



OFFICE OF THE REGISTRAR MANIPUR TECHNICAL UNIVERSITY, IMPHAL

(A University established under the Manipur Technical University Act, 2016)

Recognised by UGC under Section 2(f) and Section 22 of UGC Act, 1956

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INVITATION LETTER

Package Code: TEQIP-III/2019/MN/mtui/50

Current Date: 17-Jun-2019

Package Name: COMMUNICATION LAB

Method: Shopping Goods

To,

Sub: INVITATION LETTER FOR COMMUNICATION LAB

Dear Sir,

1. You are invited to submit your most competitive quotation for the following goods with item wise detailed specifications given at Annexure I.

Sr. No	Item Name	Quantity	Place of Delivery	Installation Requirement (if any)
1	PAM, PPM, PWM and Line Coding Techniques	2	Manipur Technical University, Govt. Polytechnic Campus, Takyelpat, Imphal West, Manipur-795004	
2	PCM, DPCM, CVSD Modulator and Demodulator	2	Manipur Technical University, Govt. Polytechnic Campus, Takyelpat, Imphal West, Manipur-795004	
3	TDM Pulse Code Modulation & Transmitter	2	Manipur Technical University, Govt. Polytechnic Campus, Takyelpat, Imphal West, Manipur-795004	
4	ASK, FSK, BPSK, DBPSK Modulator & Demodulator	2	Manipur Technical University, Govt. Polytechnic Campus, Takyelpat, Imphal West, Manipur-795004	

5	QPSK, OQPSK, DQPSK Modulator & Demodulator	1	Manipur Technical University, Govt. Polytechnic Campus, Takyelpat, Imphal West, Manipur-795004	
6	Communication System Trainer	1	Manipur Technical University, Govt. Polytechnic Campus, Takyelpat, Imphal West, Manipur-795004	
7	Digital Communication Training System	2	Manipur Technical University, Govt. Polytechnic Campus, Takyelpat, Imphal West, Manipur-795004	
8	QAM	3	Manipur Technical University, Govt. Polytechnic Campus, Takyelpat, Imphal West, Manipur-795004	
9	Communication lab kit	1	Manipur Technical University, Govt. Polytechnic Campus, Takyelpat, Imphal West, Manipur-795004	
10	16-QAM Transmitter & Receiver Training System	1	Manipur Technical University, Govt. Polytechnic Campus, Takyelpat, Imphal West, Manipur-795004	
11	CDMA Trainer kit	2	Manipur Technical University, Govt. Polytechnic Campus, Takyelpat, Imphal West, Manipur-795004	
12	DPCM/ADPCM MODULATION AND DEMODULATION TRAINER	2	Manipur Technical University, Govt. Polytechnic Campus, Takyelpat, Imphal West, Manipur-795004	
13	Fourier Synthesis Training System	2	Manipur Technical University, Govt. Polytechnic Campus, Takyelpat, Imphal West, Manipur-795004	
14	Delta, Adaptive Delta, Sigma Delta Modulator and Demodulator	2	Manipur Technical University, Govt. Polytechnic Campus, Takyelpat, Imphal West, Manipur-795004	

15	Communication Training System	5	Manipur Technical University, Govt. Polytechnic Campus, Takyelpat, Imphal West, Manipur-795004	
16	Digital storage Oscilloscope 300Mhz	5	Manipur Technical University, Govt. Polytechnic Campus, Takyelpat, Imphal West, Manipur-795004	
17	Spectrum Analyser with tracking generator	2	Manipur Technical University, Govt. Polytechnic Campus, Takyelpat, Imphal West, Manipur-795004	
18	DSB/SSB AM Transmitter	5	Manipur Technical University, Govt. Polytechnic Campus, Takyelpat, Imphal West, Manipur-795004	
19	DSB/SSB AM Receiver	5	Manipur Technical University, Govt. Polytechnic Campus, Takyelpat, Imphal West, Manipur-795004	
20	Frequency Modulation / Demodulation	5	Manipur Technical University, Govt. Polytechnic Campus, Takyelpat, Imphal West, Manipur-795004	
21	ARBITRARY FUNCTION GENERATOR	5	Manipur Technical University, Govt. Polytechnic Campus, Takyelpat, Imphal West, Manipur-795004	

2. Government of India has received a credit from the International Development Association (IDA) towards the cost of the **Technical Education Quality Improvement Programme [TEQIP]-Phase III** Project and intends to apply part of the proceeds of this credit to eligible payments under the contract for which this invitation for quotations is issued.

