

DAE TELECOMMUNICATION TECHNOLOGY

(As per Curriculum Revised, 2025)

(List of the Equipment for 50 Students)

1. ELECTRONICS LAB:

Sr. #.	Name of Item with Specifications	Qty
1.	Oscilloscope Digital LCD type 100MHz: 100 MHz 2 Channel Storage Oscilloscope Sample rate: 1GSa/s, 40K USB port With standard accessories Instruction Manual in English.	10
2.	RF Signal Generator: Signal Frequency range: 100KHz to 150MHz in 6 selectors, 3 harmonics up to 450MHz Output wave forms: Sine and amplitude modulation wave RF/AM output max, intensity $\geq$ 10Vp-p External modulation signal can be set between 50Hz to 20kHz Output Impedance: 600 ohm Radio Frequency output: over 100 mvrms Accessories: Power cord, Instruction manual.	10
3.	Digital Triple output DC Power Supply: Choice of outputs: Double output: 0 to 30VDC, 0 to 5A Single output: 0 to 60VDC, 0 to 5A Single output: 0 to 30VDC, 0 to 10A Fixed output: 5V/3A With short circuit protection With standard accessories and Operational /Instruction Manual in English	15
4.	Analog Multimeter Measuring range: DC Current 0-0.06mA-3mA-30mA-0.3A-12A DC Voltage 0-0.3V-3V-12V-30V-120V-300V-1200V AC Voltage 0-12V-60V-300V-1200V Resistance 2K, 200k, 2M, 20M ohm	20
5.	Digital Multi meter • 4000 counts measurement • Diode test/Buzzer • Temperature test • Frequency/Duty Cycle • Relative measurement • Data Hold • Auto Power Off	20

Sr. #.	Name of Item with Specifications	Qty
	• Auto/Manual Ranging • Double Molded • Mechanical / Electronic Protection System • Conform to IEC1010 CAT II 1000V • Convenient Fuse/Battery Change Design • Battery life up to 500 hours <u>Specifications</u> DC Voltage range : 0.1mV-1000V DC Current range : 0.1μA-10A AC Voltage range : 0.1mV-1000V AC Current range : 0.1μA-10A Resistance range : 0.1Ω-40MΩ Capacitance range : 0.01nF-100μF Frequency/Duty Cycle : 10Hz-100kHz Temperature range: -55°C-1000°C	
6.	Megger Portable (500V, 500MΩ) Hand operated	05
7.	Electricity & Magnetism Trainer DC Power Supply with Short-Circuit protection Fixed voltage: +5V , +12V and -12V Dual variable voltage: 0 – ±25V AC Power Supply Center tap: 2-0-2, 15-0-15, 18-0-18V Function Generator Output: Sine, Triangle, Square wave, TTL Output impedance : 50ohm Frequency: Maximum 100KHz, adjustable Output amplitude: 0-15Vp-p, adjustable Which can perform the following listed experiments: 1. Study of Multimeter 2. Colour coding of resister 3. Verification of Ohm's law 4. Verification of KVL 5. Verification of KCL 6. Verification of Superposition Theorem 7. Study of transformer 8. Study of Junction diode 9. Half-wave rectification 10. Full-wave rectification 11. Reading and understand the transformer's ratings 12. Familiarization & use of lab equipments & components. (power supply, Breadboard, Multi-meter & Finding the resistance value by colour coding) 13. Experimental determination of the transformer's polarity	10

Sr. #.	Name of Item with Specifications	Qty
	14. Conventional determination of the transformer's voltage drop 15. Measuring the winding resistance 16. Observing charging and discharging pattern in an RC circuit. 17. Study of mutual inductance. 18. Step up transformer (by hardware). 19. Step down transformer (by hardware). 20. Step up transformer. 21. Step down transformer. 22. Find out the Thevenin's equivalents of the given circuit and verify the load current. 23. Measurement of voltage ratio in voltage divider on no load condition. 24. Determine Load current for different values of RL. 25. Faraday's Law of Electromagnetic induction. 26. LDR, Photodiode, LEDs. 27. Self Inductance and Induced Induction.	
8.	Earth Tester Digital Earth Resistance Range: 0 ohm to 4K ohm Earth AC Voltage Range: 0 to 20V Digital display with analog bar graph 2 pole and 3 pole mode MAX/MIN/AVG/REL measurement functions Low battery display Display backlit With standard accessories and Operational Manual in English	05
9.	Portable Wattmeter Analog Single Phase Portable type Range: (1/5A, 240V, 1 Φ) Mirror Scale : 120 - 130mm approx With operational Manual in English.	05
10.	Electric Wiring Boards / Training board for 1 Φ , 3 Φ Protection class I (with protective conductor) Table fixation by means of the board support	05
11.	Solder Iron 40 watt, branded.	25
12.	Sucker hand operated.	25
13.	Basic Electronics/ Electrical Tool Kit	10
14.	Project Board trainer with built-in power supply.	10
15.	Spectrum Analyzer - Handheld, battery operated, weighs 7.5 lbs - Frequency range: 9 kHz to 20 GHz - Built-in pre-amplifier (standard) up to 4 GHz - Large daylight-viewable transfective color display	05

