

DAE ELECTRONICS TECHNOLOGY

(Equipments / Instruments required for Up-gradation of Labs for 50 Students)

Basic Electronics Lab

Sr. No.	Name of Item with brief Specifications	Quantity
1.	Portable Type Multirange Ammeter AC/DC Current Range 60-120-300-600 mA. -1.2-3-6A Class of accuracy 1 % Scale length 120 mm to 135 mm Frequency 40...60 ... 100 Hz Mirror under-lay, Moving iron type with delicate hair like spring provided with conical edge and jewel. Along with standard Accessories and operational manual in English.	05
2.	Portable Type Multirange Voltmeter AC/DC Voltage Range 3-6-12-30 V Class of accuracy 0.5 % Scale length 120 mm to 135 mm Frequency 40...60 400 Hz Mirror under-lay, Moving iron type with delicate hair like spring provided with conical edge and jewel. Along with standard Accessories and operational manual in English.	05
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4.	Portable Type Multirange Electrodynamic Power Meter (Three Phase) Class of accuracy 1 % Scale length 120 mm to 135 mm Scale linear calibrated AC/DC current ranges 5A/10A/20A AC/DC Voltage ranges 12-24-120-240-360-480 V Mirror under-lay, Electrodynamic movement delicate hair like spring provided with conical edge and jewel. Along with standard Accessories and operational manual in English.	05
5.	Portable Type Multirange Electrodynamic Power Meter (Singe Phase) Class of accuracy 0.5 % Scale length 120 mm to 135 mm Scale linear calibrated AC/DC current ranges 0.5-1-2.5-5 A AC/DC Voltage ranges 12-24-48-120-240-480 V Mirror under-lay, Electrodynamic movement with delicate hair like spring provided with conical edge and jewel. Along with standard Accessories and operational manual in English.	05
6.	Portable Type Multirange Frequency Meter (Moving coil movement) Class of accuracy 0.5 % Scale length 120 mm to 135 mm Scale linear calibrated AC Voltage ranges 115-230-400-500 V Measuring ranges 25-125 Hz, 45-65 Hz, 100-500 Hz Mirror under lay, Sensitive moving-coil movement is made with delicate hair like spring provided with conical edge and jewel. Along with standard Accessories and operational manual in English.	05
7.	MULTIMETER (Analog)	25

	• AC/DC voltage • DC current • Resistance up to 20MΩ • Transistor check • Audible continuity • Fuse protection on all ranges • hFE and dB measurement Specifications DC Voltage Ranges : 0 to 1000V, $\pm 3\%$FSD, in different steps AC Voltage Ranges : 0 to 1000V, $\pm 4\%$FSD, in different steps DC Current Ranges : 0 to 250 mA $\pm 3\%$FSD, in different steps and provided with 10 A terminal Resistance Ranges : 0-20MΩ, $\pm 3\%$FSD Transistor Test : NPN, PNP and Polarity Test Accessories : Test leads and instructional manual	
8.	Multi meter Digital 3-1/2digit 4000 count LCD Display Auto power off (Enable or Disable) DCV 400mV to 1000V ACV 400mV to 1000V DCA 400μA to 10A ACA 400μA to 10A Resistance 400Ω to 40 MΩ Capacitance nF upto 1000μF Frequency 50 Hz to 1MHz With all accessories and Operational Manual in English.	15
9.	Portable Type Zeroing Galvanometer Class of accuracy : 0.5 according to EN 6051 Scale length : 120 mm to 135 mm Scale : Linear calibration Current constant [A/division] : 1×10^{-7}, 5×10^{-7}, 1×10^{-6}, 5×10^{-6} Internal resistance [Ω] : 1000-1920-1080-240 External Limit resistance : 16500 Ω Response Time : 4 sec Mirror under lay, Sensitive moving-coil movement is made with taut-band bearing, wire should be protected by dampers With all accessories and Operational Manual in English.	05
10.	OSCILLOSCOPE • VERT mode triggering • X-Y switching • ALT/CHOP switching • Auto triggering signal selection • DC to 20MHz (-3dB) 5mV/div. To 5V/div. To 5V/div • 150mm rectangular CRT • TV triggering • CH1 output • 1kHz $\pm 3\%$, 1V $\pm 3\%$ calibration output Specifications Bandwidth : 20MHz Acceleration potential : Approx. 2kV Operation modes : CH1, CH2, ADD, ALT, CHOP Deflection factor : 5mV/div to 5V/div : 20MHz 1mV/div, 2mV/div : 5MHz	10