3. Quotation

3.1 The contract shall be for the full quantity as described above.

3.2 Corrections, if any, shall be made by crossing out, initialling, dating and re writing.

3.3 All duties and other levies payable by the supplier under the contract shall be included in the unit Price.

- 3.4 Applicable taxes shall be quoted separately for all items.
- 3.5 The prices quoted by the bidder shall be fixed for the duration of the contract and shall not be subject to adjustment on any account.
- 3.6 The Prices should be quoted in Indian Rupees only.
4. Each bidder shall submit only one quotation.
5. Quotation shall remain valid for a period not less than **45** days after the last date of quotation submission.
6. Evaluation of Quotations: The Purchaser will evaluate and compare the quotations determined to be Substantially responsive i.e. which
 - 6.1 are properly signed; and
 - 6.2 Confirm to the terms and conditions, and specifications.
 - 6.3 All required/derived documents contained in the Tender notice shall be submitted.
7. The Quotations would be evaluated for all items together.
8. Award of contract: The Purchaser will award the contract to the bidder whose quotation has been determined to be fulfilling all Technical Specification as desired by the University and who has offered the lowest evaluated quotation price.
 - 8.1 Notwithstanding the above, the Purchaser reserves the right to accept or reject any quotations and to cancel the bidding process and reject all quotations at any time prior to the award of Contract.
 - 8.2 The bidder whose bid is accepted will be notified of the award of contract by the Purchaser prior to expiration of the quotation validity period. The terms of the accepted offer shall be Incorporated in the purchase order.
9. Payment shall be made by e-transfer through PFMS.
10. **Satisfactory Delivery & Installation - 10% of total cost**
Satisfactory Acceptance - 90% of total cost
11. All supplied items are under warranty of **12** months from the date of successful acceptance of items and AMC/Others.
12. You are requested to provide your offer latest by **16:30** hours on **03-Jul-2019**.
13. Detailed specifications of the items are at Annexure I.
14. **Training:** Training/Demonstration must be done for each item.

15. **Testing/Installation:** Testing/Installation must be executed in presence of a faculty of concerned department of Manipur Technical University and duly certified by the Faculty.
16. Information brochures/ Product catalogue must be accompanied with the quotation clearly indicating the model quoted for.
17. The bidder should have provided similar nature of services to IITs/NITs/Govt. Departments/Semi Govt. Departments/PSU/Educational Institutions of National Importance etc. during last 3(three) years ending the last day of March 2019. Duly certified copies of such services are to be enclosed.
18. Tender/Quotations are to be submitted in TWO PARTS i.e. (a) Technical Bid and (b) Price Bid, in two separate properly sealed covers; and both these covers will have to be again put in to a single sealed cover. Also, the full address of the firm submitting the tender/quotation must appear distinctly with PIN on both the inner sealed covers, indicating also TECHNICAL BID/ PRICE BID as may be applicable.
19. The outer most cover shall be super scribed as:
 "QUOTATION FOR SUPPLY & INSTALLATION OF

 FOR..... MANIPUR
 TECHNICAL UNIVERSITY.
 VIDE TENDER REF NO:-
 DATED.....
 [The bid will summarily be rejected & returned to the bidder if the sealed envelope containing the quotation is not super scribed as above].
20. Sealed quotation to be submitted/ delivered at the address mentioned below:
**Manipur Technical University, Govt. Polytechnic Campus, Takyelpat, Imphal West,
 Manipur-795004**
21. No Part Delivery: Part shipment for any items will not be allowed and any Optional item quoted by the supplier will not be entertained.
22. The bidding agency should be a reputed firm and having all necessary certificates, viz.

