BID DOCUMENT

NATIONAL COMPETITIVE BIDDING

FOR

SUPPLY, INSTALLATION, COMMISSIONING & MAINTENANCE OF ADVANCED ELECTRONIC LABORATORY EQUIPMENT OF M.Sc PHYSICS FOR I.K.G.PUNJAB TECHNICAL UNIVERSITY, KAPURTHALA AND ITS OTHER CONSTITUENT CAMPUSES (PUNJAB)

Bid No. : EdCIL/PROC/PTU-2017/LAB-MSC-PHY/ADV-PKG1/1

PART-II- FINANCIAL BID

EdCIL (India) Limited
(A Govt. of India Mini Ratna Enterprises)
'EdCIL House', Plot No. 18A, Sector- 16A
NOIDA – 201301 (UP), INDIA
Tel: 0120 – 2512001-006, FAX: 0120-2515372

Dated: 09.06.2017
This document serially numbered from page number 01 to 32.

FINANCIAL BID

Instructions to Bidders

1. Financial Bid shall be submitted with full price details.

Financial Bid shall contain only the prices duly filled in as per the format given in Schedule of Rates provided in the tender document. Price bid should not have any Commercial and/or Technical stipulation in addition to, what is already given in Part I – Technical bid.

Financial Bid Standard Forms (Form-1, Form-2A and /or Form-2B) shall be used for the preparation of the price quote according to the instructions provided.

2. **The Bidder should quote for all the Laboratory items / equipments listed in this document. In case, the Bidder/s does not quote for all the Laboratory items/Equipments, the Bid shall be treated as incomplete and shall be rejected summarily.**

3. The Items / equipments to be supplied / delivered / installed / commissioned at various locations of IKGPTU Campuses is as shown in the enclosed Annexure VI. The rate shall be inclusive of all taxes, octroi, transportation (as per the location), packing, loading and unloading (as designated location) ,Insurance etc. and nothing shall be paid extra.

4. The bid shall be evaluated on total value of all Laboratory items/Equipments as shown in summary and supply order shall be placed to a bidder as a composite bid.

5. The prices quoted by the bidder shall be fixed for the quantity mentioned for the duration of the contract and shall not be subject to adjustment on any account. Price should be firm for any positive or negative variation in quantities up to 100%.

6. The changes displayed in the corrigendum/addendum to the bid documents, particularly with the financial bid should be attached with the financial bid submission, in the same packet, duly signed and stamped by the authorized signatory of the Bidder firm.

FINANCIAL BID SUBMISSION FORM

To:

Chief General Manager (EIS & EPS)
EdCIL (India) Limited
EdCIL House, 18 A, Sector-16 A
NOIDA – 201301 (U.P.), India

Dated: ___/___/2017

Dear Sir,

We, the undersigned, offer to provide "SUPPLY, INSTALLATION , COMMISSIONING & MAINTENANCE OF ADVANCED ELECTRONIC LABORATORY EQUIPMENTS OF MSc PHYSICS " in accordance with your Request for Proposal dated ___/___/2017.

Our attached Financial Bid is for the amount of _____ *[Indicate the corresponding to the amount(s), currency(ies) {Insert amount(s) in words and figures}].*

Please note that all amounts shall be the same as in Form-1. Our Financial Bid shall be binding upon by us subject to the modifications resulting from Contract negotiations, if any, up to expiration of the validity period of the Proposal.

We remain,

Yours sincerely,

Authorized Signature {In full and initials}:
Name and Title of Signatory:
In the capacity of:
Address:
E-mail:

FORM-1

SUMMARY OF FINANCIAL BID

S. No.	Description	Amount (exclusive of Tax) (Rs.)	Tax (Rs.)	Amount (Inclusive of Tax) (Rs.)
A.	Advanced Electronic Laboratory Equipments (Form-2A and/or Form-2B)			
B.	Comprehensive Annual Maintenance (Annexure-IV)			
	Total (Rs.)			

Total Price Bid (exclusive of taxes) (in Words)

(Rupees……..)

Total Price of Bid (Inclusive of taxes) (In Words)

(Rupees……)

Signature of bidder	**……**
Name & Address	**……** **……**
Date	**……**

Note :	
i)	***Discount or any other offers affecting the package price must be mentioned here only. Discount or any other offers affecting the package price mentioned at any other place of the bid will not be considered.***
ii)	***In case of discrepancy between unit price and total price, the unit price shall prevail.***
iii)	***Bids shall be evaluated based on total price without taxes.***

FORM-2A
(FINANCIAL BID)

PRICE SCHEDULE FOR GOODS TO BE IMPORTED

ANNEXURE – I
Date: ……..