Sr. #.	Name of Item with Specifications	Qty
	• Displayed average noise level < -159 dBm • Resolution bandwidths: 1 Hz to 3 MHz • Video bandwidths: 1 Hz to 3 MHz • Antennas are available • Trace averaging - more than 65000 traces can be averaged • Save up to 1000 measurement traces internally • RJ-45 Interface, USB 2.0 Interface, and Software included • AM, FM and SSB demodulation with speaker and headset jack • With All accessories • Operational Manual in English.	
16.	Digital Logic Trainer with given accessories DC Power Supply with short-circuit protection Fixed voltage: +5V, +15V and -15V With power indicators and protection fuse. 8 LEDs used to indicate the state of a logical output. 8 Logic Switches with complementary logic states. Two 7 segment decoder/driver and displays with BCD logic input. Logic Probe with LEDs for determining the logic states Two push switches for generating negative - going pulse. TTL Clock with adjustable frequency. Two potentiometers. Trainer should consist of various modules to perform following experiments. 1. To examine the behavior of 2- inputs AND, OR, Inverter, NAND, and NOR gates. 2. To build a 3-inputs AND and OR gate using 2-inputs AND and OR gate. 3. To build a 3-inputs NAND and NOR gate using 2-inputs NAND and NOR gate. 4. To examine the behavior of 2- inputs XOR gate. 5. To build a circuit having 2 and 3 inputs XOR gate using a two input XOR gate. 6. To prove De-Morgan's law. 7. Implementation of half adder, half subtractor, full adder and full subtractor using gates. 8. To make Karnaugh map of your roll no. 9. TTL-CMOS interfacing 10. CMOS-TTL interfacing.	05

Sr. #.	Name of Item with Specifications	Qty
	11. Input multiplexer. 12. Flip - flops. 13. Data shift registers. 14. Binary counter. 15. 1 to 4 decoder. 16. BCD -to- decimal decoder. 17. Priority encoder. 18. Seven segment LEDs and decoder driver, 19. Monostable 74121. 20. TTL-CMOS Interfacing. 21. Crystal oscillator. 22. Decoder & Encoders. 23. Operation of an 8421 BCD decoder using open - collector I.C. 24. Operation of an 8-input encoder and significance of priority. 25. Design & implementation of shift register using flip-flops & demonstration of shift right & shift left functions of MSI universal register,	