GST registration certificate, PAN, Registration, Sale Tax clearance Certificate, Authorized Dealership/Distributorship certificate, etc. The photocopies of all the certificates should be attached with the tender.

23. The firm should be an original equipment manufacturer (OEM) in the business of manufacture or supply of equipment for minimum 3-5 years. The firm should submit audited financial statements for latest three financial years in support of this claim.
24. The items being quoted should be of Original Manufacturer and no non-standard item should be quoted. All detailed specifications with make & model no. of the items accompanied by proper leaflets should be clearly mentioned and attached with the offer.
25. The rate quoted must be both in words and figures inclusive of all charges i.e. packing, forwarding, octroi, surcharge, insurance, installation, demonstration and other charges if any.
26. Manufacturer's/Company's name, it's trademark should be mentioned in the tender and illustrative leaflets giving technical particulars, etc. should be attached in the tender.
27. Each bidder should clearly specify that the bidder agrees to abide by the conditions of this tender document on their printed letter head duly sealed & signed by an authorized person.
28. The Supplier shall provide such packing of the Goods as is required to prevent their damage or deterioration during transit to their final destination as indicated in the Contract. The packing shall be sufficient to withstand, without limitation, rough handling during transit and exposure to extreme temperatures, salt and precipitation during transit and open storage. Packing case size and weights shall have to be taken into consideration, where appropriate, the remoteness of the Goods' final destination and the absence of heavy handling facilities at all points in transit. **Manipur Technical University will not take responsibility and accept any damaged goods during transit.**

29. Contact details of the person for all post sales/installation maintenance support should clearly be given with Name & Designation, Phone No., Mobile No. and E-mail address.
30. All legal disputes shall be under the jurisdiction of Manipur High Court in the state of Manipur.
31. We look forward to receiving your quotation and thank you for your interest in this project.



(Authorized Signatory)

Name & Designation

Asst. Registrar
Manipur Technical University

Sr. No	Item Name	Specifications
1	PAM, PPM, PWM and Line Coding Techniques	<p>Features : • VLSI based Design. • Detail study & analysis of respective topic. • Transmitter and Receiver on same board. • Variable sampling rates. • Clock generation from 20MHz crystal Oscillator. • On-board DDS signal generators for five different signals. • Selectable Ramp frequency (by push button or control circuit) • On board 2nd order Butterworth low pass filter with cut-off frequency of 5KHz for respective technique. Specifications : • Technology: VLSI based • Modulation Technique : o Pulse Amplitude Modulation and Demodulation o Pulse Width Modulation and Demodulation o Pulse Position Modulation and Demodulation o Line Coding Techniques • Crystal Frequency: 20MHz • Signal Generator: Sine, Square, Triangle, arbitrary signal etc. • Input Signal Frequency: 305Hz, 609.80Hz, 1.25KHz, 2.5KHz • Sampling Frequency: 1.25KHz, 2.50KHz, 5KHz, 9.80KHz, 19.53KHz, 39.06KHz, 78.13KHz • Ramp Frequency: 1.25KHz, 2.50KHz, 5KHz, 9.80KHz, 19.53KHz, 39.06KHz, 78.13KHz • Low Pass Filter: Cut-off frequency 5KHz • Test Points: 31nos.</p>
2	PCM, DPCM, CVSD Modulator and Demodulator	<p>Features : • VLSI based design. • Detail study & analysis of respective topic. • Transmitter and Receiver on same board. • Variable sampling rates with respective line speed. • Clock generation from 8MHz crystal Oscillator. • On-board DDS signal generators for five different signals. • On board 2nd order Butterworth low pass filter with cut-off frequency of 5KHz. • On board Channel effect for Channel analysis. Specifications : • Technology: VLSI based • Modulation Technique : o Pulse Code Modulation and Demodulation. o Differential Pulse Code Modulation and Demodulation o Continuously Variable Slope Delta Modulation and Demodulation • Crystal Frequency: 8MHz • Signal Generator: Sine, Square, Triangle, arbitrary signal etc. • Input Signal Frequency: 500Hz, 1KHz, 1.5KHz, 2KHz, 3KHz • Sampling Frequency: 4KHz, 8KHz, 16KHz, 32KHz • Line Speed: 32KHz, 64KHz, 128KHz, 256KHz • Noise Gain: Variable • Low Pass Filter: Cut-off frequency 5KHz • Test Points: 37nos. • Channel Effect : o Channel as a low-pass o Channel as a attenuator o Channel as a noise</p>
3	TDM Pulse Code Modulation & Transmitter	<p>Features: • VLSI based • Detail study & analysis of respective topic. • Transmitter and Receiver on same board. • Variable sampling rates. • Clock generation from 8MHz crystal Oscillator. • On-board 4 different DDS signal generators for five different signals of each signal generator. • On board 2nd order Butterworth low pass filter</p>