Name of the Department:
Name of the Laboratory:

(A) Price Schedule: (Format used for imported items)

S.No.	Currency	Description and Specification of the Item	Qty. in Units	Unit Price	Agency Commission (If applicable)	Discount	Ex-works price	Packing + Handling + DOC + Inland Freight +Insurance	CIF price	Insurance + Freight	CIP Price	Total Price
			(a)	(b)	(c)	(d)	(e)=(b+c-d)	(f)	(g)=(e+f)	(h)	(i) = (g+h)	(j) = (i*a)
				(i)In Figures: (ii)In words:								

Total Price of Bid (In Words) ……	
Signature of bidder	**……**
Name & Address	**……**
Date	**……**

Note:

1. ***The above financial template should be strictly followed. Any deviation from the above template (in terms of description and specification of the item) may debar the bidder at sole discretion of EdCIL.***
2. ***Discount or any other offers affecting the package price must be mentioned here only. Discount or any other offers affecting the package price mentioned at any other place of the bid will not be considered.***
3. ***In case of discrepancy between unit price and total price, the unit price shall prevail.***
4. ***Bids shall be evaluated based on total price including all charges as CIP Price.***
5. ***CIP - Carriage and Insurance Paid to (named place of destination):*** *The seller pays for the carriage of the goods up to the named place of destination and the seller is required to obtain insurance for the goods while in transit.*

FORM-2B

ANNEXURE-II

PRICE SCHEDULED FOR GOODS (INDIGENOUS / IMPORTED GOODS TO BE QUOTED IN INR)

Price Schedule: (Format used for indigenous items/ Imported Items).

S.No.	Description and Specification of the Item	Qty. in Units	Unit Price in Rs.	Excise Duty % /Custom Duty	CST/ VAT %	Insurance other duties and taxes if any,	Packing and Inland Transportation	F.O.R Destination Price	Total Price in Rs. (Excluding Taxes)	Total Price in Rs. (Including Taxes)
		(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)=(b*a)	(i) = (g *a)
			(i)In Figures: (ii)In words:							
Total Price of Bid (In Words) ……										
								Signature of bidder	……	
								Name & Address	……	
								Date	……	

Note:

1. ***The above financial template should be strictly followed. Any deviation from the above template (in terms of description and specification of the item) may debar the bidder at sole discretion of EdCIL.***
2. ***Discount or any other offers affecting the package price must be mentioned here only. Discount or any other offers affecting the package price mentioned at any other place of the bid will not be considered.***
3. ***In case of discrepancy between unit price and total price, the unit price shall prevail.***
4. ***Bids shall be evaluated based on total price including all charges as F.O.R Destination Price.***

ANNEXURE – III

COMPREHENSIVE ANNUAL MAINTENANCE CONTRACT PRICES SCHEDULE

S. No.	Item Description	2nd Yr.	3rd Yr.	Total Comprehensive Annual Maintenance Contract for 2 years(2nd year & 3rd year) after warranty period of 1 year from the date of successful installation. (E= C+D)
A	B	C	D	E
1.	Equipment: Make: Model: Qty.: *(Mention Total quantity from Annexure-VI)*			
			SUB-TOTAL(Rs.) (Carry forwarded to Summary)	
Sub-Total Price Bid (exclusive of taxes) (in Words) (Rupees……)				
Sub-Total Price of Bid (Inclusive of taxes) (In Words) (Rupees……)				

Signature of bidder	**……**
Name & Address	**……** **……**
Note: **Date**	**……**

i)	***Discount or any other offers affecting the package price must be mentioned here only. Discount or any other offers affecting the package price mentioned at any other place of the bid will not be considered.***
ii)	***In case of discrepancy between unit price and total price, the unit price shall prevail.***
iii)	***Bids shall be evaluated based on total price without taxes.***

Note:

1. ***The above rates shall be included in computing the total cost of the equipments.***
2. ***Agency to use separate sheet for each equipment/Item/package.***

DETAILED TECHNICAL SPECIFICATIONS:

ANNEXURE-IV

ADVANCED ELECTRONIC LABORATORY

<table>
<tr><th>Sl.No</th><th>Experiment/Equipment</th><th>Specifications</th></tr>
<tr><td>1</td><td>Setup for the forward and reverse characteristics of a Zener diode</td><td>
Diodes Features:

• The trainer should be a complete system to study the diode characteristics.
• Forward and reverse characteristics experiment should be performed on this trainer kit
• Silicon, Zener and Light Emitting Diode (LED) should provided with this system
• Inbuilt Ammeter and Voltmeter should provided with the trainer
• It should have digital display for displaying voltage and current
• Different test points should be provided to test the outputs.
• The supplier should provide online product tutorial for the trainer

Technical Specification :
<table>
<tr><td>On Board DC power supply : +12V DC
Ammeter</td><td></td></tr>
<tr><td>Range</td><td>: 1µA to 200mA</td></tr>
<tr><td>Display</td><td>: 3½ digit</td></tr>
<tr><td>Voltmeter
Range</td><td>: 1mV to 200V</td></tr>
<tr><td>Display</td><td>: 3½ digit</td></tr>
<tr><td>Mains power</td><td>: 230V AC ±10%</td></tr>
</table>
</td></tr>
<tr><td>2</td><td>Set up of Operational-Amplifier to construct adder ,subtract,differentiate and integrator circuits etc</td><td>
Technical Specification :

