INDIAN INSTITUTE OF TECHNOLOGY BOMBAY
MATERIALS MANAGEMENT DIVISION
Powai, Mumbai 400076.

Ref. PR No. 1000051750 **RFx. No. 6100002678**

Item Description: Vector Network Analyzer, RF Signal Generator, Spectrum Analyzer & Digital Oscilloscope

Sr. No	Item Description	Detailed Technical Specification	Technical Compliance (Yes / No)	Additional Information (if any)
1	**Vector Network Analyzer**	• Instrument Type : Benchtop • Frequency Range: 9 KHz to 6 GHz • Number of ports: 2 • Measurements Capability: Full 2-Port S-Parameters, VSWR, Return loss, Smith Chart, Insertion Loss/Gain, Group Delay, Z-Parameters • Connector type: N, female,50 Ohm • Output Power 100 KHz to 6 GHz : -40 dBm to 0 dBm • Aging Rate: ± 1 ppm/year • Temperature Drift (+5°C to +40 °C) :1 ppm or Better • Frequency resolution: 1 Hz • IFBW: 1Hz to 500 KHz • Sweep Type & Number of Sweep Points : Linear,Log,CW,Power Sweep 1 to 100,000 Points • Directivity: > 30 dB • Load match: > 25 dB • Dynamic Range @ Test Port (10 MHz to 6 GHz) : > 110 dB		

		• Harmonics F > 10 MHz: -25 dBc typ or better • Test port noise floor 10 MHz to 6 GHz: -110 dBm/Hz or Better • Power linearity: 1.2 dB or Better • Power Accuracy 100 KHz to 6 GHz: 2 dB or Better • Damage input power level:> +27dBm RF, 30 VDC • Display: Inbuilt 10" Touch screen color display • Remote Interface: LAN • Operating System: Windows Based • Supply Voltage:230V ±10% , 50 Hz • Accessories Required: Phase Stable Cable Assy Set 2 no.s(N(M) to 3.5 mm(F) , Mechanical Calibration Kit 3.5 mm(F) to be provided		
2	**RF Signal Generator**	• Frequency Range: 8 KHz to 6 GHz • Aging Rate:0.03 ppm/yr. • Frequency Settling Time:< 2 ms • Max Output Power 1 MHz to 6 GHz:+15 dBm or Better • Minimum Output Power 1 MHz to 6 GHz: -125 dBm or Better • Amplitude Accuracy: < 1.5 dB • VSWR: < 2 : 1 • Maximum Reverse Power & DC Voltage : +27 dBm,5 VDC		

		• Harmonics @ 10 dBm: < -30 dBc • Non-Harmonics @ 10 dBm,> 10 KHz Offset:< -80 dBc @ 1 GHz < -74 dBc @ 3 GHz < -68 dBc @ 6 GHz • SSB Phase Noise @ 10 KHz/20 KHz Offset :< -140 dBc/Hz @ 100 MHz < -125 dBc/Hz @ 1 GHz < –114 dBc/Hz @ 3 GHz < –108 dBc/Hz @ 6 GHz • Sweep Modes: RF Frequency, Amplitude, LF Sweep • Dwell time: 10 ms to 100 s • Operating Modes: Step, List • Amplitude Modulation: Internal, External • Modulation Depth: 0 to 100% • AM Distortion:< 2% • Frequency Modulation: Internal, External • Maximum Deviation: 10 MHz @ 1 GHz 20 MHz @ 3 GHz 40 MHz @ 6 GHz • Distortion: < 0.5% • Phase Modulation: Internal, External • Maximum Deviation: 40 rad @ 1 GHz 80 rad @ 3 GHz 160 rad @ 6 GHz • Pulse Modulation: Internal, External • ON/OFF Ratio: > 80 dB,90 dB typ • Minimum Pulse Width:20 ns • Pulse Period: 40 ns to 100 s		