17.	Semiconductor / Basic Electronics Trainer in Modular Form examples of performing the following experiments : 1. Identify the various diodes, transistors & IC package, number system and terminals. 2. Draw the forward & reverse characteristics of a P.N. junction diode. 3. Assemble a full wave diode rectifier circuit with a PI filter & calculate the ripple factor of output wave. 4. Assemble a double side biased diode limiter circuit. 5. Familiarize with a voltage quadrupler circuit. 6. Demonstrate diode as a switch with LED as a load. 7. Troubleshoot a faulty diode rectifier circuit. 8. Use a Zener diode as voltage regulator with diode rectifier. 9. Assemble a double side Zener diode limiter. 10. Demonstrate the performance of power supply using IC regulator. 11. Use varactor diode in a resonant circuit. 12. Assemble a tunnel diode oscillator. 13. Plot the input & output characteristics of a transistor in common base configuration. 14. Plot the input & output characteristics of a transistor in common emitter configuration. 15. Plot the input and output characteristic of transistor in common collector configuration. 16. Plot the transfer characteristics curve of transistor in CE configuration. 17. Consult data sheet for a transistor to study its parameters and ratings. 18. Study the class A, B and C Amplifiers. 19. Assemble a transistor voltage amplifier and find its voltage gain. 20. Demonstrate the characteristics of CB, CE & CC amplifier using curve tracer. 21. Study the gain of an amplifier with an without negative feedback. 22. Plot the characteristics curves for a common source FET amplifier. 23. Demonstrate MOSFET as a switch and study the performance. 24. Plot the characteristics curves for SCR & UJT.	05
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	25. Assemble a light dimmer using a Diac & a Triac. 26. Troubleshoot an operational amplifier. 27. Assemble a differential amplifier using transistor. 28. Demonstrate the working of an operational amplifier. 29. Use of op-amp as an inverting & non-inverting amplifier and a voltage follower. 30. Draw the frequency response of an op-amp. 31. Troubleshoot an operational amplifier. 32. Demonstrate the use of digital logic probe & logic pulser. 33. Recognize an open & a short TTL NAND gate in an IC using logic probe & pulser. 34. Troubleshoot a combinational logic circuit using logic probe & pulser. 35. Troubleshoot a frequency counter using oscilloscope. 36. Study the working of Hartley oscillator 37. Construct a voltage controlled oscillator using 555 timer.	
18.	Digital Frequency Counter 3GHz: DC to 3GHz frequency range Frequency, period, pulse width, ratio and event counter modes Rechargeable batteries USB interface included FM MODULATION Peak Deviation: 0.5kHz to 100kHz. Setting Resolution: 0.5kHz by direct keyboard entry, rotary control or increment–decrement keys. Modulation Frequency: Internal 1kHz; External 300Hz to 50kHz Deviation Accuracy: <±10%of setting ±0.5kHz, excluding residual FM, for 1kHz modulation, internal or 1Vrms external. External Modulation Frequency Response: ± 1dB from300Hz to 50kHz relative to 1kHz. Distortion: <2%total harmonic distortion at 1kHz modulating frequency, 100kHz deviation and 500MHz carrier. Input Impedance: 100kW	05

	Input Connector: BNC	
19.	Logic Probe.	05
20.	Logic Pulser	05
21.	Desoldering Station with ESD	20
22	Digital IC Tester: Features Support low voltage components. Provide +/- 5%, +/- 10% Vcc checking function. • Provide fast programming FLASH/EPROM function. It only takes 20 seconds to process a 16M bits FLASH memory. (C+P+V) • Graphic operation software: All programming procedures are simplified into few automatic processes. • Provide auto-programming function. • System self-test function. • Device processing interface: 48-pin ZIF socket and directly support DIP package device under 600mil . Device Supported • EPROMs, EEPROMs, FLASH, Serial EEPROM, NV-RAMs, Microcontrollers, DSP, PLD	05
23	Digital clamp on meter AC current: 400Amp Frequency: 50Hz AC Voltage: 600V Resistance: 40M Ω	05
24	LCR Meter (Bridge) Bench type: l 0.1% measurement accuracy l Test frequencies up to 10kHz l Automatic component recognition l Built-in 4 terminal component fixture l Dual 5 digit high brightness displays l Limits comparator, multiple pass and fail bins l RS-232 interface for PC connectivity MEASUREMENT FUNCTIONS Parameters Measured: R, L, C, D, & Q. Parameter Selection: Manual or automatic selection of R, L or C. Measurement Modes: Series or parallel equivalent circuit. Range Hold: Prevents autoranging when changing components. Zero Function: Nulls out up to 100pF at test fixture. Measurement Freq.: Selectable as 100Hz/120Hz, 1kHz, 10kHz. Displayed Functions: R+Q, L+Q, C+D, C+R. MEASURING RANGES	05

