



**INDIRA GANDHI INSTITUTE OF TECHNOLOGY (IGIT)**  
**SARANG, DHENKANAL (ODISHA)-759146**  
**(An Autonomous Institute of Govt. of Odisha)**

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No. IGIT/ETC /449

Date: - 30/09/2023

**TENDER CALL NOTICE**

Sealed Tenders are invited from eligible reputed OEM (Original Equipment Manufacturer)/ Authorized Distributor /Dealer/ Retailer for Purchase of Laboratory Equipments in the Department of Electronics & Telecommunication Engineering. Interested bidders may apply in the prescribed tender format which is available on the Institute website [www.igitsarang.ac.in](http://www.igitsarang.ac.in) from Dt: 30/09/2023 along with non-refundable fees as per actual in shape of account payee demand draft in favour of "PRINCIPAL, INDIRA GANDHI INSTITUTE OF TECHNOLOGY, SARANG" payable at SBI, IGIT, Sarang. Last date for receipt of the Tender document (Technical & Financial Bid) is Dt: 08/11/2023 4.30 P.M.

Sd/-

DIRECTOR

**INDIRA GANDHI INSTITUTE OF TECHNOLOGY (IGIT),  
SARANG, Dhenkanal-759146**



**Request for Proposal (RFP)**

**Purchase of Laboratory Equipments for the  
Department of Electronics & Telecommunication  
Engineering.**

**at**

**IGIT, SARANG**

*S. M. L.*  
30/09/2023

## DISCLAIMER

Indira Gandhi Institute of Technology (IGIT), Sarang is inviting eligible interested Vendors/suppliers/manufacturers to submit Request for Proposal (RFP) for Supply, Installation and Demonstration of Basic Electronics Engineering, Analog Electronics Circuit and Digital Electronics Circuit laboratory equipment for the department of ETC Engg. IGIT Sarang.

No contractual obligation whatsoever shall arise from the RFP process unless and until a formal contract is signed and executed between Indira Gandhi Institute of Technology (IGIT), Sarang and the Vendors/suppliers/manufacturers concerned. Indira Gandhi Institute of Technology (IGIT), Sarang reserves the right not to proceed with the implementation of the project.

## NOTICE INVITING RFP

**Indira Gandhi Institute of Technology (IGIT) Sarang  
Sarang, Dhenkanal-759146  
Odisha**

**No.IGIT/ETC/445**

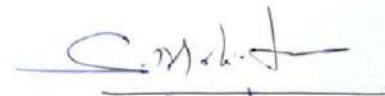
**Dated: 30.09.2023**

### **Request for Proposal (RFP)**

**Supply, Installation and Demonstration of different laboratory equipments at the department of Electronics and Telecommunication Engg. IGIT Sarang**

Indira Gandhi Institute of Technology, Sarang invites applications for Request for Proposal (RFP) from eligible interested and experienced Vendors/suppliers/manufacturers for Supply, Installation and Demonstration of different laboratory equipments at the department of ETC Engg. IGIT Sarang.

The sealed cover superscribed 'Supply, Installation and Demonstration of different laboratory equipments' shall be opened on 09.11.2023 at 9:00 AM. Sealed cover shall contain two sealed covered envelopes—Part-I (Technical bid) and Part-II (Financial bid). The Part-I (Technical bid) shall be opened on the same day in presence of attending Vendors/suppliers/manufacturers. The Part- I (Technical bid) shall contain Bank draft for earnest money and other documents as required in the herein- under. The Part- I (Technical bid) without bank draft for earnest money shall be rejected outright. The Part- I (Technical bid) shall be evaluated in accordance with qualification criteria for short-listing the Vendors/suppliers/manufacturers as prescribed in the RFP document. The Part-

  
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II (Financial bid) shall be opened in due course as noted in 'Schedule for submission of RFP'.

**Part -I (superscribing Technical bid)**

The Technical bid shall detail the technical specifications of the laboratory equipments, compliance to the specifications detailed in the RFP. Checklist for Technical Bid, supporting documents such as certificate of incorporation, memorandum of Association, copy of PAN, GST certificate, work order copy/ experience certificates, IT returns of last 3 years audited account statements, Vendors/suppliers/manufacturers profile and other requisite documents. Bank Draft for earnest money shall be kept in separate envelope marked as 'EMD' and be placed within this envelope. Any other relevant papers, which a Vendor/supplier/manufacturer feels necessary along with the Terms and Conditions duly signed and accepted by the Vendor shall form part of this Technical bid.

**Part -II (superscribing Financial Bid)**

1. The Financial bid shall give detailed of price in INR of laboratory equipments, taxes and other work as per the pro-forma in **Section-I** enclosed.

2. IGIT, Sarang shall not be liable for any expenses incurred by the Vendor/supplier/manufacturer in preparing the bid documents for this RFP or for any correspondence or for any negotiations associated with the award of a contract.

**Late Applications:** Any application, received after the last date and time i.e., Dt: **08.11.2023 (4:30 PM)** for submission, shall not be accepted. Applications received after the last date shall be summarily rejected and returned unopened.

The completed application (response document), (printed, signed and bound copy) shall be submitted in a sealed cover superscribed with the title "**Supply, Installation and Demonstration of different laboratory equipments**" at the address given below (by registered/speed post only):

To  
The Director  
Indira Gandhi Institute of Technology, Sarang  
Dhenkanal-759146, Odisha, India.

**Kind Attention: HoD, Dept. of ETC Engg.**

The RFP document, instruction to Vendor/supplier/manufacturer, other detailed terms and conditions can be downloaded from the website: <http://www.igitsarang.ac.in>.

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**Table- 1**

Last date and time of submission of tender	08.11.2023(4:30 PM)
Cost of the tender paper	Rs. 1000/- (Rupees One Thousand only)
EMD for Item - I	Rs. 30,000/-
EMD for Item - II	Rs. 8,000/-
EMD for Item - III	Rs. 31,000/-
EMD for Item - IV	Rs. 19,000/-
EMD for Item - V	Rs. 15,000/-
EMD for Item- VI	Rs. 56,000/-

**Important Details**

The document is prepared by IGIT, Sarang. It should not be reused or used in any form either fully or partially. The information provided by the Vendors/suppliers/manufacturers in response to this tender document shall become property of IGIT, Sarang and shall not be returned.

**SCHEDULE FOR SUBMISSION OF RFP**

The following are the schedule of events for this project. The schedule is subject to change depending on the outcome of the events / responses of the events and a final schedule shall be established prior to contracting with the successful Vendors/suppliers/manufacturers.

Event	Date and Time
Availability of RFP Document at IGIT Sarang Website	30.09.2023
Last Date and time for submission of completed RFP Document	08.11.2023 (4:30 PM)
Opening of RFP (Technical Bid)	09.11.2023 at 9:00 AM
Opening of RFP (Financial Bid)	10.11.2023 at 9:00 AM

*S. Mallick*  
30/09/2023

## 1. SCOPE OF WORK

Supply, Installation and Demonstration of different laboratory equipments at Electronics and Telecommunication Engg. department, IGIT Sarang.

Items are to be quoted per unit price.

### ➤ Item - I

Specifications of Basic Electronics Engineering, Analog Electronics Circuit and Digital Design Laboratory equipments.

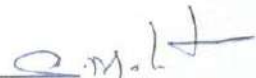
Sl. No.	Name of the equipment/setup/device	Specification	Quantity Required in number(s)
1.	Digital Storage Oscilloscope	<ul style="list-style-type: none"><li>• 70MHz or more Bandwidth with 02or 04 channels.</li><li>• 1G/2GSa/s sampling for analog channel and 1GSa/s/500MSa/s for digital channels.</li><li>• Vertical rage 1mV/div -10V / div.</li><li>• Horizontal range 5ns/div to 50 s/div.</li><li>• Trigger Types: Edge, Pattern/State, Pulse width, Setup and Hold, Rise/fall time, Video, I2c, LIN, CAN, SPI</li><li>• Window types: Hanning, Flat top, Rectangular, Blackman-Harris Vertical scaling: dB (logarithmic) or RMS (linear)</li><li>• Horizontal scaling: User-defined span and centre frequency settings, or Auto Setup</li><li>• Acquisition modes: Normal, Peak detect, Averaging, Segmented, High resolution</li><li>• Math function: Add, subtract, multiply, divide, FFT (magnitude and phase), low pass filter</li><li>• Computer Interface USB host and device and LAN.</li></ul>	08
2.	Digit Digital Multimeter	<ul style="list-style-type: none"><li>• 3 ½ Digit,</li><li>• AC Voltage(40Hz to 500Hz): 0.1mV ~ 750V</li><li>• AC Current: 0.1uA ~ 20A,</li><li>• DC Voltage: 0.1mV ~ 1000V,</li><li>• DC Current: 0.1uA ~ 20A,</li><li>• Resistance Range : .1 ohm to 40Mohm</li><li>• Capacitance : 10pF to 200uF,</li><li>• Frequency : 0.1Hz to 30MHz</li></ul>	05
3.	Transistor Characteristics Trainer(For CE,CB and CC Transistor)	<ul style="list-style-type: none"><li>• DC Power Supply : 2nos. (-15V to +15VDC /200mA),</li><li>• Display : 3½ digit,</li><li>• Analog Panel Meters : Voltmeter(3½ digit) range : 1mV to 200V,</li><li>• Ammeter(3½ digit) range : 1µA to 200mA,</li><li>• Input Line Voltage : 230V AC ± 10% , 50Hz, with bothNPN and PNP</li></ul>	08
4.	Rectifier and Filter Circuit Trainer	<ul style="list-style-type: none"><li>• Mains Supply : 230V ±10%, 50Hz</li><li>• Transformer Rating : 9-0-9V/300mA, Rectifiers : Half wave; Full wave - Bridge, Center Tapped Rectifier,</li><li>• Filter : LC Type,</li></ul>	05