• Mains power supply : 90 - 270V ±10%, 50Hz (SMPS)
• Fixed DC power supply : +12V, Regulated
-12V, Regulated
+5V, Regulated
-5V, Regulated
• Variable DC power supply : +1.5V to +10V Regulated using
</td></tr>
</table>

		LM317 : -1.5V to -10V Regulated using LM337 **Function Generator** • **Sine Wave** Frequency : 1KHz to 100KHz Frequency Control : 100KΩ, 10 turn Potentiometer Amplitude : 0V to 5Vpp Amplitude Control : 100KΩ, Single turn Potentiometer • **Triangular Wave** Frequency : 1KHz to 100KHz Frequency Control : 100KΩ, 10 turn Potentiometer Amplitude : 0V to 5Vpp Amplitude Control : 100KΩ, Single turn Potentiometer • **Square Wave** Frequency : 1KHz to 100KHz Frequency Control : 100KΩ, 10 turn Potentiometer Amplitude : 5Vpp, fixed • **Bread Board** Dimension(mm) : 175 x 61 x 10 (Approx) Distribution strips 2 Distribution holes 200 Terminal holes 640 • **Op-amp** : IC uA741 (2 Nos.) : All pins terminated on 2mm Banana Sockets Supply Voltage: ±22V max. Differential Input Voltage :±30V max. Input Voltage ±15V max. Slew Rate: 0.5 V/μs (VCC = ±15V) Should have Short circuit Protection • **Resistor Bank** SMD Resistance 1KΩ 1% 1/4W (5 Nos.) SMD Resistance 10KΩ 1% 1/4W (5 Nos.) SMD Resistance 100KΩ 1% 1/4W (5 Nos.) 1MΩ Single turn Potentiometer (2 Nos.) • **Fuse** : 500mA, slow blow
3	Setup for static and drain characteristics of a JFET	**Technical Specification :** • **Mains Supply** : 90-230V, 50Hz DC Fixed Power Supply : -5V, +15V, +35V DC Variable Power Supply: 1.5V to 14 V 1.5V to 34V

		• **Voltmeter** : 0-200V • **Ammeter** : 0-200mA • **Bread Board** Dimension (mm) : 175 x 61 x 10 (Approx) Distribution strips :2 Terminal holes : 640 • Resistor Bank : M.F.R. 100E 1W (3 Nos.) M.F.R. 470E 1W (3 Nos.) M.F.R. 1K 1W(3 Nos.) •Variable Resistances : 5 KΩ Ten turn Potentiometer (1 No.) 10 KΩ Ten turn Potentiometer (1 No. •Fuse : 500 mA, slow blow
4	Set up of an Amplitude modulation-Demodulation	**DSB/SSB AM Transmitter** **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 **Power Supply** : 110-220 V AC ±10%, 50/60Hz **Power Consumption** : 4 VA approximately **Operating Conditions** : 0-40° C, 80% RH **Product Tutorial** : Online (Theory, procedure, Reference results, etc). **Included Accessories :**

		Patch Cord 16" : 2 nos. Mains Cord, TechBook :1 no. Power Supply, Microphone, Earphone **DSB/SSB AM Receiver** **Technical Specification :** • Construction : Superhetrodyne • Frequency Range : 980 KHz to 2060 KHz • Intermediate Frequency : 455 KHz • Input Circuits : 1) RF Amplifier 2) Mixer 3) Local Oscillator 4) Beat Frequency Oscillator 5) IF Amplifier 1 6) IF Amplifier 2 • Tuning : With variable capacitor (ganged) Dial marking on board • Receiving media : Telescopic antenna / Cable • Detectors : 1) Diode detector (for DSB) 2) Product detector (for SSB) • Audio Output : Amplifier with speaker • Automatic Gain Control : Switchable • Switched Faults : 8 nos. • Interconnections : 2 mm Banana sockets • Test points : 30 nos. • **Power Supply** : 110-220 V AC ±10%, 50/60Hz • **Power Consumption** : 3 VA approximately • **Operating Conditions** : 0-40° C, 80% RH • **Product Tutorial** : Online (Theory, procedure, Reference results, etc). • **Included Accessories :** • Patch cord 16" : 2 nos. Power Supply : 1 no. Mains cord, Earphone
5	Construction of a single FET amplifier with common source configuration	Technical Specification : • DC power supply : +12V DC • Mains supply : 230V ±10%, 50Hz
6	Set up of 16 channel A/D converter circuit	**Product Name :** Analog to Digital Converter **Technical Specification :**