	No. of channels : 2 channel Input impedance : $1M\Omega \pm 2\%$, Approx. 23pF Max. sweep speed : 0.5 μ s/div Trigger source : VERT, CH1, CH2, LINE, EXT With all accessories and Operational Manual in English.	
11.	SWEEP FUNCTION GENERATOR WITH COUNTER 0.01Hz to 5MHz in 8 steps frequency, symmetry, sweep, DC offset and amplitude function Built-in 50Mhz frequency counter Out put Frequency : 0.01Hz to 5MHz, 8 Ranges Waveforms : Sine, Triangle, Square, Ramp, Pulse, TTL Amplitude : 10V _{p-p} @50 Ω Display Display Mode : 6 digits of Seven-Segment LED Sweep Mode : Linear Frequency Counter Mode : Internal /External Range : from HZ to 50MHz Time Base : 10MHz With all accessories and Operational Manual in English.	05
12.	Digital Frequency Counter Frequency Range: 1 Hz to 1.2 GHz Period Range: 10ns to 1s Double Channel With all accessories and Operational Manual in English.	05
13.	Digital Regulated DC Power Supply (Dual) Output Voltage 0 ~ 30 V (Variable) Output Current 0 ~ 3 A (Variable) Fixed V/A 5V/3A With short circuit protection. With all accessories and Operational Manual in English.	05
14.	Multi output Digital Regulated DC Power Supply (Triple output, Tracking System) Outputs: Double output: 0 to 30V, 0 to 5A Single output: 0 to 60V, 0 to 5A Single output: 0 to 30V, 0 to 10A Fixed output: 5V/3A With short Circuit protection. With all accessories and Operational Manual in English.	05
15.	Dual regulated DC Power Supply Input Voltage: 220VAC $\pm 10\%$, 50 Hz ± 2 Hz Output Voltage: 0~ 30 V x 2 Output Current 0~ 5A x 2 Output polarity : Positive and Negative Voltage regulation: $\leq 5 \times 10^{-5}$ mV ,CC 5×10^{-5} mV. load regulation: $\leq 5 \times 10^{-5}$ mV ,CC 5×10^{-5} mV. Ripple & Noise: CV < 0.5 mV rms, CC < 2mA rms Protection: Current limiting Voltage Indication Accuracy: LCD $\pm 1\%$ + 2 Digits Current Indication Accuracy: LCD $\pm 2\%$ + 2 digits With all accessories and Operational /Instruction Manual in English.	05
16.	Battery Charger Input 230 V, 50 Hz Output: 12V, 8 to 10 A, with over current protection. Fitted with Voltmeter and Ampere meter.	03

	With all accessories and Operational Manual in English.	
17.	Battery Hydrometer Range: 1.16 to 1.30 pH With all accessories and Operational Manual in English.	03
18.	Lead Acid Battery 12 V, 140 AH	03
19.	WHEATSTONE BRIDGE (PORTABLE) Range: 1Ω to $10M\Omega \pm$ Built in power source and galvanometer	10
20.	RHEOSTATE 1 to 1000 ohm, 0.57A	20
21.	Bar Magnet & Horse Shoe Magnet 4 to 6 inches.	10 each
22.	Compass Diameter 2 to 4 cm.	10
23.	Step Down Transformer Input 220V Out put 6,12 V Current 5A	10 each
24.	Transformer Winding Machine Manuel with counter, Portable with cast iron body.	02
25.	Soldering Iron 40 watt, 230 volt With non oxidizing bit and wooden/ Taffelon/ Backolite handle	50
26.	Solder Sucker Metal Body, pumping size 150 mm	20
27.	Soldering Gun 60W, 220/230 V Switchable Instant heating	10
28.	Soldering and Desoldering Station. Soldering and Desoldering station equipped with a temperature controlled heating element and an impulse pump supplying an electronically regulated high temperature air flow. Temp. adjusted : 100C to 400 C in step range Air flow Regulator : 0.2 to 4.2 liter /min Input : 240V, 50 Hz Output : 24V, 80 Watt Accessories supplied : 1.5 – 2.5 mm dia. nozzle, 4mm slot and heat shrink deflector 10 mm dia. , a hot air hand piece and a holder. With all accessories and Operational Manual in English.	05
29.	Bread Board Standard 1400 to 2000 tie points, through holes should be silver plated	25
30.	OVER HEAD PROJECTOR Type: Transmissive & Table Top Aperture: 250mm x 250mm Lens: 3 Element Lens Focal length: 295mm Fresnel Lens: Glare free fresnel lens Lamp watt: 24V 250 watt Hi Fi Optical image system Dual lamp system Cooling system With screen 60" x 60" with tripod stand With all accessories and Operational Manual in English.	01
31.	Function Generator	10