Resistance: 0.1mΩ to 990MΩ Inductance: 0.001H to 9900H Capacitance: 0.001pF to 99000μF D: 0.001 to 999 Q: 0.001 to 999 Accuracy Limits: 100Hz 1kHz 10kHz R 0.1% $\pm$ 1 digit 2Ω-1MΩ 2kΩ-500kΩ 2Ω-50kΩ 0.5% $\pm$ 1 digit 0.4Ω-5MΩ 0.4Ω-2MΩ 0.4Ω-200kΩ 2% $\pm$ 1 digit 0.1Ω-20MΩ 0.1Ω-10MΩ 0.1Ω-500kΩ L 0.1% $\pm$ 1 digit 4mH-500H 0.4mH-50H 40μH-5H 0.5% $\pm$ 1 digit 0.8mH-2500H 80μH-250H 8μH-25H 2% $\pm$ 1 digit 0.2mH-9900H 20μH-1000H 2μH-100H C 0.1% $\pm$ 1 digit 10nF-1000μF 1nF-100μF 100pF-10μF 0.5% $\pm$ 1 digit 2nF-5000μF 200pF-500μF 20pF-50μF 2% $\pm$ 1 digit 500pF-20000μF 50pF-2000μF 5pF-200μF (R accuracies apply for Q<0.1. L accuracies apply for Q>10. C accuracies apply for D<0.1 and after Null). LIMITS COMPARATOR Limits Set-up: Multiple Upper and Lower limits can be set from keyboard or from RS-232 interface Binning: Up to 8 Pass bins can be defined plus Fail on minor parameter and general Fail. COMPONENT CONNECTION Component Connection: 4-terminal connection via internal fixture for both radial and axial components. External 4-terminal connection via adaptor. Internal Fixture: Sprung jaws for vertical lead insertion. Plug-in sliding pillars for horizontal lead insertion. Bias Voltage: Switchable 2V polarising voltage. External bias up to 50V. DISPLAY Display Type: Dual 5-digit 0.56" LEDs. Annunciators: LED annunciators for all functions and measurement units. Displayed Functions: R+Q, L+Q, C+D, C+R, PASS/FAIL, Bin No. DIGITAL INTERFACE Interface Type: RS-232 via 9 pin D connector, 9600 baud. Interface Function: Full command and readback. GENERAL Keyboard: Full numeric keyboard. Non-volatile memory: Up to 9 complete set-ups.	
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	Input Voltage: 230V or 115V $\pm 14\%$, 50/60Hz, internally adjustable, 25VA max. Installation Category II. Temperature Range: +5°C to 40°C operating 20 - 80% RH, -40°C to 70°C storage. Safety: Complies with EN61010-1. EMC: Complies with EN61326. Size: 360 x 240 x 95 mm including feet. Weight: 2.9kg approx.	
25	AF Generator 1 MHz: Range: 10Hz to 1MHz in five steps Waveform output: Sine & Square Intensity of output signal: 10Vp-p 60dB accurate attenuate with 6 steps Output impedance: 600 ohm	05
26	Digital Sound Level Meter: • 35 ~ 130dB Range • 0.1dB Resolution • +/- 1.5 dB Accuracy • A/C weighting • Fast/Slow Response • Max Hold Function • AC/DC output • Reset Function • Calibration 94dB Level Range: A LO (Low) - Weighting: 35- 90dB A HI (High) - Weighting: 75-130dB C LO (Low) - Weighting: 35- 90dB C HI (High) - Weighting: 75-130dB Resolution: 0.1dB Frequency Range: 31.5Hz to 8KHz	05
27.	Microcontroller Trainer PIC Development Board-Trainer Kit	10
28.	Microcontroller Trainer 8051 Development Board- Trainer Kit	10
29	MPPT Charge controller • Compatible for PV systems in 12v, 24v or 48v • Maximum charging current up to 60a • MPPT Range Operating Voltage: 60 ~115VDC • Maximum PV Array Open Circuit Voltage: 145VDC • Maximum PV Array Power: 3200W • Maximum Input Current: 50A • Nominal Battery Voltage: 12/24/48VDC	05

	- Maximum Charge Current: 60A Experiment Include 1. Install a Tall tubular battery with MPPT charge controller. 2. Demonstrate the Power Distribution System at a Telecom Installation. 3. Demonstrate on Solar Installation at work site.	
30	Function Generator	10
31	Solar Panel 585 watt N-Type Monofacial	02
32	Solar Panel 585 watt N-Type Bifacial	02
33	IR Thermometer	05
34	Servomotor Voltage regulator 1000VA, Single Phase	01
35	Hybrid Solar Inverter. 3KW, 24V, IP21	01
36	Tubular Battery 100Ah	02
37	Circuit Breakers Single Phase, Three Phase, DC	05 each
38	Sound Level Meter 30-130db, Digital	05
39	Operational Amplifier Trainers DC Power Supply with short-circuit protection Fixed voltage: +5V , +12V and -12V Dual variable voltage: 0 – $\pm 25V$ AC Power Supply Center tap: 2-0-2, 15-0-15, 18-0-18V Function Generator Output: Sine, Triangle, Square wave, TTL Output impedance : 50ohm	10