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30/09/2023

		<ul style="list-style-type: none"> <li>• On-board DC Voltmeter : Range 0 - 20V,</li> <li>• On-board AC Voltmeter : Range 0 - 20V</li> <li>• Load : Variable Resistive load 10K.</li> </ul>	
5.	Dual Channel Function Generator	<ul style="list-style-type: none"> <li>• 1<math>\mu</math>Hz to 25MHz 2 channel Function Arbitrary waveform generator should have 125 MSa/s sample rate.</li> <li>• Waveforms: Sine, square, ramp, pulse, triangle, Gaussian noise, pseudorandom binary sequence (PRBS), 7 inch display,</li> <li>• Voltage resolution: 16bits</li> <li>• Sample rate: 1 <math>\mu</math>Sa/s to 250 Msa/s, 1 <math>\mu</math>Sa/s resolution with 7 inch display</li> </ul>	05
6.	Diode Characteristic Trainer	<ul style="list-style-type: none"> <li>• On board Variable DC Power Supply:0 to + 12V/200mA,</li> <li>• On-board DC Voltmeter : Range 0 - 20V, 0 - 200V,</li> <li>• On-board DC Ammeter : Range 0 - 20mA , 0 - 200mA,</li> <li>• Mains Supply:230 V <math>\pm</math>10%, 50 Hz,Transformer: 0 - 9 V, 500 mA (approx.)</li> <li>• On board Diode Bank : A) Silicon/PN Junction Diode, B) Zener Diode, C) Germanium Diode, D) Fast Switching Diode, E) Light Emitting Diode (LED).</li> </ul>	05
7.	Zener diode as Voltage regulator Trainer kit	<ul style="list-style-type: none"> <li>• On board Variable DC Power Supply:0 to + 12V/200mA,</li> <li>• On-board DC Voltmeter : Range 0 - 20V, 0 - 200V,</li> <li>• On-board DC Ammeter : Range 0 - 20mA , 0 - 200mA,</li> <li>• Mains Supply:230 V <math>\pm</math>10%, 50 Hz,Transformer: 0 - 9 V, 500 mA (approx.)</li> <li>• On board Diode Bank : A) Silicon/PN Junction Diode, B) Zener Diode, C) Germanium Diode, D) Fast Switching Diode, E) Light Emitting Diode (LED).</li> </ul>	05
8.	Operational Amplifier Application Trainer/ Design of Op-amp as Schmitt trigger, comparator Trainer kit	<ul style="list-style-type: none"> <li>• Mains power supply: 90 - 270V <math>\pm</math>10%, 50Hz (SMPS)</li> <li>• Fixed DC power supply :+/-12V, +/-5 V Regulated</li> <li>• Variable DC power supply:+1.5V to +10V Regulated and -1.5V to -10V Regulated,</li> <li>• With Function Generator 0 to + 15VDC</li> <li>• Sine Wave: 1Hz - 200 KHz,</li> <li>• Square Wave: 1Hz - 200 KHz,</li> <li>• Triangle Wave: 1Hz - 200 KHz</li> <li>• Different Type Circuits:Comparator, Window Comparator, Zero crossing detector, Sample &amp; Hold, schmitt Trigger, Wien Bridge Oscillator , RC Phase Shift Oscillator, Integrator, Differentiator, Precision Rectifier, Inverting Amplifier, Non-Inverting Amplifier, Adder &amp; Subtractor</li> <li>• Potentiometer bank: 470 ohm, 1K ohm &amp; 10K ohm</li> <li>• Input Line Voltage: 230V AC <math>\pm</math> 10% , 50Hz</li> </ul>	08
9.	BJT Amplifiers and Emitter Follower Trainer	<ul style="list-style-type: none"> <li>• DC power supply: +12V, +5V</li> <li>• Sine wave generator: Frequency:10Hz - 100KHz <math>\pm</math>10%, Amplitude:0 to 5Vpp,</li> <li>• Mains supply:230 V <math>\pm</math>10%, 50 Hz</li> </ul>	05
10.	RC Coupled Amplifier Trainer kit	<ul style="list-style-type: none"> <li>• Inbuilt Fixed DC Power Supply : <math>\pm</math> 5V/200mA, <math>\pm</math> 12V/200mA,</li> <li>• Inbuilt Circuitry : Push Pull Amplifier with Variable Biasing Resistance, Differential Amplifier with Voltage Divider Circuit,</li> <li>• Test Points/Inter connections: 2 mm banana sockets.</li> <li>• Sine Wave Generator : Frequency Range: 1Hz to 200KHz</li> <li>• Input Line Voltage : 230V AC <math>\pm</math> 10% , 50Hz</li> </ul>	05
11.	FET Amplifier Trainer	<ul style="list-style-type: none"> <li>• Inbuilt DC power supply : +15V DC</li> </ul>	08

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		<ul style="list-style-type: none"> <li>• On Board FET with Adequate number of other electronics components are mounted with circuit,</li> <li>• Test Points/Inter connections: Interconnections are done using 2 mmbanana sockets</li> <li>• Input Line Voltage : 230V AC <math>\pm</math> 10% , 50Hz</li> </ul>	
12.	Power and Differential Amplifier Trainer	<ul style="list-style-type: none"> <li>• Mains supply:230V <math>\pm</math>10%, 50Hz</li> <li>• DC power supply</li> <li>• Fixed :+12V, -12V, +5V, -5V</li> <li>• Frequency Variable:10kHz to 100kHz,</li> <li>• Amplitude Variable: 0 to 5Vpp with Fuse</li> </ul>	05
13.	Square wave testing of an amplifier Trainer kit	<ul style="list-style-type: none"> <li>• Generator of using Op amp : Sinewave, Triangular wave &amp; Square wave</li> <li>• Input Line Voltage : 230V AC <math>\pm</math> 10% , 50Hz</li> </ul>	05
14.	Astable and Monostable Multivibrator Trainer	<ul style="list-style-type: none"> <li>• Mains Supply: 230V <math>\pm</math>10%, 50Hz,</li> <li>• DC Bias Voltage:+5V,</li> <li>• Frequency of Trigger: 1KHz,</li> <li>• Pulse Generator Frequency Range: 600Hz – 3.2KHz of Astable Multivibrator Frequency Range: 350Hz – 1KHz and of Bistable Multivibrator Output Voltage: 5 Vpp</li> <li>• IC &amp; Components Provided ( Capacitor Bank, 555 Timer, Variable Resistor Bank, Switches (Push to ON), Output LED Indicator, Pulse Input circuit).</li> </ul>	08
15.	Active Filters Trainer	<ul style="list-style-type: none"> <li>• Function generator: Frequency range of Function Generator: Selectable 1 Hz to 10 Hz, 10 Hz to 100 Hz, 100 Hz to 1 KHz, 1 KHz to 10 KHz, 10 KHz to 100 KHz</li> <li>• Amplitude controlled output, Power Supply: 230 V <math>\pm</math>10%, 50 Hz</li> <li>• 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</li> </ul>	08
16.	Analog digital circuits development Trainer kit	<ul style="list-style-type: none"> <li>• Suitable Size of Breadboard with Tie Points,</li> <li>• DC Power Supplies: +5V, +/- 15V 1A (Fixed), +/- 15V, 200 mA (variable),</li> <li>• AC Supply: 5V-0V-5V, 10V-0V-10V can be used as 5V, 10V, 15V, 20V AC &amp; also as center tap, Sine/Square/TTL Generator: 10Hz to 1MHz in 4 steps,</li> <li>• Amplitude: Sine wave- 0 to 15Vpp, Square Wave- 0 to 10Vpp TTL-5V (fixed), Fixed TTL (Clock): 0.1Hz, Power Supply: 110-220V <math>\pm</math>10%, 50Hz, Power Consumption: 8VA</li> </ul>	05
17.	Class A, Class B, Class C amplifier Trainer kit	<ul style="list-style-type: none"> <li>• Mains Supply: 230V <math>\pm</math>10%, 50Hz,</li> <li>• Should be composed of Class A, Class B and Class C amplifiers.</li> </ul>	05
18.	Op-Amp Oscillator Trainer/ RC Phase shift oscillator Trainer kit	<ul style="list-style-type: none"> <li>• Inbuilt Operating Voltage : <math>\pm</math> 12VDC,</li> <li>• On Board Potentiometer Bank :4K7, 47K and 470K,</li> <li>• On board Oscillators : Hartley Oscillator, Colpitt Oscillator, Phase Shift Oscillator, Wien's Bridge Oscillator, Inter connections :2mm banana sockets</li> <li>• Input Line Voltage :230V AC <math>\pm</math> 10% , 50Hz</li> </ul>	05
19.	Op-Amp based Filter Trainer	<ul style="list-style-type: none"> <li>• Function Generators :Modes : Sine, Triangular and Square Wave,</li> <li>• Frequency : 1Hz-200KHz in six steps variable in each Step, Amplitude : 10Vpp,</li> <li>• On board Potentiometer Bank: 470 ohm, 1K ohm, 5K ohm, 22K ohm,47K ohm, 100K ohm,</li> </ul>	05