	• 0.01Hz to 10MHz in 8 steps • Frequency, symmetry, sweep, DC offset and amplitude function • Built-in 50Mhz frequency counter • AM, FM and Ext. Modulation Output Frequency : 0.01Hz to 10MHz, 8 Ranges Waveforms : Sine, Triangle, Square, Ramp, Pulse, TTL Amplitude : not less than 10V_{p-p}@50Ω Offset : not more than +/- 10V(OC) Display Display Mode : 6 digits of Seven-Segment LED Modulation : FM/AM Sweep Mode : Linear Frequency Counter Mode : Internal /External Range : 5Hz~50MHz Time Base : 10MHz With all accessories and Operational Manual in English.	
32.	AF OSCILLATOR • Frequency range 10Hz ~ 1MHz (5 ranges) • Frequency accuracy ± (5% + 1Hz) • Output voltage : sine wave 7V_{rms} (open circuit), square wave 10V_{p-p} (open circuit) • Distortion 0.1% • Output impedance 600Ω • External sync 1/V_{rms} minimum With all accessories and Operational Manual in English.	05
33.	RF SIGNAL GENERATOR • Up to 1GHz • 1kHz stability • FM modulation • RS 232 Specifications • Up to 1000MHz frequency range • 1kHz stability, +/-2ppm frequency stability • -127dBm to +7dBm amplitude, 0.1dB steps • FM modulation, internal or external • 80 character back-lit LCD display • Keyboard and rotary encoder control • RS232 interface standard. With all accessories and Operational Manual in English.	05
34.	Blower Electric Motor ¼ or 1/3 H.P. Single Phase 230V /50 Hz Portable Plastic Body with Handle. Provision of sucker and blower. 1200/1300 rpm. With all accessories and Operational Manual in English.	02
35.	Electric Drill Machine Cordless drill machine with 10mm, 3 jaws chuck supplied with rechargeable Nickel Cadmium battery pack, charging unit, chuck key and driver bits 2 speed and reversible. With all accessories and Operational Manual in English.	02
36.	Air Conditioners 2 Ton, Split Type With all accessories and Operational Manual in English and with installation.	02
37.	ANALOG TRAINER	05

	Specifications • Relevant DC & AC power supplies • AC power source 230 V, 50 Hz • Function generator a. Sine, Triangle and square waveform output b. Frequency range: 1Hz-100KHz in 5 decades c. With fine adjust, Amplitude and DC offset control d. Clock output 1Hz-100KHz in 5 decades • Breadboards with 1400 to 2000 tie points, through holes should be silver plated • 1K, 10 K and 100Kohm potentiometers With all accessories and Instructional and Student Manuals in English.	
38.	Basic Electricity & Electronics Trainer Curriculum Coverage: • Resistance • Resistor networks • Resistors in series & parallel • Superposition theorem • Thevenin's Theorem • Power • Capacitance • Capacitors in series and parallel • Time constant. • Electromagnetic induction • Inductance • RMS value of and ac waveform • Resistance in ac circuits • Capacitance in ac circuits. • Inductance in ac circuits • Capacitive reactance. • Inductive reactance • The series CR circuit • The series LR circuit • Impedance of a series CR circuit • Impedance of series LR circuit • Impedance of a series LCR circuit • Parallel impedances • Power in ac circuits • Series resonance • Parallel resonance • The Transformer • The semiconductors diode • Half wave rectification • Full wave rectification • The Zener diode • Transistor familiarization • The common emitter transistor circuit • The Silicon controlled rectifier (SCR) • The TRIAC • Trigger devices – the DIAC and UJT • The field effect transistor With built in relevant power supplies and relevant hardware for above mentioned practical and with Instructional and Student Manuals in English	05
39.	Power Supply Trainer <i>Experimental Capabilities :-</i> (a) Rectification Rectifier & Transformer Measurement of Voltages.	05