		• **A/D Conversion :** 4 bit discrete (ramp) 8 bit monolithic converter • Signal Source : Unipolar & Bipolar DC voltages • 0/P Indication : By LEDs separate for each type • Inter connections : 2 mm banana socket • Power Supply : 110-220 V, ±10%, 50/60 Hz • Power Consumption : 3 VA approximately **Included Accessories :** • Patch cord 16" (2mm) : 16 nos. • Mains cord : 1 no.
7	Study of Dual D/A converter circuit	**Technical Specification :** • D/A Conversion : 2.4 bit R-2R ladder network : 1.4 bit weighted resistor : 3.8 bit monolithic D/A Converter • Signal Source : DC Supply with toggle switches • O/P Indication : On DMM or Oscilloscope • Interconnections : 2mm banana sockets • Power Supply : 110-220 V ±10%, 50/60 Hz **Included Accessories :** • Patch cord 16" (2mm) : 17 nos. • Mains cord : 1 no.
8	Setup for construction of a low-pass filter circuit and study its output performance	**Technical Specification :** • **Function generator** • **Frequency range of Function Generator** : Selectable 1Hz to 10Hz 10Hz to 100Hz 100Hz to 1kHz 1KHz to 10 kHz 10kHz to 100kHz • **Amplitude controlled output** • **Active Filter** : Variable Cutoff Frequencies : Adjustable Gain of output : Manual creation of Band Pass Filter using High Pass and Low Pass Filter • **Power Supply** : 230V ±10%, 50Hz • **Fuse** : 350mA

9	Setup for construction of a high-pass filter circuit and study its output performance	**Technical Specification :** • **Function generator** • **Frequency range of Function Generator** : Selectable 1Hz to 10Hz 10Hz to 100Hz 100Hz to 1kHz 1KHz to 10 kHz 10kHz to 100kHz • **Amplitude controlled output** • **Active Filter** : Accurate frequency response : Variable Cutoff Frequencies : Adjustable Gain of output : Manual creation of Band Pass Filter using High Pass and Low Pass Filter • **Power Supply** : 230V ±10%, 50Hz • **Fuse** : 350mA
10	Logic gates circuit setup for verification of Dmorgan's law	**Technical Specification : Digital IC** • **Input** : +5V DC • **Logic levels** +5V : HIGH(Logic 1) 0V : LOW (Logic 0) Led for detection : (On/Off) **Scope of Learning:** • Verifying (A+B)' = A'. B' • Verifying (A.B)' = A'+B'
11	Study the characteristics of SCR	**Technical Specification :** • **Mains power supply** : 90 – 270V ±10%, 50Hz • **Fixed DC power supply** : +15V, Regulated +35V, Regulated -35V, Regulated • **Bread Board** Dimension (mm) : 75 x 61 x 10 (Approx) Distribution strips 2 Terminal strips 1 Distribution holes 200 Terminal holes 640 • **DIAC** : DB3 • **TRIAC** : BT136

		• **SCR** : TYN616 • **Resistor Bank** M.F.R. 2.2K 1% ¼W (3 Nos.) M.F.R. 470E 1% ¼W (3 Nos.) • **Variable Resistance bank :** 5K 10 turn Potentiometer (2 Nos.) • **Voltmeter Range** : 0V to 99V • **Ammeter Range** : 0mA to 20mA
12	Study the characteristics of MOSFET	**Technical Specification :** • **Mains Supply** : 90-230V, 50Hz DC Fixed Power Supply : -5V, +15V, +35V DC Variable Power Supply: 1.5V to 14 V 1.5V to 34V • **Voltmeter** : 0-200V • **Ammeter** : 0-200mA • **Bread Board** Dimension (mm) : 175 x 61 x 10 (Approx) Terminal Strips 1 Terminal holes 640 • **Resistor Bank** : M.F.R. 100E 1W (3 Nos.) M.F.R. 470E 1W (3 Nos.) M.F.R. 1K 1W(3 Nos.) • **Variable Resistances** : 5 KΩ Ten turn Potentiometer (1 No.) 10 KΩ Ten turn Potentiometer (1 No.) 5 KΩ Single turn Potentiometer (1 No.) • **Fuse** : 500 mA, slow blow
13	Study the characteristics of UJT	**Technical Specification :** **Mains Supply** : 90-230V, 50Hz DC Fixed Power Supply : - DC Variable Power Supply : 1.5V to 14 V 1.5V to 34V • **Voltmeter** : 0-200V • **Ammeter** : 0-200mA • **Bread Board** Dimension (mm) : 175 x 61 x 10 (Approx) Distribution strips 2 Distribution holes 200 Terminal Strips 1