  
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		<ul style="list-style-type: none"> <li>On board Filter Circuits: Low Pass Filters : Butterworth , Chebyshev and Sallen Key, High Pass Filters : Butterworth , Chebyshev and Sallen Key,</li> <li>Input Line Voltage : 230V AC <math>\pm</math> 10% , 50Hz</li> </ul>	
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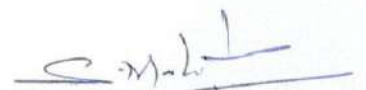
➤ **Item -II**

**Specifications of Network Theory Laboratory equipments.**

Name of Laboratory: Network Theory Laboratory			
Sl. No.	Name of the equipment/setup/device	Specification	Quantity Required in number(s)
1.	Model Network Theorem Trainer Kit	<ul style="list-style-type: none"> <li>Mains supply Voltage : 230V AC <math>\pm</math>10%, 50Hz</li> <li>Regulated DC Power Supply: +30VDC/200mA</li> <li>DC Voltmeter: 0.1 mV - 20V.</li> <li>DC Ammeter : 0.1uA - 200mA</li> <li>On Board Component bank on Different Values: Resistor bank and Variable Resistor bank</li> <li>Diagrammatic Representation of different Circuits- Pie Network T Network, Thevenin's Equivalent Circuit Northon's Equivalent Circuit, Superposition theorem Equivalent Circuit.</li> <li>Symbolic representation of all components.</li> <li>Power ON switch with indicator and fuse for protection.</li> <li>Compact, Light weight and attractive look.</li> </ul>	05
2.	Transient Response In RLC+RC+RL Circuit Trainer kit	<ul style="list-style-type: none"> <li>Mains supply Voltage : 230V AC <math>\pm</math>10%, 50Hz</li> <li>Fixed DC Power Supply + 5V /200mA</li> <li>Digital Frequency Counter range: 10Hz-2KHz (approx.)</li> <li>Inbuilt Function Generator with mode selection of Range 100Hz-1.7KHz</li> <li>Inbuilt Resistors, Inductors and Capacitors (min. of 03nos. each)</li> <li>Adequate BNC Connectors.</li> <li>Printed with all Symbols and Diagrams.</li> <li>Power ON switch with indicator and fuse for protection.</li> <li>Compact, Light weight and attractive look.</li> <li>Can Study the transient response of a series RLC circuit with TTL for under damped, critically damped and over damped cases.</li> </ul>	05
3.	Series Resonance Trainer kit	<ul style="list-style-type: none"> <li>Mains supply Voltage : 230V AC <math>\pm</math>10%, 50Hz</li> <li>Inbuilt Digital Frequency Counter : 10Hz-2KHz</li> <li>Inbuilt Function Generator with Frequency and Amplitude selection of Range 100Hz -1.7KHz or up to 60 KHz</li> <li>Inbuilt Resistors, Inductors and Capacitors (min. of 04nos. each).</li> <li>Adequate Connectors.</li> <li>Printed with all Symbols and Diagrams.</li> <li>Power ON switch with indicator and fuse for protection.</li> <li>Compact, Light weight and attractive look.</li> </ul>	05
4.	Parallel Resonance	<ul style="list-style-type: none"> <li>Mains supply Voltage : 230V AC <math>\pm</math>10%, 50Hz</li> </ul>	05

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	Trainer kit	<ul style="list-style-type: none"> <li>• Inbuilt Digital Frequency Counter : 10Hz-2KHz</li> <li>• Inbuilt Function Generator with Frequency and Amplitude selection of Range 100Hz -1.7KHz or up to 60 KHz</li> <li>• Inbuilt Resistors, Inductors and Capacitors (min. of 04nos. each).</li> <li>• Adequate Connectors.</li> <li>• Printed with all Symbols and Diagrams.</li> <li>• Power ON switch with indicator and fuse for protection.</li> <li>• Compact, Light weight and attractive look.</li> </ul>	
5.	Two Port Network Trainer kit	<ul style="list-style-type: none"> <li>• Mains supply Voltage : 230V AC <math>\pm</math>10%, 50Hz</li> <li>• Variable DC Power Supply : 0- 15Volt (2nos)</li> <li>• On board Digital Meters : On Board Digital Display meter</li> <li>• On board DC Power Supply : Provided Dual Isolated DC supply with Short circuit Protection.</li> <li>• Digital Voltmeter (Dual Range): 0-20V and 0-200VDC</li> <li>• Digital Ammeter (Dual Range) : 0-200mA and 0-2Amp.</li> <li>• On Board Circuits : T Network, Pi-Network &amp; Hybrid Network available on the Trainer</li> <li>• On board Digital Meters : On Board Digital Display meter</li> <li>• On board DC Power Supply : Provided Dual Isolated DC supply with Short circuit Protection</li> <li>• On board Potentiometers and LED Indicators: 2nos. each.</li> <li>• Adequate Power Cords and Patch cords.</li> <li>• Printed with all Symbols and schematic Diagrams.</li> <li>• Power ON switch with indicator and fuse for protection.</li> <li>• Compact, Light weight and attractive look.</li> </ul>	05
6.	Active Filter Trainer kit	<ul style="list-style-type: none"> <li>• Mains supply Voltage : 230V AC <math>\pm</math>10%, 50Hz</li> <li>• Function Generators Modes : Sine, Triangular and Square Wave with Frequency : 1Hz-200KHz in five to seven steps variable in each step, Amplitude : 10Vpp Amplitude controlled output</li> <li>• On board Potentiometer Bank: 470 ohm, 1K ohm, 5K ohm, 22K ohm, 47K ohm, 100K ohm</li> <li>• On board Filter Circuits: Low Pass Filters : Butterworth , Chebyshev and Sallen Key High Pass Filters : Butterworth , Chebyshev and Sallen Key</li> <li>• Manual creation of Band Pass Filter using High Pass and Low Pass Filter</li> <li>• Should have accurate frequency response, Variable Cutoff Frequencies, Adjustable Gain of output.</li> <li>• Printed with all Symbols and schematic Diagrams.</li> <li>• Compact, Light weight and attractive look.</li> <li>• Adequate connectors.</li> </ul>	05
7.	Transformer	220/110v, 1KVA	05
8.	Autotransformer	(0-230/270v) ,4.5 KVA	05
9.	Ammeter AC	( 0-1-2A)	05
10.	Ammeter AC	(0-5-10A)	05
11.	Voltmeter AC	( 0-250-500V)	05
12.	Voltmeter AC	(0-30-62.5V)	05
13.	Wattmeter	5/10A,150/250/500v AC	05
14.	Wattmeter	1/2A,125/150/300v AC	05

  
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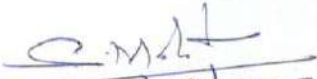
➤ **Item - III**