	(b) Capacitor filters, Voltage and Current Waveforms with or without reservoir capacitor Factors effecting ripple voltage. (c) Voltage doublers Half wave voltage doubler and Full wave voltage doubler (d) Simple voltage stabilisers Zener diode stabiliser characteristics Measurement of Ro, regulation and efficiency. (e) Circuit protection Current limiting, Current fold-back, Over-voltage protection by "crowbar" (f) Variable dc supplies Variable of regulated output, Regulation measurement, Performance of a Feedback regulator. (g) Integrated circuit voltage regulator Regulator operation, Observation of thermal shutdown (h) Inverters and Converters (i) Switch-mode regulator Observing a switching waveform, Measurement, Calculation of output voltage, Efficiency, Switching frequency. With built in relevant power supplies and relevant hardware for above mentioned practical and with Instructional and Student Manuals in English																
40.	<table><tr><td>All-In-One (AIO) Computer Core i7 12th Generation 27 inch</td></tr><tr><td>Display: 27" diagonal FHD display, 1920 x 1080 resolution, IPS, three-sided micro-edge, BrightView, 250 nits, 72% NTSC</td></tr><tr><td>Processor: 12th Gen Intel Core i7-1255U processor, 10 cores, up to 4.70 GHz with Intel Turbo Boost Technology, 12 MB L3 cache</td></tr><tr><td>Memory and Storage: 16 GB DDR4-3200 MHz RAM, 1 TB PCIe NVMe SSD</td></tr><tr><td>Graphics: Integrated Intel Iris Xe Graphics</td></tr><tr><td>Ports:</td></tr><tr><td>1 SuperSpeed USB Type-A 5Gbps signaling rate</td></tr><tr><td>2 M.2 (1 for SSD, 1 for WLAN)</td></tr><tr><td>Integrated 10/100/1000 GbE LAN</td></tr><tr><td>Realtek 802.11a/b/g/n/ac (1x1) Wi-Fi and Bluetooth 4.2 combo</td></tr><tr><td>Webcam: HP True Vision 720p FHD IR privacy camera with integrated dual array digital microphones</td></tr><tr><td>Operating System: Windows 10 Home 64 or Windows 11 Pro</td></tr><tr><td>Accessories:</td></tr><tr><td>HP 225 White Wired Keyboard and Mouse Combo</td></tr><tr><td>Power adapter (65W Smart AC or 90W Smart AC)</td></tr></table>	All-In-One (AIO) Computer Core i7 12th Generation 27 inch	Display: 27" diagonal FHD display, 1920 x 1080 resolution, IPS, three-sided micro-edge, BrightView, 250 nits, 72% NTSC	Processor: 12th Gen Intel Core i7-1255U processor, 10 cores, up to 4.70 GHz with Intel Turbo Boost Technology, 12 MB L3 cache	Memory and Storage: 16 GB DDR4-3200 MHz RAM, 1 TB PCIe NVMe SSD	Graphics: Integrated Intel Iris Xe Graphics	Ports:	1 SuperSpeed USB Type-A 5Gbps signaling rate	2 M.2 (1 for SSD, 1 for WLAN)	Integrated 10/100/1000 GbE LAN	Realtek 802.11a/b/g/n/ac (1x1) Wi-Fi and Bluetooth 4.2 combo	Webcam: HP True Vision 720p FHD IR privacy camera with integrated dual array digital microphones	Operating System: Windows 10 Home 64 or Windows 11 Pro	Accessories:	HP 225 White Wired Keyboard and Mouse Combo	Power adapter (65W Smart AC or 90W Smart AC)	5
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41.	<table><tr><td>WiFi 6 Router</td></tr><tr><td>Type: Wireless Broadband Router</td></tr><tr><td>WiFi Standard: WiFi 6 (802.11ax)</td></tr><tr><td>Frequency Bands: Dual-Band (2.4 GHz and 5 GHz)</td></tr><tr><td>Number of Antennas: Minimum 4 external antennas</td></tr><tr><td>WiFi Speed: Up to 1500 Mbps (2.4 GHz) and up to 2400 Mbps (5 GHz)</td></tr><tr><td>LAN Ports: 4 Gigabit Ethernet ports</td></tr><tr><td>WAN Port: 1 Gigabit Ethernet port</td></tr></table>	WiFi 6 Router	Type: Wireless Broadband Router	WiFi Standard: WiFi 6 (802.11ax)	Frequency Bands: Dual-Band (2.4 GHz and 5 GHz)	Number of Antennas: Minimum 4 external antennas	WiFi Speed: Up to 1500 Mbps (2.4 GHz) and up to 2400 Mbps (5 GHz)	LAN Ports: 4 Gigabit Ethernet ports	WAN Port: 1 Gigabit Ethernet port	5							
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	Processor: Minimum 1.5 GHz dual-core processor Memory: Minimum 512 MB RAM and 128 MB flash memory Security: WPA3 encryption, built-in firewall with Stateful Packet Inspection (SPI) Software: User-friendly web interface for configuration and management, compatible with SNMP and TR-069	
42.	Switch Type: Managed Gigabit Ethernet Switch Number of Ports: 8-24 Gigabit Ethernet ports Port Speed: 10/100/1000 Mbps Switching Capacity: Up to 48 Gbps Forwarding Rate: Up to 35.7 Mpps MAC Address Table: Up to 8,000 MAC addresses Buffer Memory: Up to 4.1 MB Power Supply: Internal power supply, 100-240V AC Power Consumption: Up to 20W Dimensions: Up to 440 x 240 x 44 mm Weight: Up to 2.5 kg Operating Temperature: 0°C to 40°C Storage Temperature: -20°C to 60°C Humidity: Up to 80% non-condensing Software: User-friendly web interface for configuration and management, compatible with SNMP and RMON	5
43.	Wi-Fi Range Extender Type: Dual-Band Wi-Fi 6 Range Extender Wi-Fi Technology: 802.11ax (Wi-Fi 6) dual-band (2.4GHz + 5GHz) Wi-Fi Speed: AX3000 (up to 3Gbps combined speed) Bands: 2.4GHz (574Mbps) + 5GHz (2402Mbps) Wi-Fi Coverage: Extends coverage up to 2,500 sq. ft. Compatibility: Works with any Wi-Fi router, gateway, or access point OneMesh Support: Compatible with TP-Link OneMesh routers for seamless whole-home mesh coverage MU-MIMO: Multi-User MIMO technology for simultaneous data transmission to multiple devices Gigabit Ethernet Port: 1 x Gigabit port for high-speed wired connections	5
44.	Wireless USB Adapter Type: USB wireless adapter WiFi Standard: WiFi 6 (802.11ax) Frequency Bands: Dual-Band (2.4 GHz and 5 GHz) WiFi Speed: Up to 2402 Mbps (5 GHz) + 574 Mbps (2.4 GHz) Interface: USB 3.0 Operating System Compatibility: Windows 11/10, Linux Antenna: 6dBi adjustable external WiFi antenna Security: WPA3 encryption Dimensions: Up to 80 x 26 x 12 mm	5

