

National Institute of Technology Sikkim Barfung Block, Ravangla, South Sikkim Pin Code-737139

INVITATION LETTER

Package Code: TEQIP-III/2019/ntst/90

Current Date: 09-Apr-2019

Package Name: NITS/TEQIP-III/ECE/02

Method: Shopping Goods

Sub: INVITATION LETTER FOR NITS/TEQIP-III/ECE/02

Doar 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	Equipment for Basic Electronics and Communication Lab	1	NIT Sikkim, Ravangla, South Sikkim - 737139	Required

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

- The contract shall be for the full quantity as described above.
- Corrections, if any, shall be made by crossing out, initialling, dating and re writing.
- 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.
- 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.
- The Prices should be quoted in Indian Rupees only.
- Each bidder shall submit only one quotation.
- Quotation shall remain valid for a period not less than 45days after the last date of quotation submission.
- 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.

- 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 substantially responsive and who has offered the lowest evaluated quotation price.
 - 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 in Indian Rupees as follows:

Satisfactory Delivery & Installation - 10% of total cost Satisfactory Acceptance - 90% of total cost

- Liquidated Damages will be applied as per the below:
 Liquidated Damages Per Day Min %: 0
 Liquidated Damages Max %: 10
- All supplied items are under warranty of 24 months from the date of successful acceptance of items and AMC/Others is NA.
- You are requested to provide your offer latest by 17:30 hours on 13-May-2019.
- 13. Detailed specifications of the items are at Annexure I.
- 14. Training Clause (if any) YES
- 15. Testing/Installation Clause (if any) YES
- 16. Performance Security shall be applicable: 0%
- 17. Information brochures/ Product catalogue, if any must be accompanied with the quotation clearly indicating the model quoted for.
- Sealed quotation to be submitted/ delivered at the address mentioned below, National Institute of Technology Sikkim, Barfung Block, Ravangla, South Sikkim Pin Code-737139
 - 19. We look forward to receiving your quotation and thank you for your interest in this project.

Dr. Achintesh N. Biswas

Nodal Officer (Procurement)
Nodal Officer (Procurement)

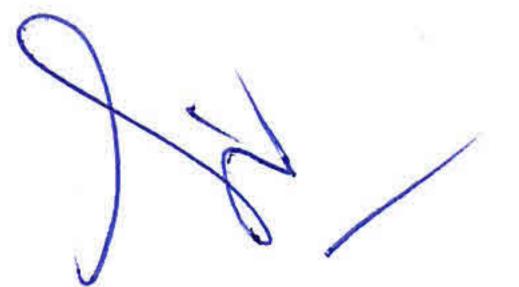
TEQIP-III

National Institute of Technology Sikkim

Annexure - I

SR	Item Name	Specification
NO 1	BASIC ELECTRONICS TRAINER	The Basic Electronics Trainers should consist of the following 7
		Modules along with SPICE Electronic Circuit Simulation Software:
	 a. Discrete Component Trainer b. Transistor Application Trainer c. Op-Amp Trainer d. Network and Bridge Trainer e. Analog to digital and digital to analog converter trainer f. Analog and digital IC trainer g. Digital IC Trainer h. Analog, Digital and Mixed Signal Electronic circuit simulation software 	a. Discrete Component Trainer Should be a single board system over basic semiconductor devices such as diodes, BJT, FET, MOSFET, UJT, PUT, DIAC, TRIAC, SCR, IGBT. IEEE symbol of all components should be provided on the PCB.On-board components:On-board resources such as resistor, capacitor, diode and Potentiometer banks of different values should be available, On-board Relay and Optocoupler,On-board variable regulated dual power supply (500mA) range from 0V to 30V,On-board dual power supply (500mA) range from 0V to 30V,On-board External AC
		power range from -12V to +35V, Resistor range from 100E to 200kΩ, Capacitor range from 0.1μF to 100 μF, Inductor (1mH)Potentiometer(10K) Good quality Breadboard (175mmX63mm) should be provided
		 Semiconductor Device Range: Germanium Diode(1N60) Fast Switching Diode(1N4148)
		 ZenerDiode(5.1V) Light Emitting Diode (GREEN LED 5mm) Bipolar Transistor PNP
		 Uni-Junction Transistor 2N2646 (UJT-N channel) Field Effect Transistor (JFET BF245) MOSFET(IRF-Z44N) DIAC(DB3)
		 TRIAC (BT136) IGBT (IRG4BC30S) Silicon Controlled Rectifier (SCR TYN604)
		 Voltage Dependent Resistor(VDR) Opto-Coupler (MCT2E) Varactor Diode (1N4007) Relay
		 b. Transistor Application Trainer All Components must be visible clearly on the top of the PCB.
		• Should be a single board system capable of covering, the basic applications of transistors such as BJT, FET, MOSFET, UJT, etc.
	• • • • • • • • • • • • • • • • • • •	 IEEE Symbol of all components to be provided on the PCB On-board resources such as resistor, capacitor, inductor, diode and Potentiometer banks of different values are