	Frequency: Maximum 100KHz, adjustable Output amplitude: 0-15Vp-p, adjustable LCD Type DC Voltmeter with ranges 200mV, 2V, 20V, 200V LCD Type Ampere Meter DC with ranges 200mA and 2A. Trainer should consist of various modules. All the necessary components required to perform the experiment be installed on the module. This trainer should be able to perform the following experiments: 1. To observe the characteristics of differential amplifier. 2. Op-amp characteristics. 3. Inverting amplifier. 4. Non inverting amplifier. 5. Inverting AC amplifier. 6. Comparator with op-amp. 7. Schmitt triggers using an op- amp. 8. Wein bridge oscillator. 9. Class A amplifier. 10. Class AB amplifier. 11. Class C amplifier. 12. Series regulator. 13. Phase locked loop. 14. Sine/Cosine oscillator. 15. Combined square and triangular wave generator, 16. Active filters. 17. Integrator using op-amp. 18. Differentiator using op-amp	
40	Solar MPPT Meter • Battery capacities from 30Ah to 200Ah. • USB Supported and built-in printer for report generation. • 12V cranking lead acid battery test • 12/24V charging or cranking system test • Display battery capacity, voltage, resistance and life • Four-termina Kelvin test	02

	• 10 types of battery standards	
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2. Advance Telecommunication Lab:

Sr. No.	Name of Item with Specifications	Qty
1..	ANTENNA TRAINER The components of the trainer: • Generator Panel • Mast and Base • Detector • Halfwave Dipole Antenna • Halfwave Folded Dipole Antenna • Yagi-Uda Antenna • Horizontal End-Fed Antenna • Ground Plane (Marconi) Antenna • Slot Antenna • Loop Antenna • Lambda $\frac{1}{4}$ antenna • Lambda $\frac{1}{2}$ antenna • Combined Collinear antenna • Helix antenna • Antenna current sensor • Parabolic antenna Study topics: • Setup of a typical antenna test bed • Review of theory basics • Basic set-up • Generator adjustments • The matching stub • SWR measurements • Radiation polar diagrams • Half-Wavelength dipole and folded dipole • YAGI-UDA antenna • Horizontal End-fed antenna • Ground plane • Slot antenna • Loop antenna	02
2.	FIBER OPTIC COMMUNICATION TEACHING SET Topic areas: • Amplitude modulation of a light source. • Transmission of signals over a fiber optic cable. • Recovery of original signal at the receiver. • Advantages of modulating a light source with a digital signal. • Analog signal transmission by frequency modulation of a digital subcarrier.	02

	• Analog signal transmission by PWM of a digital sub-carrier. • Digital communication via fiber optic cable. • Computer to computer communication using two modules. • Troubleshooting of faults in fiber optic transmitter and receiver circuits. <u>Fiber optic polishing kit:</u> A complete package of hardware, designed for use in conjunction with the Fiber Optic Transmitter/Receiver to enable students to carry out a comprehensive range of experiments that cover the polishing and preparation of fiber optic cable terminations. The Fiber optic polishing kit should comprise the following items: Microscope, microscope adaptor, polishing block, polishing surface, polishing fluid bottle, carrying case and user manual. <u>Polishing kit accessory pack.</u> To be used with the Fiber Optic Polishing Kit providing all the consumable items required to perform the experimentation comprising the following items: 10 lengths of polymer fiber optic cable (0.5m long), 20 fiber optic cable connectors, 1 pack of lint free tissue, 10 sheets of 600 grit abrasive paper, 10 sheets of 30 micron lapping film, 10 sheets of 3 micron lapping film, storage case. <u>Physics of fiber optics system.</u> To study the physics of fiber optics. Used in conjunction with a Fiber Optic Transmitter/Receiver, the system enables students to investigate the following areas: • Relationship between cable attenuation & cable length. • Coupling losses in fiber optic transmission. The Physics of Fiber Optics System comprises the following items: Optic fiber alignment module, a range of optic fiber cables of varying lengths, two in-line coupling connectors and a user manual. Complete with set of 36 x 4mm leads, Power supply, Computer Aided Instructions, Curriculum text and student workbook	
3.	TRANSMISSION LINE TRAINER <u>Topic areas include:</u> • Attenuation.	02