	Weight: Up to 50g	
45.	Splicing Machine Type: Core alignment fusion splicer Splicing Method: Core alignment Fiber Types: Single-mode, multimode, and specialty fibers Splicing Time: Approximately 9 seconds (smokeless mode) Splicing Loss: Typically 0.02 dB (SM fiber) Tension Test: Up to 10 N (2.2 lbf) Heater: High-precision, high-stability heater Display: 4.3-inch color LCD display Power Supply: AC 100-240V, DC 12V Dimensions: 260 x 120 x 65 mm (10.2 x 4.7 x 2.6 in) Weight: Approximately 3.5 kg (7.7 lbs) Operating Temperature: 0°C to 40°C (32°F to 104°F) Operating Humidity: 10% to 90% RH (non-condensing) Storage Temperature: -20°C to 60°C (-4°F to 140°F) Storage Humidity: 10% to 90% RH (non-condensing)	5
46.	Optical Time Domain Reflectometer (OTDR) General Specifications Type: Handheld OTDR with Visual Fault Locator (VFL), Light Source, Power Meter, and Smart Network Analysis Protection Class: IP65 Weight: Approximately 2.5 kg (5.5 lbs) Dimensions: 260 x 120 x 65 mm (10.2 x 4.7 x 2.6 in) OTDR Specifications Wavelengths: 1310 nm, 1550 nm, 1625 nm Dynamic Range: Up to 40 dB Resolution: Up to 0.1 m Pulse Width: 3 ns to 10 µs Sampling Resolution: Up to 0.01 m Measurement Range: Up to 200 km Visual Fault Locator (VFL) Specifications Wavelength: 650 nm Power: Up to 10 mW Continuous Wave (CW) Mode: Yes Light Source Specifications Wavelengths: 1310 nm, 1550 nm Power: Up to 0 dBm Stability: ±0.5 dB Power Meter Specifications Wavelengths: 800 nm to 1700 nm	5

	Power Range: -50 dBm to +10 dBm	
	Accuracy: $\pm 5\%$	
	Smart Network Analysis	
	Event Map: Yes	
	Loss Map: Yes	
	ORL (Optical Return Loss) Measurement: Yes	
	Battery and Power	
	Battery Type: Rechargeable Li-ion battery	
	Battery Life: Up to 8 hours	
	Power Supply: AC 100-240V, DC 12V	
47.	Pliers Combination, side cutter, long nose, flat nose, insulation remover Insulated handle 1000 Volt. L/6in	25 each
48.	Tweezers 6",9" rounded grooved tip stainless steel body	10 each
49.	Needle File Set. Length of files = 160 mm. Each File has different cross section such as hard, square, three square, half round, round, wording (flat) & Knife with cutting face 28 teeth per cm, provided in a plastic wallet.	25
50.	Steel Foot rule Length 12" high grade rust less steel rule, with permanent marking in easy to read figures.	10
51.	Persain screw driver 06 pices watch maker type	10
52.	Wire gauge Standard Japan	10
53.	Screw Driver Kit Set of 9 pices consist of three Philip type, three Flat type, Two nut driver and one poker with plastic handle housed in a plastic body.	10
54.	Diagonal Cutter , insulated handle 1000 Volt. L/6in	10
55.	Screw Driver Flat Type , Size 4 in. Tip 1/4 in.	20
56.	Screw Driver Flat Type , Size 6 in. Tip 1/8 in.	20
57.	Screw Driver Philips Type , Size 4 in. Tip 1/4 in.	20
58.	Screw Driver Philips Type , Size 6 in. Tip 1/8 in.	20
59.	Table Lamp with magnifying glass and Florescent Tube , Lens 124 mm	10

Advance Electronics Lab

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6.	Multi meter Digital 3-1/2digit 4000 count LCD Display Auto power off (Enable or Disable) DCV 400mV to 1000V ACV 400mV to 1000V DCA 400μA to 10A	15

