4051 4052 4053 4054 4055 4056 4060 4063 4066 4067 4068 4069 4070 4071 4072 4073 4075
4076 4077 4078 4081 4082 4085 4086 4093 4094 4095 4096 4098 4099 40105 40106 40107 40109 40147 40160
40161 40162 40163 40174 40175 40181 40182 40192 40193 40194 40195 40244 40245 40257 40373 40374
40097 40098 4490 4502 4503 4504 4506 4507 4508 4510 4511 4512 4514 4515 4516 4518 4519 4520 4522 4526
4527 4528 4531 4532 4534 4538 4539 4541 4543 4544 4555 4556 4558 4562 4566 4572 4584 4585 4599 4723
4724 4727

MEMORIES

2102 2114 2115 2125 2147 2148 2149 6116 6264 62256 621024 9101 91L22 93412 93422 93425 41256 4256

50256 **NV RAMS**

1220 1225 1230 1235 1240 1245 2210 2212

CPU

8085 8086 V20 8088 8400(Z80) 6502 65C02 65SC02

PERIPHERALS

8155 8156 8205 8212 8216 8226 8237 8251 8253 8254 8255 8257 8259 8279 8282 8283 8284 8286 8287 8288

8250 82450 6350 6820 6821 6822 6840 6844 6845 6850 6851 6852 6854 6520 6521 6522 6524 6551 65C51

8420(Z80PIO) 8430 (Z80CTC) 8440(SIO-0) 8441 (SIO-1) 8442 (SIO-2) 8449 (SIO-90) 1852 1871 1879 2681

TRANSISTOR ARRAYS

ULN

2001 2003 2004 2005 2011 2013 2014 2015 2021 2023 2024 2025 2064 2065 2066 2067 2801 2803 2804 2805

2811 2813 2814 2815 2821 2823 2824 2825 **RCA**

3083 3086 75468 75491 75492

LATCH/DRIVERS

UCN4801 UCN5801

LINE DRIVERS & RECEIVERS

26LS31 26LS32 743037 743038 75174 75175 75176 75182 75183

75450 75451 75452 75453 75454 8820 8830 96174 96175

LINEAR ICs

124 224 324 339 358 386 393

ANALOG SWITCHES

DG200 DG201 DG202 DG211 DG212 DG509 4016 4051 4052 4053

4066

TIMERS

555 556

CROSSPOINT SWITCHES

22100 42100 45100 22101

REAL TIME CLOCKS

1879 5832 58167 82C8167 DS1287

PHASE FREQUENCY DETECTORS

MC4044 MC4344

DECODER/ENCODER

1441 1442

SUPERVISORY CIRCUITRY Dallas

1231 1232 MX690 MX691

7 SEGMENT DISPLAYS

LT312 LT542 Lt543 5082 HP5501

OSCILLATOR / DIVIDER

5369

7) Mobile Phone Trainer

GSM Theory & Standards

Understanding of GSM technology, its network, GSM capability & data service categories.

Understanding RF environment & study of GSM network by actually connecting to the GSM environment by any service provider

Desirable Technical Specifications:

GSM capability : GSM 900 /1800, E-GSM

GSM data services : Asynchronous, Transparent & Non Transparent modes. 14.4 K bits/s

SIM Interface : 3 V

Display : 320 x 240 TFT LCD Display

Test points : 9 (Gold plated)

Key pad : Dedicated keys like: Alphabet, Numeric & Function

EGSM Sensitivity : < -104dBm

DCS Sensitivity : < -102dBm

Selectivity @ 200 KHz : > +9dBc

Selectivity @ 400 KHz : > +41dBc

Dynamic range : 63 dB

Inter modulation : > -43dBm

C-channel rejection : \geq 9dBc

Transmitter:

Maximum output power (EGSM) : 33 dBm +/- 2 dB

Maximum output power (DCS) : 30 dBm +/- 2 dB

Minimum output power (EGSM) : 5 dBm +/- 5 dB

Minimum output power : 0 dBm +/- 5 dB

Noise in 925 – 935 MHz : < -67dBm

Noise in 935 – 960 MHz : < -79dBm

Noise in 1805 – 1880 MHz : < -71dBm

Phase error at peak power : < 5° RMS

Frequency error : +/- 0.1ppm max

Tests Points : 9 nos (Gold Plated)

Current consumption : Max 500mA

Other desired features:

1. Signal strength measurement of various points from a transmitting antenna/cordless phone
2. Visit of a Mobile Switching Centre (MSC) in the nearest M.S. facility provider
3. Demonstration of Base Trans Receiver (BTS) with nearby cellular tower
4. Observing call processing of GSM trainer Kit.
5. Observing call processing of CDMA trainer Kit.
6. Practical study of setting of Wi-Fi

8) Analog Digital Trainer

Desirable Specifications :

- Built in Power Supply:
DC Power Supply: 5V /1A, \pm 12V, 500 mA, 0- \pm 12V 150 mA (variable)
- Built in Function Generator:
Output Waveform: Sine, Triangle & Square /TTL
Output Frequency: 1 Hz to 200 KHz in 6 ranges, with amplitude & frequency control pots. O/P Voltage 20V p-p max.
- Clock Generator: 10 MHz TTL clock.
- Input Data Switches and output LED status indicators for High/Low indication (15+1No.)
- Pulser switches (2 Nos.) With four debounce outputs- 2 No.
- Fixed TTL(5V) clocks: 4 Nos. 1KHz, 100Hz, 5Hz, 1Hz
- Logic probe to detect High/Low level pulses upto 1MHz, with bicolour LEDs to indicate status.
- 2 digit 7 segment display with BCD to 7 segment decoder.
- LED BAR graph with 10 LED indicator to display 0-2.5V or 0-4V input.
- Onboard DPM is provided with mode selection.
DC volt/current: 200mA/20V – 1No.
- Onboard POTS: 1K-(1No.) & 1M- (1No.)
- Onboard speaker: 8 Ω , 0.5 Watt- (1No.)

9) 8085 Microprocessor Kit with TLCC+THUMBWHEEL

Desirable Specifications :

On Board Battery backup for RAM
Three channel Timer/counter using 8253
48 I/O lines using 8255
On board EPROM programmer for 27 series
On board 8 channel ADC
On board DAC
Facility of downloading and uploading the files from PC.
Two command mode interface: ASCII Keyboard & Serial Mode
All Address and Control lines are available on 50 pin Connector
Operating Frequency : 6.144 MHz
ROM : 8 K
RAM : 8 K
Input : ASCII Keyboard
Display : 20 X 2 LCD
Mains supply : 90 - 230 V AC, 50 Hz

Desirable Accessories :

Operating and Experimental E Manual

- ADDITIONAL SERIAL AND PARALLEL I/O: SID/SOD Based.
- INTERRUPTS: 8 Nos. Using 8259.
- SPEED: 20 MHz crystal operated multi-output clock source to operate various resources on Mother Board like CPU, Baud rate, T/C etc.
- PARALLEL I/O: 48 I/O lines using two 8255 through 2 No. of 26 pin FRC header.
- TIMER COUNTER: 3 Nos. T/C using 8253 pins brought on 6 pin relimate.
- SYSTEM BUS: 50 Pin FRC buffered Bus to connect periware cards as well as to facilitate ROM Emulation of 8 bit/16 bit system memory using external ROM emulation card cum converter card.

Trainer should be on Legend PCB with no components on the top of board.