	• Delay Using a Pulse • Matching Using a Pulse Input. • Reactive Termination. • Noise in Communications • AC Coupling of Pulse Inputs. • Matching and Frequency Response. • Standing Waves. • Transformer Matching. • Low Pass Filter Effect • The 50 ohm line as an oscillator. • Time Domain Reflectometry. <u>Activities include:</u> • Predict the attenuation along a practical transmission line in decibels and Nepers. • Measure a delayed pulse using the simulated 50 ohm line. • Measure reflections using the simulated 50 ohm line. • Observe the effect of a reactive termination using the simulated 50 ohm line. • Observe noise added to a pulse signal using the simulated 50 ohm line. • Observe the effect of AC coupling on pulse signals. • Plot the frequency response of a mismatched simulated 50 ohm line. • Observe standing waves using the Standing Wave Display circuit. • Use the Transmission Line Trainer to demonstrate the low pass filter effect. • Identify the principles of TDR. • Use the principles of TDR to find faults on the Transmission Line Trainer. The teaching set comprises: • Transmission line trainer (includes laboratory manual) • Set of 36 x 4mm leads. • Power supply • Instructor's solutions book	
4.	MICROWAVE KIT / MICROWAVE TRAINING SYSTEM <u>Standard Kit contents:</u> • Solid state Oscillator • 2K25 Klystron • Klystron Tube Mount	01

	• Transitions • Frequency Meter • Slotted Line • Variable Flap Attenuators • Termination • Thermistor Mount • Power Supply (thermistor Bridge & Amplifier) • H-Plane tee • Directional Coupler • Fixed Attenuator • Fixed Attenuator • Cable RG-9”N” to “N” Male • Cable RG-58 BNC to BNC Male • E-Plane tee • Tuning Probe • Detector Mount • E-H Plane • Waveguide Stands • Horn Antennas • Shorting Plate • Bag: 8/32 screw and nuts • Training Manual <u>List of Experiments / lessons the trainer covers:</u> • Transmission Line theory • Measurement of Power • Standing Wave Ratio • Frequency and wavelength • Measurement of Impedance • Attenuator • Microwave tuner • Directional Coupler • Series Tees and Shunt Tees • Detectors and Mixers • Reflection Loss • Propagations of Microwaves • Microwave Antennas • Slid State Characteristics • Instructor can use their own configuration or develop their own experiments. <u>IMPORTANT NOTE:</u>	
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	The Power Meter and VSWR Meter are built into the Power Supply unit	
5.	DIGITAL SATELLITE COMMUNICATION TRAINER A complete system for reception of TV signals from all satellites of the Mediterranean, Middle East and Asia regions: ASTRA, EUTELSAT, (HOT BIRD) and others. The system is organized to be used as a training instrument and consist of the followings:- - Parabolic antenna, 60cm diameter, offset type, with LNB - Antenna mounting and cabling accessories - Receiver with following major features:- - o 22kHz tone to control external antennas - o 199 pre-selectable channels - o 2 GHz tuner (920 – 2050 MHz) - o Compatible also with ASTRA I D Satellite - o UHF output modulator (CH 30 – 45) - o Remote controller The system is supplied with all accessories and facilities to make installation and use simple and efficient.	02
7.	GSM Test Set Voltage ranges: 85 to 130 V and 180 to 264 V AC Frequency range: 45 to 66 Hz Power consumption: 170 VA maximum Functional Tests Call Set-up - MO & MT Call Termination - MO, MT & Call lost Synchronized Handover Transmitter Tests Tx Test - Power, Phase & Frequency Error, Power Profile, Modulation Spectrum, Burst Timing Power Levels/Steps Timing Advance Receiver Tests Rx Test - CII & CIb BER, FER, RXQUAL, RXLEV, GPRS BLER, Sensitivity (Absolute)	05

	Speech & Data Tests Voice Loopback Send speech Receive speech SMS point to point MO & MT With all accessories and Operational Manual in English.	
9	E-PABX 8+24 along with console and receiver	02
10.	4G/5G Smart Phone Trainer Kit (Mobile Trainer Board) Network : GSM / HSPA / LTE - 2G bands : GSM 850 / 900 / 1800 / 1900 - SIM 1 & SIM 2 - 3G bands : HSDPA 850 / 900 / 1900 / 2100 - 4G bands : LTE band 1(2100), 3(1800), 5(850), 8(900), 20(800), 40(2300) • CPU - Exynos 3475 - 1.3GHz Cortex-A7 quad-core - Mali-T720 • Operating system : Android • RAM : 1 GB • Internal Storage : 8 GB • External Storage : Up to 256 GB • □Display - Type : Super AMOLED capacitive touch screen, 16M colors - Size : 4.7 inches, 60.9 cm ² (~64.7% screen-to-body ratio) - Resolution : 540 x 960 pixels, 16:9 ratio (~234 ppi density) • Camera - Selfie Camera : 2 MP, f/2.2 - Rear Camera : 5 MP • Communication - WLAN : Wi-Fi 802.11 b/g/n, Wi-Fi Direct, hotspot - Bluetooth : 4.1, A2DP - GPS : Yes, with A-GPS, GLONASS GPS - Radio : FM radio, RDS, recording • Sensors : Accelerometer, proximity • Battery : Li-Ion 2000 mAh battery • Connectivity : USB 2.1 Version, 3.5mm Stereo Ear jack, Bluetooth Version v4.1 • On-board Blocks	05