	ACA 400 μ A to 10A Resistance 400 Ω to 40 M Ω Capacitance nF up to 1000 μ F Frequency 50 Hz to 1MHz With all accessories and Operational Manual in English.	
7.	Energy Meter (Single Phase) Range: 0~ 10 A, 250 V, 50 Hz 360/400 Rev/kWh, Accuracy: $\pm 5\%$	05
8.	Portable Type Zeroing Galvanometer Class of accuracy 0.5 according to EN 6051 Scale length 120 mm to 135 mm Scale Linear calibration Current constant [A/division] 1×10^{-7} , 5×10^{-7} , 1×10^{-6} , 5×10^{-6} Internal resistance [Ω] 1000-1920-1080-240 External Limit resistance 16500 Ω Response Time 4 sec Mirror under lay, Sensitive moving-coil movement is made with taut-band bearing, wire should be protected by dampers With all accessories and Operational Manual in English.	05
9.	SOUND LEVEL METER • 35 ~ 130dB Range • ± 1.5 dB Accuracy • A/C waiting • Fast/Slow Response • Max Hold Function • AC/DC output • Reset Function • Back screw hole for tripod connection Specifications Resolution : 0.1 dB Frequency Range : 31.5 Hz to 8KHz Accuracy : ± 1.5 dB Frequency Weighting : A,C Calibration : With Calibrator Accessories : Operational Manual in English, 9V Battery, Carrying Case, Screwdriver, Windscreen With all accessories and Operational Manual in English.	10
10.	Digital Lux Meter • Accurate Visible Compensation Filter $\text{f}1$ is Used • Cosine Response : 0.1 mV/Counts • Highly accurate $\text{f}1$ Compensation • MAX/Data Hold Function • Backlit LCD Display Specifications Photometric Formulas : 10,764 : footcandies = 1 Lux (lumens/meter ²) Ranges : 20Lux, 200Lux, 2,000Lux, 20,000Lux, 200,000Lux Resolution : 0.01Lux Acceptance angle : $\text{f}2 < 2\%$ cosine corrected (150°) Accessories : Test leads, soft carrying case and owners manual. With all accessories and Operational Manual in English.	05
11.	AC/DC DIGITAL CLAMP METERS	05

	• Peak Power : Measurable modulate power in operation of SSB mode. • Accuracy : Linear Characteristics assure accurate measuring over entire frequency range. • Low Insertion Loss : Less than 0.2 dB. Specifications Frequency Range : 1.8 ~ 520MHz Measurable Power Range : 0 ~ 200w Power Range : 4w/20w/200w Power Measurement Accuracy : 4w Range $\pm 10\%$ (on full scale) 20w Range $\pm 5\%$ (on full scale) 200w Range $\pm 5\%$ (on full scale) Minimum Power for SWR Measurement : 4w SWR Measurement : 1.0 ~ ∞ Insertion Loss : Less than 0.3dB Input/Output impedance : 50 ohms Along with standard Accessories and operational manual in English.	
15.	POWER FACTOR METER ELECTRODYNAMIC MOVEMENT Class of accuracy : 2.5% ~ of 90 degrees Scale length : 120 -135 mm Scale : directly in $\cos \phi$ and ϕ AC Voltage ranges : 5-10 A Measuring ranges : 150-300-450 AC V Factor $\cos \phi$: i. 0.2-1-0.8 c. Mirror under lay, cross-coiled ferrodynamic movement with spring bearings and oil damping. Three phase AC. Make USA/ Europe. Along with standard Accessories and operational manual in English.	05
16.	DIGITAL LCR METER (Bench Type) • Dual display, 20,000/1,000 counts • Auto/manual ranging • Measurement parameters: R.L.C.D.Q. θ • Test Frequency: 100/120/1K/10KHz selectable • Parallel/Serial test mode • Relative mode • Self calibration • Static recording (Max/Min/Avg) • Tolerance mode (1%, 5%, 10%, 20%) • External DC power operation • Auto power off • Low battery indicator • Backlit Specifications Ranging Mode : Auto & manual Ranging Test frequency : 100/120/1K/10KHz Resistance Range : 20Ω~20MΩ Resolution : 0.001Ω~0.001MΩ Capacitance Range : 2000pF~20mF Resolution : 0.1pF~0.001mF Inductance Range : 2mH~2000H	10

	Resolution : 0.1 μ H~0.1H Dissipation factor : .000~999 Auto Quality factor : .000~999 Auto measurement : $\pm 90^\circ$ Tolerance mode : 1%, 5%, 10%, 20% RS-232 interface : standard With all accessories and Operational Manual in English.	
17.	OSCILLOSCOPE • FIX triggering • VERT mode triggering • X-Y switching • ALT/CHOP switching • Auto triggering signal selection • DC to 40MHz (-3dB) 5mV/div. To 5V/div. To 5V/div • 150mm rectangular CRT • TV triggering • CH1 output • 1kHz $\pm 3\%$, 1V $\pm 3\%$ calibration output Specifications Bandwidth : 40MHz Operation modes : CH1, CH2, ADD, ALT, CHOP Deflection factor : 5mV/div to 5V/div : 20MHz 1mV/div, 2mV/div : 5MHz No. of channels : 2 channel Input impedance : 1M Ω $\pm 2\%$, Approx. 23pF Max. sweep speed : 0.5 μ s/div Trigger source : VERT, CH1, CH2, LINE, EXT With all accessories and Operational Manual in English.	10
18.	SWEEP FUNCTION GENERATOR WITH COUNTER 0.01Hz to 5MHz in 8 steps frequency, symmetry, sweep, DC offset and amplitude function Built-in 50Mhz frequency counter Out put Frequency : 0.01Hz to 5MHz, 8 Ranges Waveforms : Sine, Triangle, Square, Ramp, Pulse, TTL Amplitude : 10V _{p-p} @50 Ω Display Display Mode : 6 digits of Seven-Segment LED Sweep Mode : Linear Frequency Counter Mode : Internal /External Range : from HZ to 50MHz Time Base : 10MHz With all accessories and Operational Manual in English.	05
19.	Digital Frequency Counter Frequency Range: 1 Hz to 1.2 GHz Period Range: 10ns to 1s Double Channel With all accessories and Operational Manual in English.	05
20.	Digital Regulated DC Power Supply (Dual) Output Voltage 0 ~ 30 V (Variable) Output Current 0 ~ 3 A (Variable) Fixed V/A 5V/3A With short circuit protection.	05