10) TLCC+ THUMBWHEEL interface card

Desirable Technical Specifications:

2 Nos. of Thumbwheel switch (BCD) Module with card with Traffic light of 2 intersections cum logic study card with 24 tags and 24 LED's with optional light sensor (optocoupler) relay

11) Power Scope

Desirable Specifications :

1. Bandwidth : DC to 30 MHz,
2. No. of Channels : 02
3. Digital Readout with Backlit LCD for Volts/Div & Time/division 10 Magnification, 20 ns max sweep speed, Stable Triggering up to 40 MHz
4. Built in one touch component Tester
5. Ramp and Pedestal Firing

Power Scope Module

1. Input Channels : 2 No's.(Isolated Inputs)
2. Attenuation : X 100 & X 10 Accuracy : $\pm 10\%$ Coupling : AC - DC & Gnd
3. Input Voltage : Max. 1500 V (DC + Peak AC) For X100 (Min. 300 V recommended) Max. 150 V (DC + Peak AC) For X10 : (Min. 30 V recommended)
4. Frequency Response : Normally for mains operation Exceptionally upto 300 KHz
Display : On Oscilloscope

12) 3 MHz Function Generator

Desirable Specifications :

0.3 Hz - 3 MHz
Sine, Square, Triangle, Ramp, Pulse and TTL outputs
20 Vpp output and DC Offset
40 MHz Frequency Counter
Rise time & Fall time ≤ 50 ns
20 \times 4 character LCD
TTL output
50 Ω Output Impedance
20 dB/ 40 dB (fixed) & 20 dB variable attenuation

13) AM Modulation Demodulation Kit

Desirable Specifications :

AM Transmitter Trainer

Audio Oscillator : With adjustable Amplitude & Frequency (300 Hz - 3.4 KHz) Audio Output : Amplifier with speaker
Modulators : Balanced Modulator with Band pass Filter (1 MHz) - 2 nos. Balanced Modulator : 1 No. (455 KHz) Ceramic Bandpass Filter : 1 No. (455 KHz) Carrier Frequency : 1 MHz (Oscillator controlled) Transmitter Amplifier Output: (Gain adjustable) DSB (1 MHz), SSB (1.445 MHz) connected to Antenna/cable Switched Faults : 8 nos. Interconnections : 2mm Banana socket Test Points : 27 nos

Amplitude Modulation (SSB/DSB) Receiver Trainer

Construction : Superhetrodyne
Frequency Range : 525KHz to 1.605MHz
Intermediate Frequency : 455KHz ;
Input Circuit: 1. RF amplifier 2. Mixer 3. Local oscillator 4. Beat Freq. Oscillator 5. IF Amplifier 6. IF Amplifier 2
Tuning : Variable capacitor (Ganged) Dial marking on board
Receiving Media : Telescopic Antenna/ Cable
Detectors : 1.) Diode Detector (DSB) 2.) Product Detector (SSB)
Audio Output : Amplifier With Speaker/ Headphone
Switch able Automatic Gain Control, Switched Faults: 8 Nos.
Test Point : 50 ; Interconnection: 2mm patch chords.
Power supply : 230V $\pm 10\%$ / 50 Hz
Software: Teaching & Simulation Software for Analog communication with simultaneous display of waveform in time & frequency domain. with full theory & diagrams Hardware Lock should be provided with it.
Trainer should be on Legend PCB

14) Frequency Modulation & Demodulation Trainer

Desirable Specifications :

Audio Oscillator: with adjustable Amp. & Freq. (300Hz to 3.4 KHz)
FM Modulators : 2 Nos. Reactance Modulator & Varactor Modulator (With Carrier Frequency Adjustment)
Mixer/Amplifier : 1 No. (with Gain Adjustment) to allow FM Input to be Amplitude Modulated by Noise Input Prior to demodulation
Transmitter O/P Frequency : 455KHz
FM Demodulator : 1: Detuned Resonant Detector
2: Quadrature Detector 3: Foster Seeley Detector 4: Ratio Detector
5: Phase Locked Loop Detector
Low Pass Filter/ Amplifier : 3.4 KHz cutoff Frequency (with gain adjust)
Amplitude Limiter : 1 No. Switched Faults : 8 Nos.
Interconnection: 2mm
Test Point : 50 Power supply: 230V $\pm 10\%$ / 50 Hz