	- Dual SIM block : Two no of DUAL SIM Slots is provided. - Li-ion battery block : Battery Block is provided - Display block : 4.7 inch TFT Display is provided - Power & Volume block : Keypad block with Power and Volume control Key is provided - MIC block : MIC for Audio Input is provided. - Hand free MIC block : Hand free MIC block is provided - Speaker block : Speaker block is provided - Ear phone block : Ear Phone block is provided to connect, Ear phone for Audio output - Vibrator motor block : Vibrator motor block is provided - USB block : USB block is provided for data Transfer with Computer - Power supply block : Power supply block for charging the battery. • 43 Test points are provided to analyze signals at various points. • 11 no's of Fault Switches with 34 faults are Provided • All ICS are mounted on IC Sockets. • Bare board Tested Glass Epoxy SMOBC PCB with Block Diagram. • AC Input : 230V $\pm$ 10%, 50 Hz • Attractive ABS Enclosure With all accessories and Operational Manual in English.	
11.	Power beam dishes for wireless internet connection (point to point internet) With all accessories included to establish a point to point internet connection	02
12	OTDR Wavelength : 1528 - 1567 nm Interface: USB, RJ-45, LAN Internal Data Storage: upto 2GB Display: 7 inch Fiber type: single mode/ multi-mode Distance range: 0.1 - 100 Km Power Range :-50 to 27 dBm Power Supply: 100 to 240 VAC, 50 to 60 Hz With all accessories and Operational Manual in English.	02
13	Optical Power Meter	02

	1-5KM Visual Fault Locator with FC-LC Adapter Fiber Optic Cable Tester Checker Test Tool for CATV	
14	FIBER OPTICS SPLICING MACHINE • Fiber type: single mode / multimode • Display: LCD monitor with touch screen • Fiber alignment method : Active core alignment • Interface: PC, USB, Bluetooth • Input: AC100 to 240V, 50/60Hz, Max. 1.5A • Output: DC14.4V, 6380mAh • Capacity :300 splice and heat cycles • Temperature: 0-40 C • Protection and heat performance sleeve • Illumination : V-grooves LED lamp • Splice mode : 100 splice modes • Heat mode : 30 heat modes • Splice result: 20000 splices • Splice image : 100 images • Splice time: SM FAST mode : Avg. 7 to 12sec. • Splice time: AUTO mode : Avg. 14 to 20sec • Fiber holder • DC Adapter • DC power cord • J-Plate • Automatic fusion control • Splicing machine box • Optical Fiber Tool kit • With all accessories and Operational Manual in English.	03
15	GPS Device	02
16	Optical Line Terminal (OLT)	05
17	Optical Network Unit (ONU)	05
18	Optical fiber Stripper	05
19	Optical fiber Cleaver	05
20	Optical Fiber Tool Kit Tools: Fiber Cable splitter Round cutter Alfa cutter Side cutter Plier Nose plier Sheath cutter	05

	Loose tube cutter Screw drivers	
21	PON meter	05
22	Cable locator	05
23	Optical Fiber Identifier 0.25/0.9/2.0/3.0 mm Optic Dominant Traffic Detector Multi in one Chucks with 800-1700nm Cable Tester Indicate the signal presence or absence(Live or dark fiber) Power Source: Battery power	05

3. Basic Telecommunication Lab:

Sr. No.	Name of Item with Specifications	Qty
1.	Analogue & Digital Communications Training System , Covering: <u>Basic Analog Communications:</u> AM, FM, DSB, SSB, PM, PAM, TDM, PWM, Superheterodyne, Speech in Comms, PLL, QAM, SNR Concepts and more <u>Digital Communications:</u> PCM, PCM-TDM, ASK, BPSK, FSK, GFSK, Eye Patterns, DPSK, QPSK, Spread Spectrum, Line Coding, Noise Generation, SNR Concepts and more	10
2	Screwdriver Set (Precision)	10
3	Rework Station	10
4	PCB Holder/Clamp	
5	Magnifying Lamp with LED Light	10
6	Wire Stripper and Cutter	10
7	Suction Pen	10
8	Brush Set	10
9	Desoldering Pump	10
10	Hot Glue Gun	10
11	Mobile Repair Tool Kit ESD mat with wrist strap Air gun hot plate USB Tester Repair insulation pad cleaning agent screw driver set 100-in-1 interchangeable precise manual tool set.	10