	With all accessories and Operational Manual in English.	
21.	Multi output Digital Regulated DC Power Supply (Triple output, Tracking System) Outputs: Double output: 0 to 30V, 0 to 5A Single output: 0 to 60V, 0 to 5A Single output: 0 to 30V, 0 to 10A Fixed output: 5V/3A With short Circuit protection. With all accessories and Operational Manual in English.	05
22.	Dual regulated DC Power Supply Input Voltage: 220VAC $\pm 10\%$, 50 Hz ± 2 Hz Output Voltage: 0~ 30 V x 2 Output Current 0~ 5A x 2 Output polarity : Positive and Negative Voltage regulation: $\leq 5 \times 10^{-5}$ mV, CC 5×10^{-5} mV. load regulation: $\leq 5 \times 10^{-5}$ mV, CC 5×10^{-5} mV. Ripple & Noise: CV < 0.5 mV rms, CC < 2mA rms Protection: Current limiting Voltage Indication Accuracy: LCD $\pm 1\%$ + 2 Digits Current Indication Accuracy: LCD $\pm 2\%$ + 2 digits With all accessories and Operational /Instruction Manual in English.	05
23.	DIGITAL LOGIC PROBE Function: TTL/DTL/CMOS Compatibility With all accessories and Operational /Instruction Manual in English.	25
24.	DIGITAL LOGIC PULSER Function: Pulse (1Hz~16MHz): Power Supply (4.5~18VDC) With all accessories and Operational /Instruction Manual in English.	25
25.	Soldering Iron 40 watt, 230 volt With non oxidizing bit and wooden/ Taffelon/ Backolite handle	50
26.	Solder Sucker Metal Body, pumping size 150 mm	10
27.	Soldering Gun 60W, 220/230 V Switchable Instant heating	10
28.	Soldering and Desoldering Station. Soldering and Desoldering station equipped with a temperature controlled heating element and an impulse pump supplying an electronically regulated high temperature air flow. Temp. adjusted : 100C to 400 C in step range Air flow Regulator : 0.2 to 4.2 liter /min Input : 240V, 50 Hz Output : 24V, 80 Watt Accessories supplied : 1.5 – 2.5 mm dia. nozzle, 4mm slot and heat shrink deflector 10 mm dia. , a hot air hand piece and a holder. With all accessories and Operational Manual in English.	05
29.	Bread Board Standard 1400 to 2000 tie points, through holes should be silver plated	50
30.	OVER HEAD PROJECTOR Type: Transmissive & Table Top Aperture: 250mm x 250mm Lens: 3 Element Lens Focal length: 295mm	01

	Fresnel Lens: Glare free fresnel lens Lamp watt: 24V 250 watt Hi Fi Optical image system Dual lamp system Cooling system With screen 60" x 60" with tripod stand With all accessories and Operational Manual in English.	
31.	IC Tester (Digital) • Easy-operating Tester, particularly be designed for the Digital IC • Supported Device : 74 / 40 45 41 / 44 Serial • Small, portable, light ad power-saving, usable with batteries • Average search time : about 1 second • display : 16 characters in 1 line LCD • Test Pins : 14 to 24 pins Accessories 1. Main unit 2. Operation manual	05
32.	IC Tester (Linear) • Easy-operating Tester, particularly be designed for the Linear IC (OP-Amp, Comparator, Special Function Device, Transistor Array) • Small, portable, light ad power-saving, usable with batteries • Average search time : 0.8 second • display : 16 characters in 1 line • Test Pins : 8 to 16 pins • Tester voltage : +/-5V • Equipped with empty-load test, and function of Auto Power Off Accessories Main unit DC 9V / 500mA power adaptor Operation manual	05
33.	FUNCTION GENERATOR • 0.01Hz to 15MHz in 8 steps • Frequency, symmetry, sweep, DC offset and amplitude function • Built-in 50Mhz frequency counter Out put Frequency : 0.01Hz to 15MHz, 8 Ranges Waveforms : Sine, Triangle, Square, Ramp, Pulse, TTL Amplitude : 10V _{p-p} @50Ω Display Display Mode : 6 digits of Seven-Segment LED Modulation : FM/AM Frequency Counter Mode : Internal /External Range : 5Hz~50MHz Time Base : 10MHz With all accessories and Operational Manual in English.	05
34.	AF OSCILLATOR • Frequency range 10Hz ~ 1MHz (5 ranges) • Frequency accuracy ± (5% + 1Hz)	05