		Terminal holes 640 • **Resistor Bank** : M.F.R. 100E 1W (3 Nos.) M.F.R. 470E 1W (3 Nos.) M.F.R. 1K 1W(3 Nos.) • **Variable Resistances** : 5 KΩ Ten turn Potentiometer (1 No.) 10 KΩ Ten turn Potentiometer (1 No.) 5 KΩ Single turn Potentiometer (1 No.) • **Fuse** : 500 mA, slow blow
14	Study the characteristics of TRIAC	**Technical Specification :** • **Mains power supply** : 90 - 270V ±10%, 50Hz • **Fixed DC power supply** : +15V, Regulated +35V, Regulated -35V, Regulated • **Bread Board** Dimension (mm) : 75 x 61 x 10 (Approx) Distribution strips 2 Terminal strips 1 Distribution holes 200 Terminal holes 640 • **DIAC** : DB3 • **TRIAC** : BT136 • **SCR** : TYN616 • **Resistor Bank** M.F.R. 2.2K 1% 1/4W (3 Nos.) M.F.R. 470E 1% 1/4W (3 Nos.) M.F.R. 1K 1% 5W (3 Nos.) M.F.R. 4.7K 1% 5W (3 Nos.) M.F.R. 1K 1% 10W (3 Nos.) • **Variable Resistance bank :** 5K 10 turn Potentiometer (2 Nos.) • **Voltmeter Range** : 0V to 99V • **Ammeter Range** : 0mA to 20mA
15	Setup to verify the given Boolean identities on the ALU system	**Technical Specification :** • **DC power supply :** +5 V • **Logic levels** +5 V : High (logic 1) 0 V **:** Low (logic 0) • **LED Indication :** LED will be 'on' for logic high state

		and will be 'off' for logic low state
16	Encoders and Decoders	**Technical Specification :** • **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 0 state
17	Left and Right shift registers and ring counters	**Technical Specification :** • **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 0 state
18	Counters, Ring counters	**Technical Specification :** • **DC Power Supply** **:** +5 V DC • **Logic levels** **+5 V** **:** High (Logic 1) **0 V** **:** Low (Logic 0) • **LED Indication** **:** LED will be ON for logic high or '1' state and will be OFF for logic low or '0' state
29	Multivibrators: Bistable, Astable, monostable	**Technical Specification :** • **Mains Supply** : 230V ±10%, 50Hz • **DC Bias Voltage** : +5V • **Frequency of Trigger** : 1KHz • **Pulse Generator** • **Frequency Range of Astable Multivibrator** : 600Hz – 3.2KHz (approximate) • **Frequency Range of Bistable Multivibrator** : 350Hz – 1KHz (approximate) • **Output Voltage** : 5VPP (approximate)

20	Setup to determine the thermal coefficient of a thermistor	**Technical Specification :** • **Transducers** : 4 Nos. • N.T.C. Thermistor • Platinum R.T.D. • K Type Thermocouple • IC Temperature Sensor • **Heating Element** : Wirewound resistance 47W • **Signal Conditioning Circuitry :** • Instrumentation Amplifier • X100 Amplifier • DC Amplifier • Comparator • Electronic Switch • **Input Circuits** : Rotary & Slide Potentiometers • **Output Circuits :** • Relay • Buzzer • **Interconnections** : 2mm banana sockets • **Mains Supply** : 100V-240 V, AC, 50/60 Hz • **Power Consumption** : 2 VA (approximately) • **Operating Conditions** **:** 0-40°C, 85% RH • **Included Accessories :** • Mains cord -1no. • TechBook Power Supply -1no. • Patch Cord 16" (2mm) -8nos. • Patch Cord 8" (2mm) -7nos.

ANNEXURE-V

TECHNICAL COMPLIANCE REPORT:

ADVANCED ELECTRONIC LABORATORY

Sr. no.	Name of Experiment and Specifications		Numerical values or other specification	Whether comply Yes/No
1	**Setup for the forward and reverse characteristics of a Zener diode** **Diodes Features:** The trainer should be a complete system to study the diode characteristics. Forward and reverse characteristics experiment should be performed on this trainer kit Silicon, Zener and Light Emitting Diode (LED) should provided with this system Inbuilt Ammeter and Voltmeter should provided with the trainer It should have digital display for displaying voltage and current Different test points should be provided to test the outputs. The supplier should provide online product tutorial for the trainer **Technical Specification :**			
	On Board DC power supply :	: +12V DC		
	Ammeter Range	: 1µA to 200mA		
	Display	: 3½ digit		
	Voltmeter Range	: 1mV to 200V		
	Display	: 3½ digit		
	Mains power	: 230V AC ±10%		