		<p>with cut-off frequency of 5 KHz. • On board Channel effect for Channel analysis. Specifications : • Technology: VLSI based • Modulation Technique : o Single channel PCM modulation and demodulation. o Two channel TDM-PCM modulation and demodulation. o Four channel TDM-PCM modulation and demodulation. • Crystal Frequency: 8MHz • Signal Generator: Sine, Square, Triangle, arbitrary signal etc. • Input Signal Frequency: 500Hz,1kHz,1.5kHz,2kHz,3kHz • Sampling Frequency: 8kHz, 16kHz • Channel mode selection: 1,2 & 4 channel • Low Pass Filter: Cut-off frequency 5KHz • Test Points: 58nos. • Channel Effect : Channel as a low-pass, Channel as a attenuator,Channel as a noise</p>
4	ASK, FSK, BPSK, DBPSK Modulator & Demodulator	<p>Features: • Modulator and Demodulator on same board • On-board Data Generator with various Data patterns • Selectable Data frequencies and data Patterns • DDS technology based carrier generator • SMD LED indicators Specifications: • Modulation & Demodulation : ASK , FSK , BPSK , DBPSK • Techniques • Internal Data Generator : Digital Data • Data Pattern : 8-Bit , 16-Bit , 32-Bit , 64-Bit • Frequency : 2KHz, 4KHz, 8KHz, 16KHz • Internal Carrier Generator : Direct Digital Synthesized • Carrier Signal : Sine Wave • SMD LED Indicators : 24 nos. for • Digital Data Selection • Data frequency selection • Technique selection • Number of Test Points : 40 nos.(Gold plated) • Crystal Frequency : 8MHz • Selection Mode : Push switches</p>
5	QPSK, OQPSK, DQPSK Modulator & Demodulator	<p>Features • Detail study & analysis of respective topic. • Modulator and Demodulator on same board. • On-board four Variable line speed rates and single bit data pattern. • On board DDS technology based carrier generator • SMD LED indicators Technical Specifications • Modulation & Demodulation Techniques: QPSK OQPSK DQPSK • Internal Data Generator : Digital Data • Data Pattern : 8-Bit , 16-Bit , 32-Bit , 64-Bit • Frequency : 2KHz, 4KHz, 8KHz, 16KHz • Internal Carrier Generator : Direct Digital Synthesized • Carrier Signal : Sine, Cosine • SMD LED Indicators : 25 nos for Digital Data Selection,Data frequency selection, Technique selection • Number of Test Points : 57 nos.(Gold plated) • Crystal Frequency : 8MHz • Selection Mode : Push switches</p>
6	Communication System Trainer	<p>Features • Detailed study & analysis of Signal with & without Noise. • Complete study of mathematical equation $y(t) = x(t) + n(t)$. • Selectable Signal frequencies. • On-board DDS Signal Generator for standard and arbitrary signals Specifications • Noise generator : White Noise, Additive White Gaussian Noise, Periodic Random Noise • Internal Signal Generator : Direct Digital Synthesizer • Types of Signal: Sine, Square, Triangle, Arbitrary signals. • Frequency : 1.2KHz, 2.4KHz, 4.8KHz, 9.6KHz • SMD LED Indicators : 13nos for DDS Signal selection, DDS Signal frequency selection, Noise selection • Selection Mode : Push switches • Crystal Frequency : 8MHz • Test Points : 5 nos. (Gold plated) • Gain selection for Modulating : 10K potentiometer Signal • Gain selection for Noise : 10K potentiometer</p>