**Specifications of Communication Engineering Laboratory equipments.**

Sl. No.	Name of the equipment/setup/device	Specification	Quantity Required in number(s)
1.	Spectrum analyzer	<ul style="list-style-type: none"> <li>• Frequency Range: 9 kHz to 4 GHz</li> <li>• Resolution Bandwidth: 10Hz-3MHz or better</li> <li>• Amplitude accuracy: <math>\pm 0.6</math>dB or better</li> <li>• Displayed Average Noise Level@ 1GHz: -149dBm</li> <li>• Frequency Resolution: 1 Hz</li> <li>• Internal Reference Frequency: 10 MHz</li> <li>• Frequency Counter(Resolution): 1Hz, 10Hz, 100Hz, 1KHz, 10KHz, 100KHz</li> <li>• Communication Interface: USB Host, USB Device, LAN</li> <li>• Display : 8" TFT LCD</li> <li>• Power Supply: Input voltage range, AC : 100 V to 240 V AC Supply frequency : 45 Hz to 440 Hz</li> </ul>	02
2.	Satellite communication experimental trainer Kit.	<ul style="list-style-type: none"> <li>• Simultaneous communication of three different signals</li> <li>• Communicate Audio, Video, Digital data, PC data, Tone, Voice, function generator waveforms etc</li> <li>• 5740-5880 MHz PLL microwave operation</li> <li>• Communication of external broad band digital signal</li> <li>• Choice of different transmitting and receiving frequencies</li> <li>• Built-in Speaker and Microphone for Voice and Audio link</li> <li>• Remote detection of Light intensity and environment temperature</li> <li>• Detachable Dish Antenna at each station</li> <li>• RS232 port for PC communication</li> </ul> <p><b>Uplink Transmitter :</b></p> <ul style="list-style-type: none"> <li>• Transmitter with selectable frequency conversion</li> <li>• 2.4GHz Band uplink selectable frequencies</li> <li>• Wide band RF amplifier. No manual matching required.</li> <li>• 16 MHz Bandwidth</li> <li>• Frequency select switch and LED indication.</li> <li>• FM Modulation of Audio and Video.</li> <li>• Coverage area up to 300 meter</li> <li>• Transmit Audio, Video, Digital data, PC data, Tone, Voice, function generator waveforms etc.</li> <li>• Separate section for telemetry operation.</li> </ul> <p><b>Inbuilt Tone generator:</b></p> <ul style="list-style-type: none"> <li>• Frequency: 100Hz to 1 KHz.</li> <li>• Amplitude: 0V to 1Vpp.</li> <li>• Separate terminals provided for different inputs.</li> <li>• Power Supply: 230 V AC <math>\pm 10</math> %. 50/60 Hz</li> </ul>	01

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		<p><b>Satellite Link :</b></p> <ul style="list-style-type: none"> <li>• Transponder with selectable Uplink and downlinks frequency conversion.</li> <li>• Detachable Dish Antennas.</li> <li>• Power Supply: 230 V AC <math>\pm 10\%</math>, 50/60 Hz</li> </ul> <p><b>Downlink Receiver :</b></p> <ul style="list-style-type: none"> <li>• • Receiver with selectable frequency conversion.</li> <li>• Receives and demodulate three signals simultaneously.</li> <li>• Built-in speaker for audio and video output.</li> <li>• Detachable Dish Antenna.</li> <li>• Power Supply: 230 V AC <math>\pm 10\%</math>, 50/60 Hz</li> </ul> <ul style="list-style-type: none"> <li>• Supply Input Voltage: 230V AC.</li> <li>• Attractive ABS Plastic Enclosure.</li> <li>• Male to male connectors for Audio Video operation.</li> <li>• Camera and TV for Video Operation</li> <li>• Adequate 2mm Patch cords for interconnections</li> </ul>	
3	DM, ADM and sigma Delta trainer Kit	<ul style="list-style-type: none"> <li>• On-board 250Hz, 500Hz, 1KHz, 2KHz Sine-wave generator with Amplitude of 0 - 4Vp-p (Amplitude adjustments possible)</li> <li>• Sampling rate of 8KHz, 16KHz, 32KHz, 64KHz.</li> <li>• On-board Comander &amp; Expander.</li> <li>• On-board Gain integration setting</li> <li>• Modulation Technique: Delta Modulation and Demodulation, Adaptive Delta Modulation and Demodulation, Sigma Delta Modulation and Demodulation.</li> <li>• Crystal Controlled Pulse Generator.</li> <li>• Unipolar to Bipolar, Integrator for Modulation &amp; Demodulation.</li> <li>• 2<sup>nd</sup> order Butter-worth Low pass filter with cut off frequency of 3.4 KHz.</li> <li>• 4<sup>th</sup> order Butter-worth Low pass filter with cut off frequency of 3.4 KHz.</li> <li>• Mic &amp; Speaker for Audio Modulation/Demodulation</li> <li>• In-Built Power Supply of +5V/1.5A, <math>\pm 12V/250mA</math> with Power ON indication</li> <li>• Compact and Attractive look.</li> <li>• Adequate 2mm Patch cords for interconnections.</li> </ul>	05
4	ASK, FSK, BPSK and DBPSK, DEPSK modulation demodulation trainer Kit	<ul style="list-style-type: none"> <li>• Carrier Generator generating frequency of 500KHz (<math>0^\circ</math>), 500KHz (<math>180^\circ</math>) &amp; 1MHz (<math>0^\circ</math>)</li> <li>• Data Pattern : 8-Bit , 16-Bit , 32-Bit , 64-Bit</li> <li>• Frequency: 2KHz, 4KHz, 8KHz, 16KHz</li> <li>• 8 bit variable NRZ-L pattern generated depending on the position of the 8-dit Data Switch provided.</li> <li>• Clock Frequency is of 250 KHz.</li> <li>• Modulation &amp; Demodulation : ASK , FSK , BPSK , DBPSK , DEPSK Techniques</li> <li>• Rectifier Diode for ASK modulation</li> <li>• PLL Detector for FSK modulation</li> <li>• Square Loop Detector for BPSK, DBPSK &amp; DEPSK modulation</li> <li>• NRZ-L pattern Data Simulator.</li> <li>• Switch Faults are provided to study different</li> </ul>	05

  
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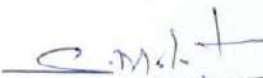
		<p>effects on circuit</p> <ul style="list-style-type: none"> <li>• In-Built Power Supply of +5V/1.5A,±12V/250mA with Power ON indication</li> <li>• Compact and Attractive look.</li> <li>• Adequate 2mm Patch cords for interconnections.</li> </ul>	
5	Understanding MSK/GMSK/FSK/GFSK Modulator and demodulator with AWGN channel noise and BER Trainer Kit	<ul style="list-style-type: none"> <li>• On Board synchronized RF carrier signal generators with frequencies of 120 KHz, 200 KHz</li> <li>• 8 bit Digital Data generator to generate any binary input word.</li> <li>• Selection of Data using 8-way DIP Switch.</li> <li>• On board two Balanced Modulator Circuit.</li> <li>• Demodulator PLL Detector Circuit.</li> <li>• Squarer Circuit</li> <li>• Fixed DC power supply : +5V/500mA and +12V/500mA</li> <li>• Provides White Noise Source output</li> <li>• Amplitude of 0 - 4Vp-p</li> <li>• Provision for Amplitude adjustments provided.</li> <li>• <b>PRBS Generator</b> 16 Bit switch selectable Jumper selectable clock rate of 16, 32, 64, 128, 256, 512 KHz, and 1.024 Mhz</li> <li>• <b>BIT Error Rate Meter</b> Four digit counter displayed on seven segment Four digit seven segment counting up to 9999 LED for terminal count indication provided</li> <li>• <b>Digital Modulation Technique</b> Pulse Amplitude Modulation technique is used Internal sampling clock: 16 KHz to 1MHz 50 % duty cycle</li> <li>• <b>Coding Operation</b> <ul style="list-style-type: none"> <li>• 16 bit data pattern for scrambler</li> <li>• 16 bit data pattern for unscrambler</li> </ul> </li> <li>• Switch Selectable first order Butterworth Transmitter filter (Five Bands)</li> <li>• Switch Selectable first order Butterworth Receiver filter (Five Bands)</li> <li>• Switch Faults are provided on board to study different effects on circuit</li> <li>• In-Built Power Supply of +5V/1.5A,±12V/250mA with Power ON indication</li> <li>• Compact and Attractive look.</li> <li>• Adequate 2mm Patch cords for interconnections.</li> <li>• Modulations: Continuous Phase FSK (CPFSK), Minimum Shift Keying (MSK), Gaussian Frequency Shift Keying (GFSK), Gaussian Minimum Shift Keying (GMSK) etc.</li> </ul>	05
6	Time division multiplexing and de-multiplexing board	<ul style="list-style-type: none"> <li>• <b>Fixed Sine Wave Generator</b> Should provide Sine waveform Natural &amp; Flat Top output of 250Hz, 500Hz, 1 KHz, and 2 KHz, Amplitude adjustments of 0 - 4Vp-p (Provision for Amplitude adjustments).</li> <li>• <b>Variable Sine Wave Generator</b> Should Provide Sine waveform output from 1Hz to 10/100 KHz and Provision for Amplitude adjustments for 15Vp-p</li> <li>• <b>DC Source</b> Should One no of variable (0-5V) DC source with Provision for Amplitude adjustments.</li> </ul>	05