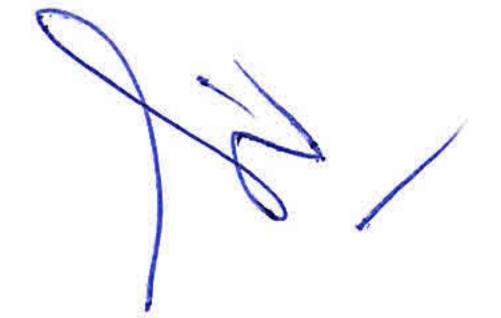
SR NO	Item Name	Specification
110		provided.
		• On-board variable regulated and isolated power supplies
		• Dual Isolated power supply
		• Range 1 with GND from +35 V to -35V
		• Range 2 with AGND 300mA from +12V to - 12V
		 2 Helical pots to control the voltage
		 Dual DC Variable On-Board power supply 0 V to 30 V
		 Application study of different types of transistors like
		general purpose different NPN transistors like
		BC107,2N2222 and BD138 PNP transistor and power
		transistor like SL100.
		• Also other types of transistors like FET (BF245), MOSFET
		(IRF-Z44N) and UJT (2N-2646) are present on board.
		• Resistor bank: 54 from 100 E to 1MΩ, Capacitor bank: 27
		from 0.47µF to 220 pF
		• Inductor bank: 09 from 1 μH to 2.2mH,Potentiometer bank: 08 from 1 K to 1 M
		■ Diodes hank ,Rectifier diode (1N/1007) 0 to 4,Zener diode (5.1V),1 LED- Green
		• Ovod quality breadboard should be
		available(175mm*63mm)
		c. Op-Amp Trainer
		• Should be a single board system capable of covering Op-
		Amp (741) & its various applications • Allows study of timer using 555 IC, IEEE Symbol of all
		components to be provided on the PCBOn-board
		components:
		• On-board resistor, capacitor, diode and potentiometer bank
		of different values.
		• Breadboard (175mmX63mm) area allows construction of
		circuits using external components along with on board
		resources.
		 On-board fixed power supply and variable regulated
		positive & negative power supply.
		• LM331 IC should be provided with all the respective pin
		• DC nower supply (300m Δ) with Helical not on board to
		 DC power supply (300mA) with Helical pot on board to vary the voltage of ±5 V and ±12 V
		• DC Variable power supply with Helical pot on board to
		vary the voltage of ±1.5 V and 10 V
		Semiconductor Device Range:
		• Three IC 741 Op-Amp stage, One 555 IC stage, 4 diode
		(1N4007),2 Zener diode (5.1V)
		• Transistor: BJT(BC547), MOSFET (IRF-Z44N), Green
		LED 5mm ,
		• 16 pin ZIF socket with pin out to be provided on board.



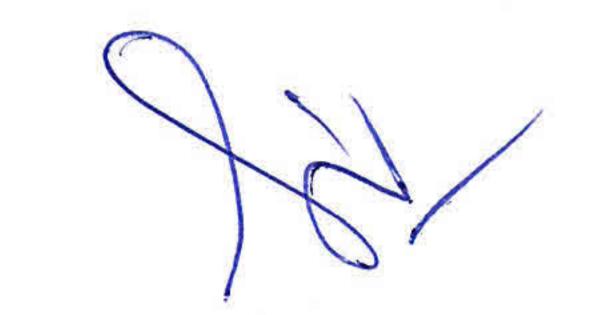
SR NO	Item Name	Specification
110		 45 Resistors bank from 100 E to 10MΩ,16 Capacitors bank
		from 56pF to 220 μ F,6 pots of $1k\Omega$ to $10M\Omega$
		d. Network and Bridge Trainer
		• Should be a single board system capable of covering the
		basic theorems, the two port network parameters, different AC
		bridges and Analysis of network
		 On-board power supply, resistor, capacitor, inductor bank
		 On-board dual isolated power supply 0 to 20 V
		 Variable current source
		• 54 Resistors from 4.7 E to 150 K,12 Capacitor (fixed and
		variable) 33pF to 47μF, Gang capacitors of pF and μF, 8
		Inductor bank from 1mH to 10 µH
		 Potentiometer bank 4 from 1 K to 100 K
		•Good quality breadboard should be
		available(175mm*63mm),Interconnection points and test
		points
		e. Analog to digital and digital to analog converter trainer It should consist of 8-bit binary weighted and 8-bit ladder type
		DAC are constructed using discrete components
		It should consist of 8-bit monolithic DAC having settling time
		in the range of ns, wide power supply range, low power
		concumption, full scale error + 1LSB
		8-bit digital ramp ADC constructed using discrete components
		should be included.
		It should provide 12-bit monolithic ADC having conversion
		time in the range of µs, industry standard pin out, wide input
		range
		Should include 8 onboard switches to provide digital inputs to
		DAC
		Should include 8-bit counter running on external clock
		frequency to study settling time of DAC
		It should consist of Built in low frequency clock generator
		• 1 KHz sine wave with adjustable amplitude level should be
		provided. • Onboard variable DC valtage course for studying unipolar
		• Onboard variable DC voltage source for studying unipolar
		 and bipolar modes of ADC should be provided Should include 12 output LEDs to observe ADC outputs
		• Should provide ADA operates on DC power supply (+12V,-
		12V,+5V and GND)
		 Interconnection should be provided by standard 2mm
		connector
		• Extensive experimental manual is to be provided with the kit
		f. Analog and digital IC trainer
		• High level, high quality digital-analog trainer
		• It should combine all essential functions of analog and
		digital experiment with removable breadboard, includes DC
		power supply, function generator, two pulse switches, 8Ω
		0.5W speaker