7	Digital Communication Training System	Digital Communication Training System provides an interface to MATLAB Version 7.0 (R14) or above with Signal Processing, Communication and Instrumentation tool box through PC USB 2.0 and it contains the following hardware units: • Base Unit with USB Interface for transfer of Data to & from the kit to the PC – 1Nos. • Pluggable 70 MHz IF Module consisting of transmitter & receiver with SMA interface – 1 Nos. • The IF Module have the facility for monitoring the data at the Baseband level and provide facility for IF Loopback, Baseband Loopback and also IF & Baseband Full Duplex Communication. Comprehensive set of experiment manual along with the MATLAB codes for the below mentioned experiments will be provided. Apart from the experiments, the system is also allow the students to perform additional experiments & projects.
8	QAM	PSK, QPSK, 16 QAM, 8 QAM, 8 PSK, MSK differential mode & non-differential mode Expt Panel On-board Clock source @5MHz. Mod/Demod Function Blocks:- Onboard adjustable DC signal source (+- 5Vpp) ,7 Bit ADC with Sampling Frequency of 6.5 KHz, 4bit selectable digital i/p's using switches, Sine Adder, Sine Divider, Differentiator Block, Scheme selector block, Frequency selector block, Quadrature sine generator I, Q @208-416KHz, MUX 2:1, Latch, PISO, SIPO(1:2,1:3,1:4), on board 208 KHz, TTL reference clock, Delayed clock for cycle slip error, 7 Bit DAC with single Analog Output- 10Vpp & Audio upto1.3KHz [2KHz can be tolerated], 7 Bit Amplitude & Phase comparator, Socket selectable DAC O/P either one of the Modulation O/P or Demodulation O/P, with differential or non differential mode and recovered signal by passing through 4Pbutterworth filter on NGLPF Panel (MU)
9	Communication lab kit	On-board Clock source @ 5MHz. a) Modulator Function Blocks:- 1 Analog Input- 10Vpp & Audio upto 1.3KHz[2KHz], Onboard adjustable DC signal source, ADC Sampling Frequency @6.5KHz, 7 Bit ADC, Signed Adder, Quadrature sine generator I, Q @208KHz, Mux and Latch, TTLreference @208KHz. b) Demodulator Function Blocks :- 1 Analog Output- 10Vpp & Audio upto 1KHz [2KHz], switch selectable DAC O/P either OQPSK O/P or Demod O/P, original signal recovered by passing through 2P/4P Butterworth filter on NGLPF Panel (MU), 7 Bit DAC, Signed Adder, 7 Bit Amplitude & Phase comparator, Latch & Mux List of experiments: Generate OQPSK modulated sin output, Verify constancy of frequency & amplitude but only phase angle varies depending upon modulation bits, Draw constellation diagram for OQPSK, Demodulation verification, Determine upper limit of data rate given a particular carrier frequency, Send and receive voice using OQPSK
10	16-QAM Transmitter & Receiver Training System	On-board Clock source @ 1.2 MHz. a) Modulator Function Blocks:- 1 Analog Input- 10Vpp & Audio upto 300Hz [1KHz], Onboard adjustable DC signal source, ADC Sampling Frequency @ 1.5KHz, 7 Bit ADC, Signed Adder, Quadrature sine generator I, Q @ 55KHz,