2	**Set up of Operational-Amplifier to construct adder ,subtract,differentiate and integrator circuits etc** **Technical Specification :**			
	Mains power supply (SMPS)	: 90 - 270V ±10%, 50Hz		
	Fixed DC power supply	: +12V, Regulated -12V, Regulated +5V, Regulated -5V, Regulated		
	• **Variable DC power supply**	: +1.5V to +10V Regulated using LM317		
		: -1.5V to -10V Regulated using LM337		
	Function Generator **Sine Wave** Frequency	: 1KHz to 100KHz		
	Frequency Control	: 100KΩ, 10 turn		
	Potentiometer Amplitude	: 0V to 5Vpp		
	Amplitude Control Potentiometer	: 100KΩ, Single turn		
	Triangular Wave Frequency	: 1KHz to 100KHz		
	Frequency Control	: 100KΩ, 10 turn		
	Potentiometer Amplitude	: 0V to 5Vpp		
	Amplitude Control Potentiometer	: 100KΩ, Single turn		
	Square Wave Frequency	: 1KHz to 100KHz		
	Frequency Control	: 100KΩ, 10 turn		
	Potentiometer Amplitude	: 5Vpp, fixed		
	Bread Board Dimension(mm)	: 175 x 61 x 10 (Approx)		
	Distribution strips	2		
	Distribution holes	200		

	`Terminal holes	640		
	Op-amp	: IC uA741 (2 Nos.) All pins terminated on 2mm Banana Sockets		
	Supply Voltage	: ±22V max.		
	Differential Input Voltage	:±30V max.		
	Input Voltage	: ±15V max.		
	Slew Rate	: 0.5 V/µs (VCC = ±15V)		
	Should have Short circuit Protection			
	Resistor Bank SMD Resistance 1KΩ 1% 1/4W (5 Nos.)			
	SMD Resistance 10KΩ 1% 1/4W (5 Nos.)			
	SMD Resistance 100KΩ 1% 1/4W (5 Nos.)			
	1MΩ Single turn Potentiometer (2 Nos.)			
	Fuse	: 500mA, slow blow		
3	**Setup for static and drain characteristics of a JFET** **Technical Specification :**			
	Mains Supply	: 90-230V, 50Hz DC Fixed		
	Power Supply	: -5V, +15V, +35V DC		
	Variable Power Supply	: 1.5V to 14 V 1.5V to 34V		
	Voltmeter	: 0-200V		
	Ammeter	: 0-200mA		
	Bread Board Dimension (mm)	: 175 x 61 x 10 (Approx)		
	Distribution strips	: 2		
	Terminal holes	: 640		
	Resistor Bank	: M.F.R. 100E 1W (3 Nos.) M.F.R. 470E 1W (3 Nos.) M.F.R. 1K 1W(3 Nos.)		
	Variable Resistances	: 5 KΩ Ten turn Potentiometer (1 No.)		

		10 KΩ Ten turn Potentiometer (1 No.)		
	Fuse	: 500 mA, slow blow		
4	**Set up of an Amplitude modulation-Demodulation** **DSB/SSB AM Transmitter**			
	Oscillator	: With adjustable Amplitude & Frequency (300 Hz – 3.4 KHz)		
	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		
	Power Supply 50/60Hz	: 110-220 V AC ±10%,		
	Power Consumption	: 4 VA approximately		
	Operating Conditions	: 0-40° C, 80% RH		

	Product Tutorial	: Online (Theory, procedure, Reference results, etc).		
	Included Accessories : Patch Cord 16"	: 2 nos.		
	Mains Cord, TechBook Microphone, Earphone	:1 no. Power Supply,		
	DSB/SSB AM Receiver **Technical Specification :**			
	Construction	: Superhetrodyne		
	Frequency Range	: 980 KHz to 2060 KHz		
	Intermediate Frequency	: 455 KHz		
	• Input Circuits	RF Amplifier		
		Mixer		
		Local Oscillator		
		Beat Frequency Oscillator		
		IF Amplifier 1		
		IF Amplifier 2		
	• Tuning	: With variable capacitor (ganged) Dial marking on board		
	• Receiving media	: Telescopic antenna / Cable		
	• Detectors	: 1) Diode detector (for DSB) 2)Product detector (for SSB)		
	Audio Output	: Amplifier with speaker		

	Automatic Gain Control	: Switchable		
	Switched Faults	: 8 nos.		
	Interconnections	: 2 mm Banana sockets		
	Test points	: 30 nos.		
	Power Supply 50/60Hz	: 110-220 V AC ±10%,		
	Power Consumption	: 3 VA approximately		
	Operating Conditions	: 0-40° C, 80% RH		
	roduct Tutorial	: Online (Theory, Procedure, Reference results, etc).		
	Included Accessories : Patch cord 16"	: 2 nos.		
	Power Supply	: 1 no. Mains cord		
	Earphone	: 1 no.		
5	**Construction of a single FET amplifier with common source configuration** Technical Specification :			
	DC power supply	: +12V DC		
	Mains supply	: 230V ±10%, 50Hz		
6	**Set up of 16 channel A/D converter circuit** **Technical Specification :** **A/D Conversion :** 4 bit discrete (ramp)			
	8 bit monolithic converter			
	Signal Source	: Unipolar & Bipolar DC voltages		
	0/P Indication	: By LEDs separate for each type		