SR NO	Item Name	Specification
		• Solder-less bread board should be interconnected with tie points Nickel plated contact, fitted with all DIP sizes and all components with lead and solid wire. It can be changed and replaced for different purposes and can be connected with demonstration panel. Therefore, it is very convenient for both teachers and students
		• It should consist of Fixed DC output power supply of ±5V, ±12V@500mA
		 It should include Dual Variable DC output power supply,0~30V,0~-30V@500mA It should consist of AC power supply of
		5~0~5VAC,12~0~12VAC
		Potentiometers of IK 12, IUK12 should be included
		• It should consist of Function generator with following
		frequency range. Frequency range : 1Hz~10Hz
		10Hz~100Hz
		100Hz~1KHz
		1KHz~10KHz
		10KHz~100KHz
		• It should consist of Amplitude with following readings
		1. Sine wave output : 0~4Vpp variable@.1Hz~1MHz in step of 5
		2. Triangle wave output .0~4Vppvariable@1Hz ~300KHz in step of 5
		3. Square wave output: 0~5Vpp variable@1Hz ~ 400KHz in step of 5
		4.TTL mode output: 5V@1Hz~1MHz in step of 5
		 It should have Two digits of 7 segment LED display
		 Should have Two pulse switches to generate inverting and non inverting pulses supported with de-bounce elimination
		• It should provide Toggle switches and corresponding output point. When switch is set at "Down" position, the output is
		LO level, contrarily it is to be 'High' level while setting at "Up" position
		 Speaker of8 □ □ / 0.5W to be used for load is to be provided
		• It should consist Four channel adapter
8		The two banana sockets and BNC jacks suitable for the
		trainer to be connected with peripherals
		• It should consist Sixteen bit LED display
		 g. Digital IC Trainer Should be a single board system capable of covering
		minimum 10 Experiment
		Should be designed using a Lattice CPLD Chip LC4128ZE
		covering all the Digital IC's as mentioned in the
		specification
		 IEEE Symbol of all components to be provided on the
		PCB
		 On-board Power supply (7.5V,300mA)

Item Name	Specification
	 Basic logic gate IC's:NOT (7404),OR (7432),AND (7408),NOR (7402),NAND (7400),EX-0R (7486),NAND and NOR gates as Universal Logic Gates,TTL to CMOS and CMOS to TTL Interface,Half Adder, Full Adder, Half Subtractor, Full Subtractor, Basic Flip-Flops:RS (using NOR),JK (7476),D (7474), D (7474), T (using JK) Counters:Synchronous Binary Counter (74191),4 Bit Ring Counter using 7476 Decade / BCD counter using 7490 Universal Shift register 74194,,9 bit parity Generator / Checker (74280) Multiplexer (74153) and Demultiplexer (74138) BCD to seven segment decoder (7447) & Seven segment display 4 bit Comparator (7485) Binary to Gray, Gray to Binary, Binary to BCD, BCD to Binary, BCD to Excess 3, Excess 3 to BCD,16 switches to provide Logic 0 & 1 inputs,16 LEDs to observe the output logic states Manual clock, present and clear to observe the counter operation ,20 plin ZIF socket
	 h. Analog, Digital and Mixed Signal Electronic circuit simulation software Should be a perpetual license and capable of simulating analog and digital circuits. Analysis possible: transient, dc bias, ac sweep, sensitivity analysis, distortion, noise, network analysis, etc. A large number of "black box" blocks performing signal processing and conditioning functions such as gain block, summer, multiplier, divider, differentiator, integrator, limiter, etc. A large variety of sources and excitation waveforms, including sine, square and triangle waves, single-tone modulated signals, nonlinear dependent sources and arbitrary waveforms defined through mathematical expressions Curve tracer circuits to examine the behavior of an active device before you place it in your circuit Continuous (perpetual) transient simulation should be possible to vary live circuit parameters while the simulation is running Virtual instruments: oscilloscope, function generator,
	Item Name