		• PRF: 0 Hz to 25 MHz • Interfaces: USB,LAN • Display: In-Built 5 inch Touch Screen Display • Operating Temperature: 0 °C to +55 °C • Power Supply: 230 VAC,50 Hz • Weight: < 8 Kg		
3	**Spectrum Analyzer**	• Frequency Range: 5 KHz to 7.5 GHz • Frequency Span: 0 Hz,10 Hz to 7.5 GHz • Counter Resolution: 0.001 Hz or Better • Analysis Bandwidth: 10 MHz or Better • Aging Rate: 1 ppm/yr. • Temperature Drift 0 to 50 °C : 1 ppm or Better • Sweep time: Span = 0 Hz : 1 µs to 6000 s Span ≥ 10 Hz : 1 ms to 6000 s • Resolution Bandwidth : 1 Hz to 10 MHz in 1/2/3/5 steps • Phase Noise @ 1 GHz: -105 dBc/Hz @ 10 KHz Offset -110 dBc/Hz @ 100 KHz Offset or Better • Video Bandwidth : 1 Hz to 10 MHz in 1/2/3/5 steps • Displayed Average Noise Level 10 MHz to 7.5 GHz : With Preamp OFF < -130 dBm or Better With Preamp ON < -150 dBm or better • Sweep Points : 201 to 100,000		

		• Maximum Safe Input Level RF Attenuation ≥ 10 dB : +30 dBm or Better • 1 dB Compression Point in full frequency range : +5 dBm nominal or Better • Third Order Intercept : +16 dBm @ 1 GHz +15 dBm @ 5 GHz • Second Harmonic Intercept @ -15 dBm level : +65 dBm nom @ 7.5 GHz or Better • Amplitude level measurement uncertainty for input levels of -50dBm to 0dBm : ≤ 1.5 dB for input attenuation levels up to 30dB, S/N >20dB • Trace Detector : Peak, Sample,RMS,Average • Measurements : Adjacent Channel Power, Occupied Bandwidth, Carrier to Noise Ratio, Spectrum Emission Mask, TOI, Harmonic Distortion, Spectrogram, EMI measurements • Internal Generator : Should be available • Connector : type N female,50 Ohm • I/Q Memory Depth : Upto 20 Msa I and Q • Interface : LAN • Display : Minimum 10 inch Touch Screen • Operating System : Windows Based 20 GB SSD Internal Storage • Operating Temperature : 0 to 50 °C • Power Supply : 230 VAC,50 Hz		

4	**Digital Oscilloscope**	• Input Analog channels:4 Channels • Digital Channels:16 • Input impedance:50 Ω ± 1.5 % (meas.),1 MΩ • Bandwidth: ≥ 1.5 GHz • max. 5 Gsample/s on 2 channels, max. 2.5 Gsample/s on 4 channel • Input/Vertical Sensitivity: 0.5 mV/div to 1 V/div at 50Ω &0.5 mV/div to 10 V/div at 1 MΩ • Vertical resolution : 12-Bit ADC and up to 18-Bit in HD mode • Maximum Memory Depth: 400 Mpoints/channel • Time Base Range: Selectable between 200 ps/div and 10000 s/div • Time Base Accuracy : < 0.2 ppm • Waveform Update Rate (Waveform/sec): 4,500,000 • Minimum Detectable Pulse Width : 200 picosecond • Trigger Types : Edge, Pulse width, Pattern/State, External, Pattern, Burst, Zone Trigger • Measurements : Math function-Add, subtract, multiply, divide, Automatic Measurements of Amplitude and time, low-pass filter, Frequency Domain function, Time & Voltage cursors • Acquisition Modes : Peak Detect, Averaging, High Resolution, Roll Mode, Sample, Envelope • Arbitrary function generator: 2-channels, 100 MHz, ARB length: 40 Mpoints • Mixed signal capabilities (MSO) : 400 MHz,16		

		channels, 5 Gsample/s, 400 Mpoints/channel • Integrated Digital Voltmeter : Yes • Other Protocols/Features Supported: Power Analysis, Frequency analysis, Triggering and decoding for (I2C,SPI,UART/RS-232/-422/-48, CAN,CAN-FD,CAN-XL,LIN) • I/O Interface : USB, LAN Port • Display : 13.3" LC TFT color display with capacitive touchscreen • AC supply: 230±10% at 50 Hz • Temperature: Operating temperature range: 0 °C to +50 °C Storage Temperature Range: –40 °C to +70 °C		

Terms and Conditions for Supply of Vector Network Analyzer, RF Signal Generator, Spectrum Analyzer & Digital Oscilloscope:

1. **Training & Documentation -**
   - The supplier shall provide comprehensive hands-on training to installation. Training must cover all core functionalities of the equipment's.
2. **Installation & Delivery -**
   - The supplier shall be responsible for the complete installation and commissioning of the equipment.
3. **Warranty & Support -**
   - A comprehensive warranty shall be provided for a period of one (1) year from the date of commissioning.
4. **Timeline -**

   The supplier shall complete the installation, training, and commissioning within 15 days from the date of delivery.