Software: Teaching & Simulation Software for Analog communication with simultaneous display of waveform in time & frequency domain. with full theory & diagrams Hardware Lock should be provided with it.
Trainer should be on Legend PCB

15) PAM, PPM, PWM Trainer with Line Coding Techniques

Desirable Specifications :

- VLSI based
- Transmitter and Receiver on same board.
- Variable sampling rates.
- Clock generation from 20MHz crystal Oscillator.
- On-board DDS signal generators for five different signals.
- Selectable Ramp frequency (by push button or control circuit)
- On board 2nd order Butterworth low pass filter with cut-off frequency of 5KHz for respective technique.
- Technology: VLSI
- Modulation Technique :
 - Pulse Amplitude Modulation and Demodulation
 - Pulse Width Modulation and Demodulation
 - Pulse Position Modulation and Demodulation
 - Line Coding Techniques
 - Crystal Frequency: 20MHz
 - Signal Generator: Sine, Square, Triangle, arbitrary signal etc.
 - Input Signal Frequency: 305Hz, 609.80Hz, 1.25KHz, 2.5KHz
 - Sampling Frequency: 1.25KHz, 2.50KHz, 5KHz, 9.80KHz, 19.53KHz, 39.06KHz, 78.13KHz
 - Ramp Frequency: 1.25KHz, 2.50KHz, 5KHz, 9.80KHz, 19.53KHz, 39.06KHz, 78.13KHz
 - Low Pass Filter: Cut-off frequency 5KHz
 - Test Points: 31nos.

16) Digital Multimeter

Desirable Specifications :

Direct and alternating voltages from 100 μ V ... 1000V
Direct and alternating currents from 10 μ A ... 10.00A
Resistances from 100m Ω ... 40.00M Ω with zero correction
Capacitance from 1pF ... 200.00mF with zero correction .
Frequencies from 10.00Hz ... 500.0kHz
Diode measurement and continuity testing
Hold measurement .
Relative measurement
Duty cycle (%) measurement
Temperature measurement with K type Thermocouple

Power Supply

Battery

2 numbers of 1.5V mignon cell

Zinc- carbon cell as per IEC R6

Alkaline manganese dry cell as per IEC LR 6

Service life

Zinc-carbon cell: approx. 300 hours

Alkaline manganese dry cell: approx. 600 hrs

Fuse

Fuse for ranges up to 400 mA 1.6 A / 600V; 6.3 mm x 32 mm
Fuse for 10 A range 16 A / 600V; 6.3 mm x 32 mm

Display

LCD display field (50 mm x 30 mm) with digital display, and with display of measurement unit, type of current and other special functions.

1 Digital display with dot and polarity

2 Low Battery Indication

3 Display for REL and HOLD

4 Continuity test display

5 Display for diode measurement

6 Measurement unit display

7 Display for automatic measuring range selection

8 Display for selected type of Voltage/Current (AC or DC)

Digital

Display 7 segment

Character height 10 mm

Number of digits 3 3/4 digit \cong 3999 steps

Overflow display OL

Polarity display

Measurement rate 3 measurement/s for V, I, W, Capacitance, Frequency and Duty cycle Measurements

17) Semiconductor and Power Semiconductor Devices Experiment Panel

Characteristics of following devices:

Silicon diode, semiconductor testing using multimeter, germanium diode, zener diode, LED, diac, bipolar transistor, (NPN, PNP), FET, MOSFET, IGBT, SCR etc.

18) Oscillator and Multivibrator Experiment Panel

Hartley Oscillator, Colpitts Oscillator, Crystal Oscillator, Clapp Oscillator, Twin T Oscillator, Astable Multivibrator, Monostable Multivibrator, Bistable Multivibrator

19) Operational Amplifier Experiment Panel

Lo Pass filter, Hi pass filter, Band pass filter, Band stop filter, Phase shift oscillator, Wien Bridge oscillator, Log Amp, Antilog Amp, f to V converter, V to f converter