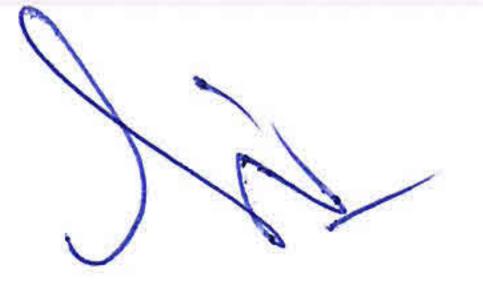
SR NO	Item Name	Specification
		used during a live continuous simulation
		Should have a Device Database & Editor
		 A large selection of active device models (diode, BJTs, FETs, MOSFETs,
		 MESFET's, operational amplifiers, etc) with no less
		than six distinct MOSFET models including BSIM3 and BSIM4
		 "Real-world" devices model performance of actual parts such as resistors, capacitors, and inductors
		Nonlinear resistors, conductors, capacitors, and
		inductors as well as lossless and lossy transmission lines
		Shared process models
		Powerful Device Editor with integrated Symbol Editor
		Unlimited user-defined parameterized sub-circuit models
		Create a part from any circuit and package it as a
		reusable database device
		 Import and manage external parts libraries
		Should have a Data Visualizer
		• Extensive graphing utilities with complete control over all aspects of the graph
		Real and complex data plots and Smith chart
		Live digital timing diagrams during live digital circuit simulations
		 Circuit visualization/animation displays the actual
		current flow through a circuit and relative voltage
		relationships by varying the wires' display color.
		 Cross probing interactively updates the graph as you
		add or move the probes around the circuit.
		 Simulation data update on virtual instruments or via
		circuit animation on the schematic during live in
		response to live circuit parameter variations
		 Should be provided with minimum 20 sample
		experiments in manual
2	DSP TRAINER KIT	The kit should feature the TMS320C6745 DSP or
		Equivalent, a 375 MHz device delivering up to 3648
		million instructions per second (MIPs) and 2736 MFLOPS
		Should have On board clock generator
		This Kit should have a White noise generator of
		Amplitude 0 ~ 5Vpp with Signal and noise adder on board
		 On Board 4*4 LED matrix, 20*2 character LCD



SR NO	Item Name	Specification
		 display 7 segment displays should be available on the Kit. JTAG supported via USB programmable cable to be provided. TLV320AIC23B or equivalent programmable stereo codec and expansion for port connector for plug-in modules should be provided Should have facility for 8 DIP switches for inputs and 8 LED indication for output Should be compatible with Code Composer Studio to write programs and implement on the DSP Chip. All Source Codes for the experiments should be provided on a CD.
	DIGITAL COMMUNICATION SYSTEM CONSISTING OF: a. Basic Digital Communication Training System b. Advance Digital Communication System c. GFSK/GMSK Modulator & Demodulator d. Dasic Software Defined Radio System	The Digital Communication System should consist of the Following a. Basic Digital Communication Training System Digital Communication System should be a single board system based on VLSI technology for the study of basic digital communication techniques. The Board should have various test points for the students to view intermediate signals on an Oscilloscope. It should be accompanied with a Learning Resource Software consisting of Animations explaining various Digital Modulation Techniques like Sampling, PCM, ASK,FSK,PSK etc and Experiments for the Students to understand the basic concepts of Digital Communication. Specifications: Clock & Signal generation section: • sine wave: Fixed Frequency: 250Hz, 500Hz, 1 KHz, 2khz • Variable Frequency: 1Hz to 30Hz, 0 - 2 Vpp • Sampling clock: Frequency: 2 KHz, 4 KHz, 8 KHz, 16 KHz, 32 KHz, 64 KHz, 128 KHz • Duty Cycle: 10 - 90% Selectable in steps of 10% • D.C. Signal: 0 - 5 V Tx Clock Frequency: 240 KHz Fast Mode • Tx Frame Frequency: 8 KHz • Carrier Sine Waves: 500 KHz (0 deg), 1 MHz (0 deg), 1 MHz(180 deg) • Data Pattern: 8 bit variable NRZ-L pattern • PRBS generator: 14 bit Transmitter Section: • Analog signal sampling: Sample & Hold, Natural Sampling, Flat-top Sampling • 4-Channel Analog Time Division Multiplexing