		Mux and Latch. b) Demodulator Function Blocks :- 1 Analog Output- 10Vpp & Audio upto 300Hz [1KHz], switch selectable DAC O/P either 16 QAM O/P or Demod O/P, original signal recovered by passing through 2P/4P Butterworth filter on NGLPF Panel (MU), 7 Bit DAC, Signed Adder, 7 Bit Amplitude & Phase comparator, Latch & Mux
11	CDMA Trainer kit	On-board Clock source @1. 2 MHz. a) Modulator Function Blocks : High speed 7 bit ADC & 4 station data (sequence generator), 4 parallel in serial out (PISO) converter, 4 chip sequence (m=8) generators, signed digital adder, modulation control mode select switches, CDMAclock control logic. b) Demodulator Function Blocks: Signed synchronous multiplier, station select mux, bipolar to unipolar converter, serial in parallel out (SIPO) and 7 bit DAC.
12	DPCM/ADPCM MODULATION AND DEMODULATION TRAINER	Operation mode: Switch selectable - DPCM OR ADPCM Number of data bits in data frame switch selectable 3/4/5 bits. On-board Clock source @ 660 KHz. a) Modulator Function Blocks : - 1 Analog Input- 10Vpp & Audio upto 2KHz, Onboard adjustable DC signal source, ADC Sampling Frequency @8.5 KHz, 7 Bit Comparator, Subtractor, Signed Adder, Parallel to Serial Converter. b) Demodulator Function Blocks : - 1 Analog Output- 10Vpp & Audio upto 2KHz, Demodulated DPCM / ADPCM signal reconstructed using 7-bit DAC followed by passing through 2P/4P Butterworth filter on NGLPF Panel (MU), Serial to Parallel Converter, 7 Bit Signed Adder List of experiments: DPCM - Modulation - Demodulation, ADPCM - Modulation - Demodulation, Slope Overload Error, Voice Communication using DPCM / ADPCM, Study of Eye Diagram.
13	Fourier Synthesis Training System	Fundamental frequency 1KHz Analysis by Splitting 1KHz square wave into fundamental sin and 9 harmonics including DC component if any. Synthesis of 10 above components to generate original signal. Display frequency components on CRO using spectrum display controller in external trigger mode. Study of filters (LPF, HPF, BPF) and display characteristics curve on CRO (XYMode) using FM sweep display
14	Delta, Adaptive Delta, Sigma Delta Modulator and Demodulator	Consisting of Voltage comparator, differential amplifier, TTL to Bipolar Converter. Switched faults. (4 Nos.) Delta, adaptive delta (CVSD), sigma modulation & demodulation, Adaptive control circuits 2Nos. each, provides 2 bit binary code, used to control gain of an integrator for adaptive delta modulation. Companding: Using compressor and expander function blocks, Study of Mu Law & A Law.
15	Communication Training System	5V/1A, \pm 12V/500mA, 0 to -15V DC (Variable) / 100mA, 0 to15V DC (Variable)/100mA. Carrier Generator: Waveform : SINE / TRG / TTL / CMOS 1 Hz to 1 MHz, 0-20 Vpp Audio Oscillator: Waveform : SINE / TRG / SQUARE 50 Hz to 5KHz, Sine 0-2Vpp, Sq. 0-9 Vpp, TRG. 0-3Vpp Synchronized Sine Wave Generator : Input: 32 KHz TTL I/P to Generate 4 nos. of sync. sine O/P 250 / 500 / 1000 / 2000 Hz, 0-10 Vpp FM Transmitter Carrier Tunable from 88 MHz to