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		<ul style="list-style-type: none"> <li>• <b>Pulse Generator</b> Should Provide Switch selectable sampling clock of 2, 4, 8, 16, 32 &amp; 64 KHz. (Crystal Controlled Pulse Generator)</li> <li>• <b>Clock and Data Generator</b> Should Provide 8 bit variable NRZ-L pattern generated of 8-bit Data Switch provided. Clock Frequency is of 250 KHz</li> <li>• <b>PRBS Generator</b> Fast (240 KHz/Channel approx.), Slow (1 Hz/Channel approx.)</li> <li>• <b>Carrier Sine Wave Generator</b> Should Provide synchronized Sine output of 0KHz(0°), 500KHz(90°), 500KHz(180°), 500KHz(270°), 1MHz(0°).</li> <li>• MIC &amp; Speaker interface circuit for Voice Link</li> <li>• Should Provide 1 no. of 2nd order Low pass filter with cut off frequency of 3.4 KHz.</li> <li>• Should Provide 5 no's of 4th order Butterworth Low pass filter with cut off frequency of 3.4 KHz</li> <li>• In-Built Power Supply of +5V/1.5A, ±12V/250mA with Power ON indication</li> <li>• Attractive look.</li> <li>• Adequate Patch cords for interconnections.</li> <li>• Multiplexing : Time Division Multiplexing</li> <li>• Modulation : Pulse Amplitude Modulation</li> </ul>	
7	AM Modulator and Demodulator Trainer Kit	<ul style="list-style-type: none"> <li>• <b>Sine Wave Generator</b> Provides Sine waveform output with Frequency varying from 20 Hz.-20 KHz. in three steps.(Frequency and Amplitude adjustments possible.)</li> <li>• <b>Carrier Generator</b> Provides Carrier waveform output of 40 KHz and Max. 2V p-p.(Amplitude adjustments possible)</li> <li>• <b>On-board Block features</b> AM-modulator circuit (Balanced Modulator with Band pass Filter and Balanced Modulator with Ceramic Band pass Filter) AM-Demodulator using Diode detector method, RF Amplifier, Mixer, Local Oscillator, Beat Frequency Oscillator, IF Amplifiers.</li> <li>• Transmitter Amplifier Output : (Gain adjustable) DSB, SSB connected to Antenna/cable</li> <li>• Power Supply : 110-220 V AC ±10%, 50Hz</li> </ul>	05
8	FM Modulator and Demodulator Trainer Kit	<ul style="list-style-type: none"> <li>• <b>Sine Wave Generator</b> Provides Sine waveform output with Frequency variable from 20 Hz.-20 KHz. in three steps. (Frequency and Amplitude adjustments possible)</li> <li>• <b>Carrier Generator</b> Carrier waveform output of 50 KHz and Max. 5V p-p.(Amplitude adjustments of carrier waveform possible)</li> <li>• <b>On-board Block features</b> FM Modulator circuit (Reactance Modulator, Varactor Modulator, VCO Based Modulator), FM Demodulator using PLL method, Amplifier circuit.</li> <li>• Test points are provided to analyze signals at various points.</li> <li>• In-Built Power Supply of +5V/1.5A, ±12V/250mA with Power ON indication</li> <li>• Attractive look.</li> <li>• Adequate Patch cords for interconnections.</li> </ul>	05

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	Trainer kit of QAM / DQAM Modulation and demodulation	<ul style="list-style-type: none"> <li>• On-board Sine-wave generator</li> <li>• On-board Four Carrier Sine waves of 500KHz (<math>0^{\circ}</math>), 500KHz (<math>90^{\circ}</math>), 500KHz (<math>180^{\circ}</math>), 500KHz (<math>270^{\circ}</math>).</li> <li>• On board three nos. of 8-bit NRZ-L. pattern Data Simulator.</li> <li>• Clock frequency of 250 Hz.</li> <li>• Data Format (Coding: Non Return to Zero-Level (NRZ-L), Tribit encoded data (I, Q &amp; C)</li> <li>• Differential Encoded I &amp; Q Bits.</li> <li>• <b>Carrier Modulation Techniques:</b> Quadrature Amplitude Modulation, Differentially Quadrature Amplitude Modulation</li> <li>• Switch Faults are provided on board to study different effects on circuit</li> <li>• In-Built Power Supply of +5V/1.5A, <math>\pm 12V/250mA</math> with Power ON indication</li> <li>• Attractive look.</li> <li>• Adequate Patch cords for interconnections.</li> <li>• Receiver Clock generated by PLL method</li> <li>• Demodulation is done using PLL and Envelop Detector Method</li> <li>• Switch faults are provided to study its effects on circuits</li> </ul>	05
10	Trainer kit for Various Line Coding Schemes	<ul style="list-style-type: none"> <li>• On-board Clock and Coding data</li> <li>• Data format of NRZ-L, NRZ-M, NRZ-S, URZ, AMI, BIO-L, BIO-M, BIO-S.</li> <li>• On-board Unipolar to Bipolar and Bipolar to Unipolar conversion.</li> <li>• On-board 8 bit Data Generator for simulation of data coding.</li> <li>• Modulation &amp; Demodulation Techniques: PAM, PWM, PPM</li> <li>• Line Coding Techniques</li> <li>• Internal Signal Generator : Direct Digital Synthesizer</li> <li>• Types of Signal : Sine, Square, Triangle, Arbitrary signals.</li> <li>• Frequency : 500Hz, 1KHz, 2KHz, 3KHz</li> <li>• External Signal :</li> <li>• Types of Signal : Sine, Square, Triangle, Arbitrary signals</li> <li>• Maximum Input Voltage : 3Vpp (Max.) +1.5V DC offset</li> <li>• Frequency : 500Hz to 3.5KHz</li> <li>• Sampling/Ramp Frequencies: 1.25KHz, 2.50KHz, 5KHz, 9.80KHz, 19.53KHz, 39.06KHz, 78.13KHz</li> </ul>	05
11	Pulse code Modulation & Demodulation Trainer kit	<ul style="list-style-type: none"> <li>• <b>Sine Wave Generator</b> Provides Sine waveform output, Frequency of Sine wave is 30 Hz with variable Amplitude of max. <math>\pm 5V</math> p-p.</li> <li>• Separate DC source Available from <math>\pm 5V</math> (Provision for Amplitude adjustments provided.)</li> <li>• <b>Sampling Frequency Generator</b> Provides Sampling Frequency TTL output of 25KHz.</li> <li>• <b>On-board Block features</b></li> <li>• PCM modulation</li> <li>• 8 bit Analog to digital data displayed in 8 Led's</li> <li>• PCM demodulation</li> </ul>	05

  
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	<ul style="list-style-type: none"> <li>• 8 bit Digital to Analog data displayed in 8 Led's</li> <li>• On-board Low pass filter</li> <li>• In-Built Power Supply of +5V/1.5A,±12V/250mA with Power ON indication</li> <li>• Attractive look.</li> <li>• Adequate Patch cords for interconnections.</li> </ul>	
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➤ **Item - IV**

**Specifications of Microwave Engineering Laboratory equipments**

Name of Laboratory: Microwave Engineering Laboratory			
Sl. No.	Name of the equipment/setup/device	Specification	Quantity Required in number(s)
1.	Klystron Based Microwave Test Bench	<p>Should be composed of</p> <p><b>1. Klystron Power Supply</b>            Power Supply : 230 VAC ±10%, 50 Hz            Beam Supply Voltage : 200 - 450 V DC Variable,            Current : 50 mA,            Repeller Supply : -10 V to -270 V DC Variable            Modulation : AM (Square) FM (Saw - tooth) and External (if, suitable) with Frequency Range : 500 - 2000 Hz, 50-150 Hz respectively.</p> <p><b>2. VSWR meter</b>            Power : 230 Volts AC ± 10%, 50Hz            Gain Control : Range 0-10dB (approx),            Input Frequency : 1000Hz ± 10%            LCD Display: SWR Scale, dB Scale, Modulation, Frequency, Power.</p> <p><b>3. Detector Mount</b>            Band: X-Band, Waveguide :WR-90, Material :Brass,            Output Connector: BNC (F)</p> <p><b>4. Analog D.R.F. Meter</b>            Band: X band (10.5 GHz)            Waveguide :WR-90,            Accuracy :± 2%,            Calibration Iner. :5 MHz.</p> <p><b>5. Isolator</b>            Band: X band, Waveguide : WR-90,            Min. Insert. Loss : 0.46dB,            Min. Isolation : 20dB</p> <p><b>6. Klystron Mount</b>            Band :X band, Waveguide :WR-90,            Material :Brass</p> <p><b>7. Fixed Short</b>            Frequency Range : 8.2 -12.4 GHz,            Material: Brass.</p> <p><b>8. Matched Termination</b>            Band: X band, Waveguide : WR-90,            Material : Brass            AV power : 2W</p> <p><b>9.Klystron Tube</b></p> <p><b>10. Movable Short</b></p>	03