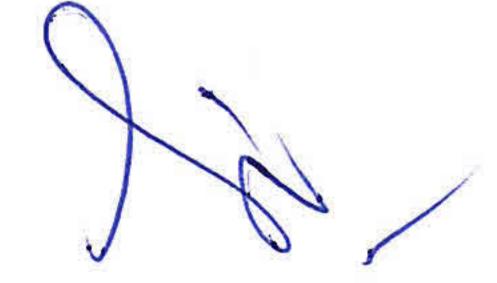


SR NO	Item Name	Specification
		 Odd, Even Parity & Hamming Code Generator
		 Pulse Code Modulation
		• Data Encoding NRZ(L), NRZ(M), NRZ(S), Bi-phas
		(Manchester), Bi-phase (Mark), Bi-phase (Space), URZ
		Alternate Mark Inversion (AMI), Unipolar to Bipolar &
		Bipolar to Unipolar
		ASK, FSK, PSK Modulation
		 Delta / Adaptive Delta / Sigma Delta / CVSD Modulation PAM / PPM / PWM Modulation
		 Audio Preamplissier with microphone interface.
		Receiver Section:
		 2nd order and 4th order Low Pass Butterworth Filter
		 4-Channel Time Division De-multiplexing
		 Odd, Even Parity & Hamming Code Recovery
		 Pulse Code Demodulation
		Duta Decoding NRZ(L), NRZ(M), NRZ(S), Diphase
		(Manchester), Biphase (Mark), Biphase (Space), URZ,
		 Alternate Mark Inversion (AMI)
		ASK, FSK, PSK Demodulation
		• Delta / Adaptive Delta / Sigma Delta / CVSI
		Demodulation
		PAM / PPM / PWM Demodulation
		Audio Amplifier with headphone / speaker interface
		b. Advance Digital Communication System
		Advanced Digital Communication System should be a single
		board system based on VLSI technology for the study of various
		digital communication techniques.
		The Board should have various test points for the students to
		view intermediate signals on an Oscilloscope. It should be
		accompanied with a Learning Resource Software consisting of
		Animations explaining various Digital Modulation Techniques
		like QPSK Modulation / Demodulation, DQPSK Modulation as Demodulation, ADPCM, QAM etc and Experiments for the
		Students to understand the basic concepts of Digital
		Communication
		Specifications:
		Clock & Signal generation:
		• On-board 500Hz sine wave with amplitude 0 to 4V
		• On-board Synchronized Sine wave of 512 KHz (0° 90°, 180° and 270°).
		• On-board 24 bit variable data pattern (8 bit, 16 bit a 24 bit selectable @ 256 KHz).
		• 16 bit switch selectable PRBS generator.
		• White noise source with amplitude 0 to 2Vpp.
		• Transmitter clocks: 16KHz, 32KHz, 64 KHz, 128
). .		KHz, 256 KHz, 512 KHz & 1.024MHz.



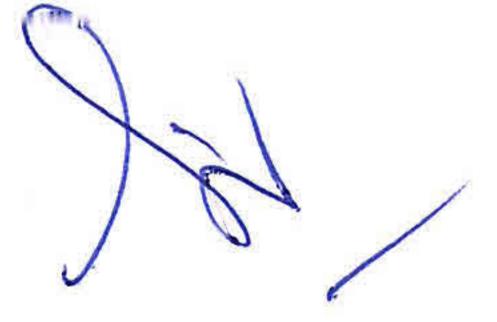
SR NO	Item Name	Specification
		Transmitter section:
		Data encoding:
		Differential encoder
		Di-bit encoder
		Tri-bit encoder
		Scrambler
		Modulation Techniques:
9		BPSK, DPSK & DEPSK modulation.
		• QPSK & DQPSK modulation.
		• QAM & DQAM modulation.
		• DPCM & ADPCM modulation.
		Pulse Amplitude Modulation.
		Coding and Decoding Technique:
		• Error bit adder & inter symbol interference.
		Bit error rate measurement. (ber)
		• Study of eye pattern.
		• Quantization error.
		• 8 BIT ADC.
		Receiver section:
		Data Decoding:
		Differential decoder
		Di-bit decoder
		Tri-bit decoder
		BPSK, DPSK & DEPSK demodulation
		QPSK & DQPSK demodulation
		QAM & DQAM demodulation
		DPCM & ADPCM demodulation
		Constellation diagrams:
		Transmission & Reception of Band limited Pulse train in base
		band digital transmission system.
		Transmitter & receiver filter with selectable switch of five
		different bands.
		Data extraction & reception of band limited pulse train in base
		band digital transmission system.
		Low pass Butterworth filters.
		Low pass Butter worth Thiers.
		c. GFSK/GMSK Modulator & Demodulator
		GFSK / GMSK Modulator / Demodulator Kit should be
		VLSI based design. It should consist of separate
		component and operational area. It should support modular
		organization of circuit functions. It should comprise of test
		points to access signals at every stage of circuit operation.
		Specifications:
		Data simulator:On – board variable NRZ-L pattern, Crystal
		oscillator: 32.768MHz
		Data clock: 256 KHz, Data encoding: NRZ (L)
		On board carrier sine waves:
		HIGH and LOW carrier frequency
		Modulation index: 0.5 for GMSK, Gaussian filter bt
		index . U.S for Givisk, Gaussian filter bt

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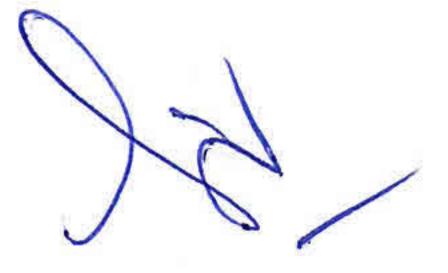