		108 MHz Modulating Signal : 5Vpp, Audio Range FM Receiver : External 5 BS5 to connect to antenna AM Transmitter (Transistorized): Carrier : 500KHz to 1.5MHz Modulating Signal: 5Vpp, Audio Range. AM Receiver : External 5 BS5 to connect to antenna Fibre Optics Transmitter : Data Input Bandwidth : 500KHz to 1.5MHz. Modulating Signal: 5Vpp, Audio Range. FO Receiver: Detector separate BS5 socket for digital, AC coupled & TTL o/ps. Transmission: 1m plastic fiber cable terminated with SMA connector.
16	Digital storage Oscilloscope 300Mhz	Digital Storage Oscilloscope 300 MHz , 2 Channel Real-time sampling rate: Max. 2 Gsa/s Equivalent sampling rate: Max. 50 GS/s 7.0" TFT LCD Color display 24Kpts memory depth Independent vertical scale & position control knobs for each channel Edge, Pulse Width, Video, Slope, Alternate trigger mode Math functions including add, Subtract, Multiply, Divide & 1024 point FFT Channel waveforms & its FFT display on split screen. 32 parameters of automatic measurements Digital Filter & Waveform recorder function Advanced cursor modes: Manual, Auto & Track PASS / FAIL detection, PASS/FAIL output Built in Full Bandwidth Frequency Counter Standard Interface USB Host: Support USB flash driver save/recall function & update firmware
17	Spectrum Analyser with tracking generator	All-Digital IF Technology Frequency Range from 9 kHz up to 3.2 GHz Frequency resolution: 1 Hz Resolution Bandwidth: 10 Hz~1 MHz , in 1-3-10 sequence Resolution filter shape factor < 4.8:1 (60dB:3 dB), Gaussian – like Amplitude Precision < 0.7dB Min. -161 dBm/Hz Displayed Average Noise Level (Typ.) Min. < -98 dBc/Hz @10kHz Offset Phase Noise (1 GHz, Typ.) Total Amplitude Accuracy < 0.7 dB Measurement range : DANL to +10 dBm,100 kHz~1 MHz, preamplifier off DANL to +20 dBm,1 MHz~3.2 GHz, preamplifier off Reference level : -100 dBm to +30 dBm,1dB steps Maximum input DC voltage : +/- 50 VDC Maximum series RF power : 33 dBm,3 minutes, input attenuation>20 dB 10 Hz Minimum Resolution Bandwidth (RBW) Standard Preamplifier Reference frequency : 10.000000 MHz frequency reference accuracy : ±[(time since last adjustment×frequency aging rate) +temperature stability+calibration accuracy] Initial calibration accuracy < 0.2 ppm Temperature stability < 1 ppm/Year, 0 0C ~500C Storage Internal (Flash) 256 Mbyte, External (USB storage device) 32 Gbyte Electromagnetic Compatibility and Safety: EMC EN 61326-1:2013 Electrical safety EN 61010-1:2010
18	DSB/SSB AM Transmitter	Specifications: • Audio Oscillator: with Adjustable Amplitude • Frequency: (300Hz to 3.4KHz) • Audio Output :Amplifier with Speaker/headphone • Modulators: 2Nos. o Balanced Modulator with Band pass Filters (1MHz),1No o Balanced Modulator (455KHz)1No. o Ceramic Band Pass Filter Carrier Frequency :1MHz (Crystal Controlled) o Transmitter Output :Amplifier (Gain Adjust) DSB (1MHz) o SSB (1.455MHz) Connected to Antenna/cable o Switch Faults: 8 Nos. o Test Point :27 • Interconnection: 2mm patch chords. • Power supply : 230V ±10%