	Inter connections	: 2 mm banana socket		
	Power Supply	: 110-220 V, ±10%, 50/60 Hz		
	Power Consumption	: 3 VA approximately		
	Included Accessories : Patch cord 16" (2mm)	: 16 nos.		
	Mains cord	: 1 no.		
7	**Study of Dual D/A converter circuit**			
	D/A Conversion	• 2.4 bit R-2R ladder network		
		: 1.4 bit weighted resistor		
		: 3.8 bit monolithic D/A Converter		
	• Signal Source	• : DC Supply with toggle switches		
	• O/P Indication	• : On DMM or Oscilloscope		
	• Interconnections	• : 2mm banana sockets		
	• Power Supply	• : 110-220 V ±10%, 50/60 Hz		
	Included Accessories :	• Patch cord 16" (2mm) : 17 nos. • Mains cord: 1 nos		
8	**Setup for construction of a low-pass filter circuit and study its output performance** **Technical Specification :**			
	Function generator			
	Frequency range of Function Generator :	Selectable 1Hz to 10Hz 10Hz to 100Hz 100Hz to 1kHz 1KHz to 10 kHz 10kHz to 100kHz		
	Amplitude controlled output			
	Active Filter	: Variable Cutoff Frequencies		

		: Adjustable Gain of output		
		: Manual creation of Band Pass Filter using High Pass and Low Pass Filter		
	Power Supply	: 230V ±10%,		
	Fuse	: 350mA		
9	**Setup for construction of a high-pass filter circuit and study its output performance** **Technical Specification :** **Function generator**			
	Frequency range of Function Generator :	Selectable 1Hz to 10Hz 10Hz to 100Hz 100Hz to 1kHz 1KHz to 10 kHz 10kHz to 100kHz		
	Amplitude controlled output			
	Active Filter	: Accurate frequency response		
		: Variable Cutoff Frequencies		
		: Adjustable Gain of output		
		: Manual creation of Band Pass Filter using High Pass and Low Pass Filter		
	Power Supply	: 230V ±10%,50Hz		
	Fuse	: 350mA		
10	**Logic gates circuit setup for verification of Dmorgan's law** **Technical Specification :** Digital IC			
	• **Input**	: +5V DC		

	• **Logic levels** +5V : HIGH(Logic 1) 0V : LOW (Logic 0) Led for detection : ON/OFF			
	Scope of Learning: • Verifying (A+B)' = A'. B' • Verifying (A.B)' = A'+B'			
11	**Study the characteristics of SCR** **Technical Specification :** **Mains power supply** : 90 – 270V ±10%, 50Hz			
	Fixed DC power supply	: +15V, Regulated		
		+35V, Regulated		
		-35V, Regulated		
	Bread Board Dimension (mm)	75 x 61 x 10 (Approx)		
	Distribution strips	2		
	Terminal strips	1		
	Distribution holes	200		
	Terminal holes	640		
	DIAC	DB3		
	TRIAC	BT136		
	SCR	TYN616		
	Resistor Bank	M.F.R. 2.2K 1% ¼W (3 Nos.) M.F.R. 470E 1% ¼W (3 Nos.)		
	Variable Resistance bank	5K 10 turn Potentiometer (2 Nos.)		
	Voltmeter Range	0V to 99V		
	Ammeter Range	0mA to 20mA		
12	**Study the characteristics of MOSFET** **Technical Specification :** • **Mains Supply** 90-230V, 50Hz DC			

	• Fixed Power Supply	-5V, +15V, +35V DC		
	• Variable Power Supply	1.5 V to 14 V 1.5 V to 34 V		
	• **Voltmeter**	0-200V		
	• **Ammeter**	0-200mA		
	• **Bread Board** Dimension (mm)	175 x 61 x 10 (Approx)		
	Terminal Strips	1		
	Terminal holes	640		
	• **Resistor Bank**	M.F.R. 100E 1W (3 Nos.)		
		M.F.R. 470E 1W (3 Nos.)		
		M.F.R. 1K 1W (3 Nos.)		
	• **Variable Resistances**	1)5 KΩ Ten turn Potentiometer (1 No.)		
		2)10 KΩ Ten turn Potentiometer (1 No.)		
		3)5 KΩ Single turn Potentiometer (1 No.)		
	• **Fuse**	500 mA, slow blow		
13	**Study the characteristics of UJT** **Technical Specification :** **Mains Supply** DC Variable Power Supply	1.5V to 34V, 1.5V to 14 V		
	Voltmeter	0-200V		
	Ammeter	0-200mA		
	Bread Board Dimension (mm)	175 x 61 x 10 (Approx)		
	Distribution strips	2		
	Distribution holes	200		
	Terminal Strips	1		
	Terminal holes	640		
	Resistor Bank	M.F.R. 100E 1W (3 Nos.)		
		M.F.R. 470E 1W (3 Nos.)		