	With all accessories and Operational Manual in English.	
12	Ultrasonic Cleaner	10
13	Battery Analyzer and Tester	02
14	Microscope with Camera	02
15	UV Lamp	02
16	Heat Gun	02
17	Mobile Phone Flashing Box/Tool Kit	02
18	LCD Tester (Universal)	02
19	BGA Rework Station	02
20	Replacement Screens and Batteries	05
21	Multiplexer Trainer Perform FDM,TDM CDM	05
22	Lab View Simulator	01
23	Mobile Training Kit Dual band 900 / 1800 MHz GSM / GPRS Modem. Data, SMS, Voice. Onboard RS-232 & USB connector for PC Communication. 20 Membrane keys with multifunctional operation. GLCD 128x64 for display. On board RTC with independent battery backup. Onboard Mic and Speaker interface. SMA antenna connector with antenna. Sliding / fixed landing SIM holder (3.3V/5V SIM interf.) Remote control by AT commands (according to GSM 07.07 and GSM 07.05) Maximum output power 2W for GSM 900: 1W for GSM 1800. Bare board Tested Glass Epoxy SMOBC PCB is used. In-Built SMPS of 12V/2A. With all accessories and Operational Manual in English.	10
24	AutoCAD	1
25	MS Visio	1
26	Proteus	1
27	CST	1
28	Electronic workbench	1
29	Packet tracer simulator	1
30	DSL Modem	05
31	DSL/IP TV modem	05
32	Routers	05
33	Network cards	10

34	Biometric machines	02
35	Fingerprint recognition system	02
36	RFID System	02
37	QR code scanner	02
38	Bar code scanner	02
39	PABX Equipment	02
40	Complaint management System Robocall software	01
41	Cordless phones	05
42	Walkie-Talkie sets/handset	05
43	Video surveillance Equipment	05
44	Wi-Fi routers	05
45	Satellite Dish Antenna with all accessories	02
46	Telephone set	10
50	Guided medium demonstration kits	05
51	Telephone Cable and Drop Wire Construction Kit	05
52	Wi-Fi System installation kit Crimping tool for RJ11, RJ12, RJ45 RJ45 Punch down tool	05
59	Fault injection/detection equipment	05
60	PABX fault repair equipment	02
61	Underground cable fault repair tools (TDR)	05
62	Cisco Network assistant tool	02
63	Camera Analog	02
64	Camera IP (4MP)	02
65	Camera PTZ (4MP)	02
66	Camera Dome (4MP)	02
67	Camera Bullet (4MP)	02
68	DVR/NVR 8 channel with all accessories	02
69	Mobile phone Screen Splitter(separator) Compatible for cellphone screen size: 14 inch Temperature: 300-400 C Power: 600w; Input: 110V-250V 50 / 60HZ; Hot plate Built-in vacuum pump temperature controller With all accessories and Operational Manual in English.	10
70	Hot air station Power consumption: Wind gun 480W Welding table 90W Screen split 600W Temperature range: Wind gun 100-480 °C Welding table 200-480 °C	10

	Screen split 50-150°C Type of airflow: Brushless fan, gentle wind. Air flow: 120 litres per cent (max.) With all accessories and Operational Manual in English.	
71	Universal Battery Checker Tester with Leads LCD Display Compatibility a. 1.2V Ni-MH Cylindrical Batteries: AAAA, AAA, AA, A, C, SC, D b. 1.4V Zinc air battery: A10, A13, A312, A675 c. 1.5V alkaline cylindrical batteries: AAA, AA, C, SC, D d. 1.5V alkaline button cell e. 3.0V lithium manganese button cell f. 3.0V lithium manganese column battery: CR123A, CR2 g. 6.0V lithium manganese battery pack: 2CR5, CR-P2 h. 3.2V lithium iron phosphate battery i. 3.7V lithium-ion battery j. 9.0V alkaline battery k. 12.0V alkaline batteries: 23A, 27A With all accessories and Operational Manual in English.	10
72	Cable Testers	05
73	Desktop computers As per MIS TEVTA	25