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SR	Item Name	Specification
NO		
		product: 0.3
		Carrier modulation: GFSK, GMSK, Carrier demodulation
		: GFSK, GMSK
		Data decoding: NRZ (L) Intermediate signal, Previous for absenting intermediate
		Intermediate signal: Provision for observing intermediate
		signals: Inter Connection: 2mm banana socket, □ Power Supply:
		+12V, -12V,+5V, GND
		Test points: 20
		Tot points. 20
		d. Basic Software Defined Radio System
		This experimental hardware should cover 70MHz – 6 GHz
		with integrated RFIC technology, a Spartan6 FPGA, and
		USB 3.0 connectivity. This new platform should enable
		experimentation with wide range of applications including
		FM and TV broadcast, cellular, Wi-Fi, ISM, and more.
		TheBasic SDR kits should have one receive and one
		transmit channel. With this kit, users should be able to
		develop their GNU Radio applications. Application
		Development with the SDR Kit:
		This kit should be supported by an open-source, cross-
		platform driver that can run on Windows, Linux, It should
		provide a common API, which is used by several software
		frameworks, such as GNU Radio.
		Features:
		• RF Coverage from 70 MHz to 6 GHz RF
		GNU Radio and open DTS support through the open source USRP Hardware Driver
		• USB 3.0 High speed interface (Compatible with USB
		2.0)
		• Flexible rate 12 bit ADC/DAC
		SDR Kits:
		• 1TX, 1 RX, Half or Full Duplex
		• Xilinx Spartan 6 XC6SLX75 FPGA
		• Up to 56 MHz of real-time bandwidth
		Specifications:
		• Power:
		DC Input: 6V
		 Conversion Performance and Clocks
		ADC Sample Rate (max): 61.44MS/s
		ADC Resolution: 12bits
		ADC Wideband SFDR: 78dBc
		DAC Sample Rate (max): 61.44MS/s
		DAC Resolution: 12bits
		Host Sample Rate (16b): 61.44MS/s
		W/ GPSDO Reference: 0.01ppb
		• RF Performance(single channel)

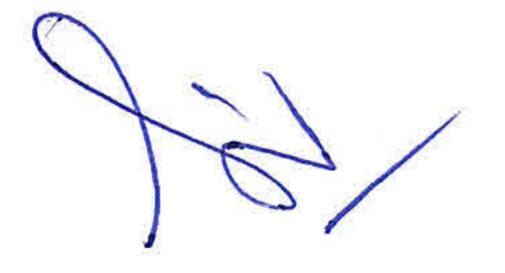


SR	Item Name	Specification
NO		QQD/T O Q
		SSB/LO Suppression: -35/50dBc
		3.5 GHz: 1.0deg RMS
		6 GHz: 1.5deg RMS Power Output: >10dBm
		IIP3 (@. typ NF) : -20dBm
		Receive Noise Figure : <8dB
		Deliverables: Basic SDR Kits, USB Cable, Power
		Adaptor, Log periodic Antennas frequency Band
		850MHzto 6 Ghz: 2nos
		• Software on Bootable USB memory driver consisting of:
		Ubuntu 12.10 (32 - bit), GNU Radio (3.6.4) & GNU Radio
		Companion, USRP Hardware Driver (UHD) Software
		(3.5.1git), Source Codes of Sample Applications, SDR
		Environment Updater
		Source code and generated documentation to be included
	ANALOG COMMUNCATION	The Analog Communication Training System should consist of
	TRAINING SYSTEM	the following modules
	a. Amplitude Modulation Transmitter	
	Kit With eManual b. Amplitude Demodulation Receiver	a. AMPLITUDE MODULATION TRANSMITTER KIT
	Kit with eManual	with e-Manual TECHNICAL SPECIFICATIONS:
	c. Frequency Modulation Transmittor	Audio Uscillator : Frequency 100Hz to
	Kit with eManual	10 KHz
	d. Frequency Demodulation Receiver	Sine wave generator : Amplitude 0 to 2 Vpp
	Kit with eManual e. Noise Power Spectral Density	Audio Input : Audio preamplifier
	Measurement Kit	with microphone input.
	f. FDM Transmitter / Receiver Kit	Voltage Controlled Oscillator (VCO)
	g. Filter/Noise and Audio Amplifier	Output Signal : Sine wave
	Kit h. Fourier Synthesis Kit	Frequency Range :1) 400 KHz to 500KHz
	1. I ourier Symmesis IXII	2) 400 KHz to 1500
		KHz
		AM/DSB/SSB/Modulator
		Modulation : Amplitude
		Modulation, Double Side band, Single side band
		Carrier input : 1-1000 KHz
		Certan Francisco
		Center Frequency : 455KHz Output Amplifion : Gein edingtehle
		Output Amplifier : Gain adjustable connected to cable or antenna
		Antenna : MW Coil.
		Switch Faults: 4 Switch Faults should be provided
		~ " recan a deducto . — Townchi i aunto should de provided
		b. AMPLITUDE DEMODULATION RECEIVER KIT
		with emanual
		TECHNICAL SPECIFICATIONS:
		Superheterodyne Receiver:
		Frequency Range : 400KHz to 1.5MHz.