		/50 Hz Accessories Included: Line Cord, Manuals, Set of patch Cord , E manual Cabinet Housing : Enclosed on a plastic Molded box Software: Teaching & Simulation Software for Analog communication with simultaneous display of waveform in time & frequency domain with full theory & diagrams Hardware Lock should be provided with it. • Trainer should be on Legend PCB, housed in a molded case with molded cover on top.
19	DSB/SSB AM Receiver	Specifications: • Construction : Superhetrodyne • Frequency Range: 525KHz to 1.605MHz • Intermediate Frequency :455KHz • Input Circuit: o RF amplifier o Mixer o Local oscillator o Beat Freq. Oscillator o IF Amplifier o IF Amplifier 2 • Tuning :Variable capacitor(Ganged) Dial marking on board • Receiving Media :Telescopic Antenna/ Cable • Detectors : o Diode Detector (DSB) o Product Detector (SSB) • Audio Output :Amplifier With Speaker/ Headphone • Switch able Automatic Gain Control, • Switched Faults: 8 Nos. • Test Point: 50 • Interconnection: 2mm patch chords. • Power supply : 230V±10% /50 Hz Accessories Included :Line Cord, Manuals, Set of patch Cord , E manual Software: Teaching & Simulation Software for Analog communication with simultaneous display of waveform in time & frequency domain with full theory &diagrams.
20	Frequency Modulation / Demodulation	Specifications: • Audio Oscillator: with adjustable Amp. & Freq. (300HZ to 3.4 KHz) • FM Modulators: 2Nos. Reactance Modulator & Varactor Modulator (With Carrier Frequency Adjustment) Mixer/Amplifier: 1 No. (with Gain Adjustment) Allows FM Input to be Amplitude Modulated by Noise Input Prior to demodulation • Transmitter O/P Frequency: 455KHz • FM Demodulator : o Detuned Resonant Detector o Quadrature Detector o Foster Seeley Detector o Ratio Detector o Phase Locked Loop Detector • Low Pass Filter/ Amplifier :3.4 KHz cutoff Frequency (with gain adjust) • Amplitude Limiter: 1 No. • Switched Faults: 8 Nos. • Interconnection: 2mm • Test Point : 50Power supply: 230V ±10% /50 Hz Accessories Included :Line Cord, Manuals, Set of patch Cord , E manual Cabinet Housing : Enclosed on a plastic Molded box Software: Teaching & Simulation Software for Analog communication with simultaneous display of waveform in time & frequency domain with full theory & diagrams Hardware Lock should be provided with it.
21	ARBITRARY FUNCTION GENERATOR	Dual-channel, 120MHz maximum bandwidth, 20Vpp maximum output amplitude, high fidelity output with 80dB dynamic range 1.2GSa/s sampling rate and 16-bit vertical resolution. Frequency Resolution: 1 microHz Waveform : Sine, Square, Ramp, Pulse, Gaussian Noise, Point-by-point architecture, should support any 8pts-8Mpts Arb waveform with a sampling rate in range of 1microSa/s-75MSa/s Analog and digital modulation types: AM, DSB-AM, FM, PM, FSK,ASK and PWM Sweep and Burst function High precision Frequency Counter Standard interfaces: USB Host, USB Device, USBTMC, LAN(VXI-11) 4.3" touch screen display Compliance: IEC 61010-1:2010, EN61326-1:2013

CHECK-LIST (TECHNICAL BID)

SUMMARY OF COMPLIANCE TO REQUIREMENT OF TENDER

Sl. No.	Description of Requirement	Yes / No / NA	Page No.
1	Copy of Manufacturer/ Authorized Supplier Certificate		
2	Audited financial statement for the last 3 years		
3	Copy of the PAN card.		
4	Copy of GST registration certificate		
5	Copies of previous work order of similar work with completion certificate		
6	Declaration certificate		
7	No Deviation certificate		
8	Bidder's details		
9	Technical Specification		
10	NSIC/SSI/MSME Certificate where applicable		
11	All the pages of tender document have been signed		
12	Price bid in separate sealed envelope.		
13	Complete copy of Quotation in the format given along with the Price Bid.		

(Signature & seal of the contractor)

Place:

Date:

FORMAT FOR QUOTATION SUBMISSION
(In letterhead of the supplier with seal)

Date: _____

To: _____

Sl. No.	Description of goods \ (with full Specifications)	Qty.	Unit	Quoted Unit rate in Rs. (Including Ex-Factory price, excise duty, packing and forwarding, transportation, insurance, other local costs incidental to delivery and warranty/ guaranty commitments)	Total Price (A)	Sales tax and other taxes payable	
						In %	In figures (B)
Total Cost							

Gross Total Cost (A+B): Rs. _____

We agree to supply the above goods in accordance with the technical specifications for a total contract price of Rs. _____ (Amount in figures) (Rupees _____ amount in words) within the period specified in the Invitation for Quotations.

We confirm that the normal commercial warranty/ guarantee of _____ months shall apply to the offered items and we also confirm to agree with terms and conditions as mentioned in the Invitation Letter.

We hereby certify that we have taken steps to ensure that no person acting for us or on our behalf will engage in bribery.

Signature of Supplier

Name: _____

Address: _____

Contact No. _____