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		<p>Band :X band, Waveguide :WR-90, Material: Brass.</p> <p><b>11. SS tuner</b> Waveguide : WR-90, Material: Brass.</p> <p><b>12. Slotted Section</b> Band: X band, Waveguide: WR-90.</p> <p><b>13. Tunable Probe</b> Band : X band, Output connector: BNC(F).</p> <p><b>14. Variable Attenuator</b> Band: X band, Waveguide :WR-90, Material :Brass</p> <p><b>15. Wave guide stand- 3 Nos.</b></p> <p><b>16. Cooling Fan- 1 No</b></p> <p><b>17. other Accessories</b></p> <ul style="list-style-type: none"> <li>• Cable BNC (M) to BNC (M)-2 Nos.</li> <li>• Mains Cord - 2 Nos.</li> <li>• Fastener (Brass Fly, Nut- Screw set) 1 No</li> <li>• Operating Manual 1 No.</li> </ul> <p><b>Besides these, require microwave application trainer kits along with their accessories and software to perform application oriented additional experiments.</b></p>	
2.	Microwave power meter	<p>Frequency range : 10 MHz to 12.4 GHz. Power range : -10dBm to +20 dBm. Power measurement : dBm, UW, mW, W, dbW, Vrms, Vpeak. Accuracy : +/-0.5dBm, Display: LCD Power requirement : 230V+/- 10% AC Coarse &amp; Fine adjustable from front panel Power sensor : Inbuilt in main unit of Microwave Power Meter, RF input connector : SMA Connector</p>	02
3.	Gunn Diode Microwave Test Bench	<p>Should be composed of</p> <p><b>1. Gunn Power Supply</b> Mains Supply :230V AC ±10%, 50Hz LCD Display, Modulation Frequency (800 to 1200Hz) Voltage Range: 0 to 10V, Current :750mA max, Modulation Modes : Continuous Wave Internal Modulation (Square Wave) Audio Modulation &amp; PC Data Modulation. PC Interface :RS232 Output Connector: BNC for Gunn Bias, TNC for Pin Bias.</p> <p><b>2. Digital VSWR Meter</b> Power : 230 Volts AC ± 10%, 50Hz LCD Display Scale: SWR, dB, Power Bar Graph Modulation: Frequency Noise Level: Less than 0.02 V . Modes: Normal, Audio, PC (this mode can be used only with Gunn based bench), Gain Control : Range 0-10dB (approx), Input Connector: BNC (F). Input Frequency: 1000Hz ± 10%.</p> <p><b>3. Cooling Fan with stand- 01 nos.</b></p> <p><b>4. Detector Mount</b></p>	03

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		<p>Band: X-Band, Waveguide :WR-90,  Output Connector: BNC (F)  Material: Brass</p> <p><b>5. Analog D.R.F. Meter</b>  Band: X band (10.5 GHz)  Waveguide :WR-90,  Accuracy :± 2%,  Calibration Incr. :5 MHz.</p> <p><b>6. Isolator</b>  Band: X band,  Waveguide :WR-90,  Insert. Loss :0.46dB,  Min. Isolation :20dB,  Return Loss : 22.4dB.</p> <p><b>7. Gunn Oscillator</b>  Band: X band, Waveguide :WR-90  Material :Brass,  Bias voltage max. :10V  Power output :10mW,  Output connector: BNC Female.</p> <p><b>8. Pin Modulator</b>  Band :X band,  Waveguide :WR-90,  Material :Brass,  Bias Voltage :0-12Vpp  Output Connector: TNC (F)</p> <p><b>9.Wave guide stand - 3Nos.</b></p> <p><b>10. Fixed Short</b>  Frequency Range : 8.2 -12.4 GHz,  Material : Brass</p> <p><b>11. Matched Termination</b>  Band : X band,  Waveguide : WR-90,  Material : Brass,  AV power : 2W,  Type : Fixed,</p> <p><b>12. Movable Short</b>  Band : X band,  Waveguide : WR-90,  Material : Bras.</p> <p><b>13. SS tuner</b>  Band : X band,  Waveguide : WR-90,  Material : Brass,  Max. VSWR : 20:1.02</p> <p><b>14.Slotted Section with Dial Guage</b>  Band : X band,  Waveguide : WR-90.</p> <p><b>15.Tunable Probe</b>  Band : X band,  Detector : In23,  Output connector : BNC(F).</p> <p><b>16. Variable Attenuator 20 dB</b>  Band : X band,  Waveguide : WR-90,  Material : Brass,  AV. Power : 2W</p> <p><b>17. other Accessories</b></p>	
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		<ul style="list-style-type: none"> <li>• Cable BNC (M) to BNC (M) 1 Meter 2 Nos.</li> <li>• Mains Cord 1 No.</li> <li>• Fastener (Brass Fly. Nut- Screw set) 1 No.</li> <li>• Cable TNC (M) - TNC (M) 1 meter 1 No.</li> <li>• Operating Manual 1 No.</li> </ul> <p>Besides these, require microwave application trainer kits along with their accessories and software to perform application oriented additional experiments.</p>	
4.	VSWR Meter	<p>LCD Display  Power : 230 Volts AC <math>\pm</math> 10%, 50H  Input Frequency : 1000Hz <math>\pm</math> 10%,  Noise Level : Less than 0.02 V,  Range : 0 60dB in 10dB steps,  Scale: SWR, dB, Power Bar Graph  Modes : Normal, Audio, PC (this mode can be used only with Gunn based bench),  Gain Control : Range 0-10dB (approx),  Input Connector : BNC (F).</p>	03

➤ **Item - V**

**Specifications of Control & Instrumentation Laboratory equipments.**

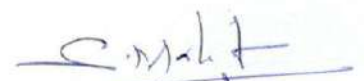
Sl. No.	Name of the equipment/setup/device	Specification (s)	Quantity Required in number(s)
1.	DC motor driven position control system Trainer kit	<ul style="list-style-type: none"> <li>• Position control of a 12V, 1A D.C. gear motor (50rpm)</li> <li>• Provision for positive and negative tacho-generator feedback.</li> <li>• Tacho constant: 2V/ 1000 rpm (approximately).</li> <li>• Calibrated dials for reference and output position.</li> <li>• <math>\mu</math>P based waveform capture card.</li> <li>• Built-in 3 ½ digit DVM for signal measurements.</li> <li>• Built-in step signal and IC regulated power supplies for electronic circuit.</li> <li>• Servo-potentiometer with full 360<sup>o</sup> rotation.</li> <li>• In-Built Power Supply with Power ON indication</li> <li>• Patch cords for interconnections.</li> </ul>	01
2.	Two phase AC servo motor to determine the speed torque characteristics and its transfer function Trainer kit	<ul style="list-style-type: none"> <li>• 2-phase A.C. servomotor – 12V/50Hz per phase.</li> <li>• Small generator for loading.</li> <li>• Digital speed display.</li> <li>• 3-digit time constant display.</li> <li>• 3 ½ digit R.M.S. volt meter and D.C. panel meter.</li> <li>• Calibrated dials for reference and output position</li> <li>• Separate unit for motor.</li> <li>• In-Built Power Supply with Power ON indication</li> <li>• Patch cords for interconnections.</li> </ul>	01
3.	Lag and lead compensator to obtain the frequency response Trainer kit	<ul style="list-style-type: none"> <li>• Simulated 'uncompensated' system having adjustable damping. Peak percent overshoot <math>M_p</math>, variable from 20% to 50%, and steady state error variable from 50% to 0.5%.</li> <li>• Compensation network implementation through built-in variable gain amplifier. Gain is adjustable from 1 to 11.</li> <li>• Built-in square and sine wave generators for transient and frequency response studies. Frequency adjustable from</li> </ul>	02