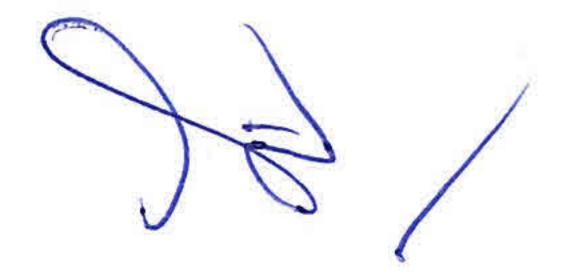


	R	Item Name	Specification				
1			Intermediate Frequency	• 45	5KHz.		
			Output IF Frequency		5KHz adjustable.		
			RF amplifier with variable ga		ordina adjustation.		
			Mixer (Frequency Converter				
			Voltage Controlled Oscillat				
			Output Signal		ne wave for local oscillator	r	
			input.	. 511	ne wave for focal oscillato.	58 -	
			Frequency		: From 400KHz to		
			1500KHz.		. Prom 400Kriz to		
			Amplitude		· Adiustable from 0 to		
					: Adjustable from 0 to		
			2Vp-p. Output Impedance		. FO O1		
					: 50 Ohm.		
			1 st IF and 2 nd IF Amplifier:		A = = T = T =		
			Central Frequency		. 455KHZ.		
			Diode Envelope Detector:				
			Detection of the positive and RC filter DSB.	negativ	e envelope with variable		
			Product Detector:				
			Operating Frequency	: Ad	justable from 400KHz to		
			500KHz SSB.				
			Receiving Media:				
			MW Coil Antonna and via ca	ble.			
			Switch Faults:				
			4 Switch Faults should be pro	vided o	n board to study different		
			effects on circuit.				
			c FREQUENCY MOI	DULAT	TION TRANSMITTER		
			KIT with eManual			ļ	
			TECHNICAL SPECIFICA'	TIONS	•		
			Synchronous Function Gene	erator:			
			Waveforms	•	Sine, Triangular,		
			Square	SHC2			
			Frequency Range		1) 100Hz to 1KHz		
				45.0	2) 1 KHz to 10 KHz		
			FM Modulators		2 Nos.		
				≥€ 3	Varactor Modulator		
			with carrier frequency adjustr	nent	v aractor ivioaarator		
			Mixer (Frequency Converte				
			Dual gate MOSFET Inputs		Local oscillator and		
				•	Local oscillator and		
			RF Signal.	<u> </u>	155 VII 1:4-1-1		
			Output Frequency Switch Foulto	1 C	455 KHz adjustable		
			Switch Faults: provided on board	4 SW	vitch Faults should be		
			d. FREQUENCY DEM	IODUL	ATION RECEIVER		
			KIT with eManual – 3 Nos				
			TECHNICAL SPECIFICAT	TIONS:			

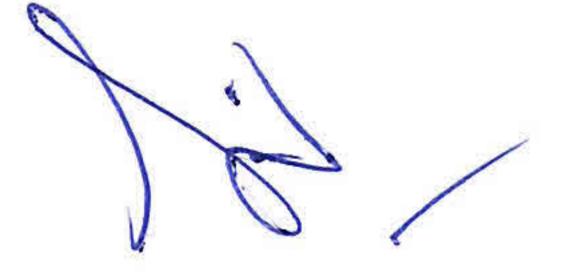
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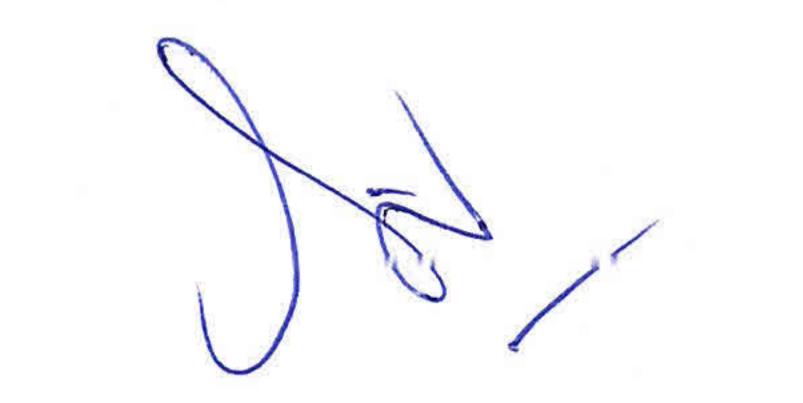
SR NO	Item Name	Specification			
110		Foster-Seely Detector:			
		Operating frequency : Adjustable from 400KHz to 500KHz.			
		Ratio Discriminator Detector:			
		Operating frequency : Adjustable from 400KHz to 500KHz.			
		Phase Lock Loop Detector:			
		Operating frequency : Adjustable from 400KHz to 500KHz.			
		Phase Detector And FM Quadrature Detector:			
		Operating frequency : Adjustable from 400KHz to 500KHz.			
		Amplitude Limiter:			
		Operating frequency: 455KHz.			
		Low Pass Filter: 4 TH Order Butterworth Filter.			
		Switch Fuults: Switch Faults should be provided on board			
		e. NOISE POWER SPECTRAL DENSITY MEASUREMENT KIT			
		SPECIFICATIONS			
		Clock generator Frequency . 2MHz			
		Onboard signal Sine wave Frequency . 1KHz~ 10KHz			
		Noise generator			
		Psoudo random noise source			
		• Number of bits: 32-bit			
		• Output amplitude : $0 \sim 1V$			
		• Noise bandwidth : 2MHz			
		Signal attenuator and adder			
		• Adjustable from 0 to the maximum of input value			
		signal + noise adder stage			
		Low pass filter 4th Order Butterworth filter Power meter and display			
		 Input signal amplitude : 0Vpp ~ 2Vpp Timer : 1 ~ 15 seconds 			
		• Display : 2 digits seven segment			
		Switch faults			
		4 switch faults are provided on board to study different effects			
		on circuit			
		f. FDM Transmitter / Receiver Kit			
		It should provide On-board clock generator.			
		• Carrier generator range should be 1KHz ~ 20KHz and			
	1KHz ~ 30KHz with adjustable amplitude of 0Vpp ~ 2Vpp and				
		Pilot carrier with 256KHz frequency			
		It should support High frequency transmission using DSB with			