		M.F.R. 1K 1W (3 Nos.)		
	Variable Resistances	1)5 KΩ Ten turn Potentiometer(1 No.)		
		2)10 KΩ Ten turn Potentiometer (1 No.)		
		3)5 KΩ Single turn Potentiometer (1 No.)		
	Fuse	500 mA, slow blow		
14	**Study the characteristics of TRIAC** **Technical Specification :** **Mains power supply** : 90 - 270V ±10%, 50Hz			
	Fixed DC power supply	: +15V, Regulated		
		+35V, Regulated		
		-35V, Regulated		
	Bread Board Dimension (mm)	75 x 61 x 10 (Approx)		
	Distribution strips	2		
	Terminal strips	1		
	Distribution holes	200		
	Terminal holes	640		
	DIAC	DB3		
	TRIAC	BT136		
	SCR	TYN616		
	Resistor Bank	M.F.R. 2.2K 1% 1/4W (3 Nos.)		
		M.F.R. 470E 1% 1/4W (3 Nos.)		
		M.F.R. 1K 1% 5W (3 Nos.)		
		M.F.R. 4.7K 1% 5W (3 Nos.)		
		M.F.R. 1K 1% 10W (3 Nos.)		
	Variable Resistance bank	5K 10 turn Potentiometer (2 Nos.)		
	Voltmeter Range	0V to 99V		

	Ammeter Range	0mA to 20mA		
15	**Setup to verify the given Boolean identities on the ALU system** **Technical Specification :** **DC power supply :** +5 V			
	Logic levels +5 V : High (logic 1) 0 V **:** Low (logic 0)			
	LED Indication **:** LED will be 'on' for logic high State and will be 'off' for logic low state			
16	**Encoders and Decoders** **Technical Specification :** **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 0 state			
17	**Left and Right shift registers and ring counters** **Technical Specification :** **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 0 state			

18	**Counters, Ring counters** **Technical Specification :** **DC Power Supply** : +5 V DC			
	Logic levels **+5** : High (Logic 1) **0 V** : Low (Logic 0)			
	LED Indication : LED will be ON for logic high or '1' state and will be OFF for logic low or '0' state			
19	**Multivibrators: Bistable, Astable, monostable** **Technical Specification :** **Mains Supply** : 230V ±10%, 50Hz			
	DC Bias Voltage	+5V		
	Frequency of Trigger	1KHz		
	Pulse Generator Frequency Range (approximate) **of Astable Multivibrator**	600Hz – 3.2KHz		
	Frequency Range (approximate) **of Bistable Multivibrator**	350Hz – 1KHz		
	Output Voltage	$5V_{PP}$ (approximate)		
20	**Setup to determine the thermal coefficient of a thermistor** **Technical Specification :**			
	Transducers	• N.T.C. Thermistor • Platinum R.T.D. • K Type Thermocouple • IC Temperature Sensor		
	Heating Element	Wirewound resistance 47W		

	Signal Conditioning Circuitry :	• Instrumentation Amplifier • X100 Amplifier • DC Amplifier • Comparator		
	Input Circuits	: Rotary & Slide Potentiometers		
	Output Circuits	• Relay • Buzzer		
	Interconnections	2mm banana sockets		
	Mains Supply	100V-240 V, AC, 50/60 Hz		
	Power Consumption	2 VA (approximately)		
	Operating Condition	0-40°C, 85% RH		
	Included Accessories	Mains cord -1no.		
		TechBook Power Supply -1no.		
		`Patch Cord 16" (2mm) -8nos.		
		Patch Cord 8" (2mm) -7nos.		

ANEXURE-VI

DETAILS OF EQUIPMENTS TO BE SUPPLIED AT VARIOUS IKGPTU CAMPUSES:

S.No.	Name of the Equipment	Kapurthala	Total Quantity
1	Setup for the forward and reverse characteristics of a Zener diode	2	**2**
2	Set up of OP-Amp	2	**2**
3	Setup for static and drain characteristics of a JFET	2	**2**
4	Set up of an Amplitude modulation-Demodulation	2	**2**
5	Construction of a single FET amplifier with common source configuration	2	**2**
6	Set up of 16 channel A/D converter circuit	1	**1**
7	Study of Dual D/A converter circuit	1	**1**
8	Setup for construction of a low-pass filter circuit and study its output performance	2	**2**
9	Setup for construction of a high-pass filter circuit and study its output performance	2	**2**
10	Logic gates circuit setup for verification of Dmorgan's law	2	**2**
11	SCR setup	2	**2**
12	MOSFET setup	2	**2**
13	UJT setup	2	**2**
14	TRIAC setup	2	**2**
15	Setup to verify the given Boolean identities on the ALU system	2	**2**
16	Encoders and Decoders	2	**2**
17	Left and right shift registers and ring counters	2	**2**
18	Counters, Ring counters	2	**2**
19	Multivibrators: Bistable, Astable, monostable	1	**1**
20	Setup to determine the thermal coefficient of a thermistor	1	**1**