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		<ul style="list-style-type: none"> <li>25Hz-800Hz (approx).</li> <li>• Compensation Design for Lead &amp; Lag Interconnections</li> <li>• Test points are provided to analyze signals at various points.</li> <li>• In-Built Power Supply with Power ON indication</li> <li>• Patch cords for interconnections</li> </ul>	
4.	Temperature control system Trainer kit	<ul style="list-style-type: none"> <li>• Temperature controller with facilities for P, I, D and relay control blocks.</li> <li>• Operating temperature: Ambient to 90 C.</li> <li>• Separate controls for P, I, D channel gains.</li> <li>• Two settings for relay hysteresis.</li> <li>• Fast 25W oven fitted with IC temperature sensor.</li> <li>• Digital display of set and measured temperature on 3 ½ digit built-in DVM.</li> <li>• Buttered output for recorder.</li> <li>• Bare board Tested Glass Epoxy SMOBC PCB is used.</li> <li>• In-Built Power Supply with Power ON indication</li> <li>• Patch cords for interconnections.</li> </ul>	02
5.	Relay Control System	<ul style="list-style-type: none"> <li>• Simulated electronic relay using high speed ICs</li> <li>• Simulated second order linear plane. facility for displaying X and Y signals</li> <li>• Dead zone variable from 0-600mv (approx.)</li> <li>• Hysteresis variable from 0-500mv (approx.)</li> <li>• Built-in signal sources- Sine and Square</li> <li>Amplitude: 0-1v (min)</li> <li>Variable Frequency: 10,20,40,80,100,200,400,800 &amp; 1000 Hz</li> <li>• IC regulated internal power supply</li> <li>• 220V ±10 %, 50 Hz mains operation</li> <li>• Literature and patch cord included</li> </ul>	01
6.	P,PI and PID control system to observe the time response of a 2 <sup>nd</sup> order process and apply PID control to servomotor Trainer kit	<ul style="list-style-type: none"> <li>• Simulated blocks of Dead time (transportation lag), Integrator, Time constant, Error detector and gain</li> <li>• PID Controller (Configuration as P, PI, PD or PID), Prop. Band : 5% to 50% (Gain 2-20), Integral time : 10msec-100msec, Derivative time : 2-200msec.</li> <li>• Built-in signal sources: Set Value of -1V to +1V, Square wave of 1V p-p (min) at 40Hz, Triangular of 1V p-p (min) at 40Hz, Built-in 3 ½ digit DVM for DC measurements.</li> <li>• Test points are provided to analyze signals at various points.</li> <li>• In-Built Power Supply of +5V/1.5A, ±12V/250mA with Power ON indication</li> <li>• Patch cords for interconnections</li> </ul>	03
7.	Kelvin Double Bridge to measure unknown resistance, Inductance and capacitance using bridge Trainer kit	<ul style="list-style-type: none"> <li>• LED indicator to indicate Power input.</li> <li>• Two different Potentiometers of resistances 100 Ω &amp; 1KΩ.</li> <li>• A helical 10 turn &amp; 10KΩ potentiometer mounted with dial for easy measurement.</li> <li>• Fixed Resistances of 10MΩ, 1MΩ, 100KΩ, 10KΩ, 1KΩ, 100Ω &amp; 10Ω available through Selector Switch.</li> <li>• Fixed Capacitances of 100μf, 10μf, 1μf, 100kpf, 10kpf, 1kpf &amp; 100pf available through two different Selector Switches.</li> <li>• One DPM with selector Switch.</li> <li>• OUTPUT Waveform - Sine</li> <li>• 15 KHz sine wave with frequency adjustable facility.</li> </ul>	05

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		<ul style="list-style-type: none"> <li>• Variable DC power supply: 0 - +15V/ 500mA</li> <li>• On board fixed Resistance, Capacitance and Inductance.</li> <li>• Patch cords for interconnections.</li> <li>• Test points are provided to analyze signals at various points.</li> <li>• Attractive ABS Plastic enclosure.</li> </ul>	
8.	Hay's Bridge Trainer to measure unknown Inductance.	<ul style="list-style-type: none"> <li>• LED indicator to indicate Power input.</li> <li>• One Potentiometer of 1K <math>\Omega</math>.</li> <li>• Another 10K<math>\Omega</math> potentiometer with a helical 10 turn pot mounted with dial for easy measurement.</li> <li>• Fixed Resistances of 10M<math>\Omega</math>, 1M<math>\Omega</math>, 100K<math>\Omega</math>, 10K<math>\Omega</math>, 1K<math>\Omega</math>, 100<math>\Omega</math> &amp; 10<math>\Omega</math> available through Selector Switch.</li> <li>• Fixed Capacitances of 100<math>\mu</math>f, 10<math>\mu</math>f, 1<math>\mu</math>f, 100kpf, 10kpf, 1kpf &amp; 100pf available through Selector Switch.</li> <li>• OUTPUT Waveform – Sine</li> <li>• Fixed 10 KHz sine wave 3Vp-p should available.</li> <li>• Separate Fixed Unknown Resistance &amp; Inductance.</li> <li>- On Board circuit: Hays Bridge</li> <li>• Patch cords for interconnections.</li> <li>• Test points are provided to analyze signals at various points.</li> </ul>	05
9.	Schering Bridge Trainer to measure unknown capacitance.	<ul style="list-style-type: none"> <li>• LED indicator to indicate Power input.</li> <li>• 10 K<math>\Omega</math> potentiometer of helical 10 turn pot mounted with dial for easy measurement.</li> <li>• Fixed Resistances of 10M<math>\Omega</math>, 1M<math>\Omega</math>, 100K<math>\Omega</math>, 10K<math>\Omega</math>, 1K<math>\Omega</math>, 100<math>\Omega</math> &amp; 10<math>\Omega</math> available through Selector Switch.</li> <li>• Fixed Capacitances of 100<math>\mu</math>f, 10<math>\mu</math>f, 1<math>\mu</math>f, 100kpf, 10kpf, 1kpf &amp; 100pf available through two Selector Switches. (CT1).</li> <li>• OUTPUT Waveform - Sine</li> <li>• Fixed 10 KHz sine wave 5Vp-p should be provided.</li> <li>• Separate Fixed Unknown Capacitance should be provided.</li> <li>• Patch cords for interconnections.</li> <li>• Test points are provided to analyze signals at various points.</li> </ul>	05
10.	LVDT trainer kit to Plot the displacement voltage characteristics.	<ul style="list-style-type: none"> <li>• LVDT Transducer with transparent enclosure with Displacement of <math>\pm</math> 10mm and Primary Excitation voltage of Sine wave 1Vp-p</li> <li>• On-board Digital Panel Meter Option and Screw Gauge for reference displacement reading</li> <li>• Provided with Onboard excitation voltage and Instrumentation Amplifier.</li> <li>• Facility to Interface with PC, 8085/86/51 kit.</li> <li>• Test points are provided to analyze signals at various points.</li> <li>• In-Built Power Supply of +5V/1.5A, <math>\pm</math>12V/250mA with Power ON</li> <li>• Patch cords for interconnections</li> <li>• User's Manual with sample experimental programs</li> </ul>	05
11.	Strain gauge to plot the curve between strain applied to a beam and the output voltage Trainer kit	<ul style="list-style-type: none"> <li>• Resistive Load Transducer, can be measured up to 3 KGs load in weight and Primary Excitation voltage of 12V DC.</li> <li>• On-board Digital Panel Meter option and Weights can be verified by Physical counting of weights</li> <li>• Provided with onboard excitation voltage, Instrumentation Amplifier and Weights of different denominations.</li> </ul>	05

  
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		<ul style="list-style-type: none"> <li>• Facility to Interface with PC, 8085/86/51 kit.</li> <li>• Test points are provided to analyze signals at various points.</li> <li>• In-Built Power Supply of +5V/1.5A, ±12V/250mA with Power ON</li> <li>• User's Manual with sample experimental programs.</li> </ul>	
12.	DSP Kit	<ul style="list-style-type: none"> <li>• Processor : TMS320C6748 DSP Application Processor, 456-MHz C674x Fixed/Floating Point DSP, On-Chip RTC</li> <li>• Memory: 128 M-Byte DDR2 SDRAM running at 150MHz, 128 M-Byte 16-bit wide NAND FLASH, 1 Micro SD/MMC Slot</li> <li>• Interfaces: One mini-USB Serial Port (on-board serial to USB), One Fast Ethernet Port (10/100 Mbps) with status LEDs, One USB Host port (USB 1.1), One mini-USB OTG port (USB 2.0), One SATA Port (3Gbps), One VGA Port (15 pin D-SUB), One LCD Port (Beagle board XM connectors), One Composite Video Input (RCA Jack), One Leopard Imaging Camera Sensor Input (36-pin ZIP connector), Three AUDIO Ports (1 LINE IN &amp; 1 LINE OUT &amp; 1 MICIN), 14-pin JTAG header and External emulator is provided.</li> <li>• 6748 LCDK Kit</li> <li>• Power Card</li> <li>• XDS 100v2 JTAG Emulator</li> <li>• USB cable</li> <li>• User Manual</li> <li>• Code composer studio</li> </ul>	05

➤ **Item - VI**

**Specifications of Laboratory Softwares**

Sl. No.	Name of the Software	Specification (s)	Quantity Required in number(s)
1.	CST / HFSS	• 5 Users	01
2.	Network Simulator 5G Suite 11.1-13.3 + VANET	• 15 Users	01

**2.VALIDITY OF RFP**

The RFP response submitted by the applicants shall remain valid for a period of 90 (Ninety) days after the date of RFP response opening prescribed in this document. A RFP response which is valid for shorter period may be rejected as nonresponsive.