SR NO	Item Name	Specification
		Frequency division multiplexing
		It should provide 2 channel FDM communication
		system
		 DSB AM modulation and demodulation should be
		supported
		• It should perform Amplitude demodulation of DSB at Receiver
		• It should consist of Pass band
		Filter 1 and 3 frequency range 8 ~12KHz with f _C 10KHz filter 2
		and 4 frequency range 18KHz ~ 22KHz with f _C 20KHz
		It should have 4 th order Butterworth low pass filters
		 8 switch faults are provided on-board to study different effects on circuit
		• 2mm banana socket should be provided for
		Interconnection
		 25 test points are provided to observe various
		intermediate signals
		• It should have a Fixed Power supply of, +5V and GND
		and a Fixed Power supply of +12V, -12V.
		g. Filter /Noise and Audio Amplifier Kit
		White noise source generator with adjustable Output amplitude
		from 0Vp-p to 3Vpp should be provided.
		It should consist of an Adjustable Signal attenuation network
		from 0 to the maximum of input value signal + noise adder
		stage
		It should have Audio amplifier with loud speaker of Output
		power 0.5W and Speaker of 8□, 0.3W
		• It should consist of High pass filter with 3.4KHz cut off frequency
		It should contain Band pass filter Frequency range
		from 7KHz to 13KHz
		It should contain Band reject filter Frequency range
		from 7KHz to 13KHz
		 It should consist of Matched T and π, high pass, band pass and band reject filters
		■ Matched filter for □□section 20KHz as cut off ■ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □
		frequency should be provided.
		• Matched filter for T section 20KHz as cut off
		frequency should be provided. It should support Input Waltage and Output Valtage
		It should support Input Voltage and Output Voltage from 0Vp-p to 2Vpp
		• 4 switch faults are provided on board to study
		different effects on circuit
8		2mm banana socket for Interconnection is to be given.
		24 test points are provided on board to observe various
		intermediate signals
		It should consist of Fixed Power supply of, +5V and GND
		It should consist of Fixed Power supply of +12V, -12V



SR NO	Item Name	Specification		
		h. FOURIER SYNTHESIS KIT		
		It should support Signal synthesis by summing 10 harmonics		
		Each harmonic selectable with +sin, -sin, +cos, -cos value should be supported.		
		Square, triangle, ramp, pulse, rectified sine, AM and other waves should be available.		
		It should perform Spectrum analysis of the signal using ACT- 01 and ACT -02 for Wave-form generation		
		Frequency of the fundamentals 10 KHz with quartz control is to be included		
		Frequency of the harmonics is 20KHz, 30KHz, 40KHz, 50KHz, 60KHz, 70KHz, 80KHz, 90KHz, 100KHz, should be		
		meluded.		
		It should carry Selectable Phase of each sine wave 0° (sin) 90° (cos), 180° (-sin), 270° (-cos)		
		Adjustable amplitude of each sine-wave on 2 ranges from		
		0Vpp to 1Vpp or from 0Vpp to 10Vpp should be provided.		
		Indication of the presence of each harmonic via LED should be		
		provided.		
		It should provide Adjustable Amplitude of the DC component		
		from -10V to +10V		
		Adder stage with 11 inputs should be included		
		Fixed Power supply of, +5V and GND should be provided.		
		Fixed Power supply of +12V, -12V should be provided		



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

Date: _							
To:							
Sl. No.	Description of	Qty.	Unit	Quoted Unit rate in Rs.	Total Price	Sales tax and other taxes payable	
	goods \ (with full			(Including Ex-Factory price,	(A)	In %	In figures (B)
	Specifications)			excise duty, packing and forwarding,			
				transportation, insurance, other local			
				costs incidental to delivery and warranty/ guaranty commitments)			
<u> </u>				waitanty/guaranty commitments)			
			Total Co	ost			
						Gross Total Cost	(A+B): Rs.
We agree	to supply the above go	ods in	accordan	ce with the technical specifications for a to	tal contract price of Rs		unt in figures) (Rupees ———
conditions	m that the normal cor as mentioned in the Ir	mmerci vitatio	al warran n Letter.	specified in the Invitation for Quotations. ty/ guarantee of ——————————————————————————————————			onfirm to agree with terms and
	of Supplier						