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### 3. EARNEST MONEY DEPOSIT (EMD)

- (a) EMDs of respective amount (as mentioned in Table-1) of the total cost of the equipment in form of a Demand Draft drawn in favour of **Principal, IGIT, Sarang** and payable at IGIT, Sarang from any Nationalized Bank (preferably SBI) must be submitted along with the Part -I Technical Bid in separate envelope. The Bids not accompanied by EMD shall be rejected as non-responsive.
- (b) No interest shall be payable by the Institute for the sum deposited as EMD.
- (c) The EMD of the unsuccessful Vendors would be returned within one month of signing of the contract.
- (d) No bank guarantee shall be accepted in lieu of the EMD.

### 4. FORFEITURE OF EARNEST MONEY DEPOSIT (EMD)

The EMD shall be forfeited by the **IGIT, Sarang** in the following events:

- (a) If the bid is withdrawn during the validity period or any extension agreed by respondent Vendor thereof.
- (b) If the bid is varied or modified in a manner not acceptable to the **IGIT, Sarang** after opening of bids during the validity period or any extension thereof.
- (c) If the respondent Vendor tries to influence the evaluation process.
- (d) If the First ranked Vendor withdraws its bid during negotiations (failure to arrive at a consensus by both the parties shall not be construed as withdrawal of proposal by the consultant).

### 5. OTHER TERMS & CONDITIONS

#### 1. General Terms

- (a) The conditional/ incomplete bids or those who received after due date shall be summarily rejected.
- (b) The award/ cancellation of work/order shall be decided at the sole discretion of **IGIT, Sarang**. Invitation of Tenders/ quotations is not a commitment.
- (c) **IGIT, Sarang** reserves the right to accept or reject in part or full or all the offers without assigning any reason thereof. Any decision of **IGIT, Sarang** in this regard shall be final and binding on the Vendor.
- (d) The Vendor/supplier/manufacture shall abide by all labour laws such as payment of wages Act 1936 with up-to-date amendments, minimum wages Act 1948 with amendments etc and other laws as applicable during the execution of work.
- (e) The institute shall make all payments through account payee cheque drawn on SBI, **IGIT, Sarang** in Indian rupees. Necessary bank mandate detailing bank account number Etc. shall be submitted after execution of agreement.
- (f) Neither party shall bear responsibility for the complete or partial non-performance of any of its obligations (except for failure to pay any sum which has become due on account of receipt of goods under the provisions of the present contract), if the non-performance results from the Force Majeure circumstances such as Flood, Fire, Earth Quake and other acts of God as well as War, Military operation, blockade, Acts or

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Actions of State Authorities or any other circumstances beyond the parties control that have arisen after signing of the present contract.

- (g) In case of any dispute arising out of or in connection with the contract either during the tenure of the contract or thereafter, the Director of the institute is the sole arbitrator to decide the same and his decision is final and binding on both the parties. If differences persist after arbitration and there are compelling reasons to go to court, it shall be decided in the court of Kamakhyanager/Dhenkanal.

## **2. Price Stability**

Contract prices and discounts as offered in the bid and accepted by IGIT, Sarang shall remain fixed during the contract period. In the event of price changes, replacement equipment shall be purchased at the lower of quoted value or then current market price. In no case shall a price higher than contract price be paid for equipment proposed. If **IGIT, Sarang** desires to purchase equipment or services not contained in the contract, future purchases shall be determined using the Vendors/suppliers/manufacturers -specified discount rate in the proposal from the manufacturer's suggested retail price as of the date of the order. In no case shall the price exceed the favored Vendor prices.

## **3. Right to Reject**

**IGIT, Sarang** reserves the right to reject all bids. Responses should be submitted initially with the most favorable terms that the Vendor can propose.

## **4. Standards**

**IGIT, Sarang** expects that the Vendor supplier/manufacturer would use standards./

## **5. IGIT, Sarang Involvement**

**Director, IGIT, Sarang** shall be the single-point contact for the project. All major decisions must be made with the involvement and agreement of the ETC Department. At no time must the Vendor hold back any information related to the **IGIT**.

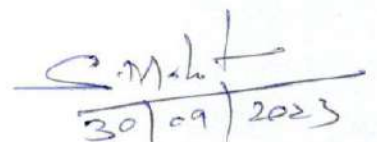
### **Section –I (Price Bid)**

- **Instruction for Price Bid**

#### **Price Bid submission -**

1. The price bid submitted by the Vendor/supplier/manufacturer shall be inclusive of all elements of costs and shall ensure that the followings are also included therein: -

- The cost of delivery and installation at project sites.
- All the expenses like cost of loading, Unloading etc at IGIT site.

  
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**a. Format for price bid**

Sl. No.	Name of the equipment/setup/device	Specification/Description	Quantity Required in number(s)	Unit cost	Total cost	GST 18%	Total cost including GST
<b>Grand Total</b>							

**Eligibility Criteria:**

Those who fulfill the following criteria are eligible to participate in the tender.

1. The tenderer must be a reputed original manufacturer and/or the Authorised Dealers of a reputed manufacturer. Manufacturers should provide all documents relating to their Manufacturing Capabilities and the brand should be a registered trade mark.
2. If the tenderer is an Authorised Dealers of a reputed manufacturer, necessary Tender Specific authorization to this effect from the manufacturer must be enclosed.
3. The tenderer must have cleared Sales Tax and Income Tax payment up- to- date. Attested copies of Sales Tax Clearance Certificate or non-assessment certificate from the concerned Sales Tax Authority valid up-to-date and attested copy of Income Tax Clearance Certificate or non-assessment certificate, GST certificates from the competent authority, PAN Number must be enclosed along with the Tender documents.
4. The Bidder must have ISO certification. The OEM should have IIMS for valid Quality and environment compliance Green guard certificates. The copy of the above certificates shall be enclosed with technical bid.
5. The net worth of the vendor should be positive. Certificate from the CA shall be submitted
6. The Vendor/supplier/manufacturer should not be blacklisted. Declaration in this regard shall be submitted by the vendor.
7. If the Vendor/supplier/manufacturer found guilty and any discrepancies in submitted the documents the RFP of the vendor shall be rejected and the vendor shall be blacklisted.
8. The bidder should submit the model details with manuals in the technical bid.
9. The price should be quoted for all the items of the respective laboratory.
10. Decision of the committee will be final towards L1 for individual laboratory.
11. PO is to be provided after qualifying in the technical bid verified by the committee members, followed by the selection as a lowest bidder (L1).

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## General Term & Conditions

- i) In case, after Pre-bid meeting (wherever applicable) any modification(s) / addition(s) / deletion(s) or any alteration in the requirement(s) / specification(s) etc. is required, the same will be placed on the IGIT website-www.igitsarang.ac.in therefore, all the bidders are advised to visit our website before filling / submitted their tenders. No separate advertisement / information will be published in this regard in the Newspapers.
- ii) The offered rates will be valid initially for a period of one year. The Institute can place repeat order on same terms & conditions within this period.
- iii) Acceptance of tender will be intimated to the successful tenderer through a Letter of Intent (LOI) duly signed by the authorized signatory of the institution.
- iv) EMD / Performance Security of successful bidder may be forfeited, if the bidder withdraws or amends or derogates from the tender in any respect.
- v) This tender is valid upto 180 days from the issue of tender notification.
- vi) The supplier will provide one year onsite guarantee, and under guarantee period all the damages items shall be repaired / replaced by the supplier at their cost and risk.
- vii) IGIT's official(s) can visit the workplace of successful bidder and can review the progress of work and can instruct regarding quality aspect.
- viii) The rates quoted by the bidder shall be complete for supply and installing of the finished items as per the specification(s) and shall be inclusive of all applicable tax, duty(ies), loading, unloading, packing, transportation to IGIT, Sarang installation **(in laboratories of new academic block i.e. Third floor)** etc. and nothing extra / additional shall be payable on these rates.
- ix) In any case, if tenders are not opened due to any reason, the Tender documents, processing Fee and EMD shall be returned to all bidders.
- x) Conditional Tender will not be accepted.
  - xi) Successful bidder will be required to submit schedule of activities to complete the work order (daywise / Datewise) with technical bid document.
  - xii) The supplier has to ensure the rectification of defects within **seven days** of the complaint during the period of guarantee.
  - xiii) AMC charges if any will be mentioned in the Tender.
  - xiv) The tenderer is required to submit one year onsite Guarantee i.e. to replace, the damaged equipments during the guarantee period or repair.
  - xv) The authority reserves the right to accept or cancel any or all tenders without assigning any reason thereof.
  - xvi) **Proof of bills for purchase of the materials as per our standard specification is submitted at the time of final payment.**
  - xvii) **All items should be ISI standard.**

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