	• Output voltage : sine wave 7Vrms (open circuit), square wave 10V_{p-p} (open circuit) • Distortion 0.1% • Output impedance 600Ω • External sync 1/Vrms minimum With all accessories and Operational Manual in English.	
35.	RF SIGNAL GENERATOR • Up to 1GHz • 1kHz stability • FM modulation • RS 232 Specifications • Up to 1000MHz frequency range • 1kHz stability, +/-2ppm frequency stability • -127dBm to +7dBm amplitude, 0.1dB steps • FM modulation, internal or external • 80 character back-lit LCD display • Keyboard and rotary encoder control • RS232 interface standard. With all accessories and Operational Manual in English.	05
36.	Curve Tracer Semi Conductor/Bench Type Specifications Collector Drain Sweep Voltage Frequency : 120Hz or 100Hz (2 line frequency) Voltage : 5 to 200V, in different steps, accuracy ±10% (or continuously variable) Sweep waveform : Full wave rectified Current : 500 mA maximum Current Limiter : 1kΩ for low level transistor 100Ω for power transistor <u>Step generator</u> Number of Steps : 7 or more External Bias : one curve display Polarity Switch : Three modes of Operation - NPN, PNP, DIODE. <u>General</u> Power Supply : 230V/ 50 Hz With all accessories and Operational Manual in English.	05
37.	Blower Electric Motor ¼ or 1/3 H.P. Single Phase 230V /50 Hz Portable Plastic Body with Handle. Provision of sucker and blower. 1200/1300 rpm. With all accessories and Operational Manual in English.	02
38.	Electric Drill Machine Cordless drill machine with 10mm, 3 jaws chuck supplied with rechargeable Nickel Cadmium battery pack, charging unit, chuck key and driver bits 2 speed and reversible. With all accessories and Operational Manual in English.	02
39.	Multi-Media Native XGA resolution: clear, full screen detail Built-in Audio:3-watt integrated audio system Sharp: 4500 Max ANSI lumens Lenz: 4 optical lenses Optical Focus Range: 1.5 ~ 8.9 m With all accessories and Operational Manual in English.	01

40.	Electrical Machine Trainer <i>Experimental Capability:</i> <u>Single Phase Cage Motor</u> Demonstrating: • No Capacitor • Capacitor starting • Capacitor start, capacitor run • 2 value capacitor start and run • Changing rotational direction in each case <u>Shaded Pole Induction Motor</u> Demonstrating: • Starting & Running <u>Synchronous Motor</u> Demonstrating: • Starting & Running • Reversal of rotation • Star & delta connection <u>Direct Current Motor</u> Demonstrating: • Starting & Running • Series Configuration • Shunt Configuration • Compound Configuration • Reversal of rotation in each of the above. <u>Single Phase Alternator</u> Demonstrating: • Generation of an AC voltage <u>Split Phase Cage Motor</u> Demonstration • Starting & running • Reversal of rotation <u>Three Phase Cage Motor</u> Demonstration • Starting & running • Reversal of rotation • Star connections • Delta connections <u>Slipring Motor</u> Demonstration • Starting & running • Reversal of rotation • Star & Delta connections <u>Universal Motor</u> Demonstration • Starting & running on AC & DC Supplies • Series configuration • Shunt configuration • Reversal of rotation <u>Eddy Current Brake</u> This provides a load for motors & measures the speed of rotation, as well as torque readout in Newton meters. The following plug-in component modules must be supplied: Ammeter(x2); Voltmeter(x2); Load resistor(250watt,50 ohm with 20, 30 & 40 ohm taps);Lamp module(3x100watt, 230volts); Double pole double throw (DPDT) switch; Multimeter. The plug-in modules attach to the VHI matrix via 4x chrome spring-load pins.	02
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	The electrical machines must constructed from a variety of components, including endshields, stators, rotors, brushgear, mechanical brake assembly, centrifugal switch step, clamping set, assembly bolt/nut set, coupling set, allen keys. A set of stackable silicon banana plug connecting leads and comprehensive user/experimental manual must be supplies.	
41.	TACHOMETER (Digital) • 5 Digits LCD display • Light reflex measurement • Range from 10.00 to 99,999 RPM • Measuring distance 50 to 300mm • Event counter elapsed time • Max/Min/Hold : True average • Auto range RPM • Optical measurement & contact Measurement • Event counter (0 ~ 99,999) • RS-232 interface • Contact RPM and circumferential velocity measurement in one simple adaptor General Specification Battery : Four 1.5 V battery (AA, UM3) Time Base : 4,000MHz quartz crystal Operating temperature : 0 °C ~ 50°C (32°F~122°F) Reflective light : Red LED With all accessories and operational manual in English.	02
42.	Micro Phone Electrodynamic type (moving coil / ribbon type) & Capacitor type.	10
43.	Loud Speaker 8 Ω, 20 w size : dia. 8 inch	10
44.	Digital Telephone Exchange Maximum Capacity: 6 Cos, 24 Extensions (16:Hybrid 8: SLT) Intercom Paths: 4 Dialling Method: External: Tone/Pulse (10pps,20pps) Internal: Tone/Pulse (10pps,20pps) Dialling Conversion: Tone to pulse, or pulse to tone Connection: CO Line : Modular Jack (2-wire) Intercom: Modular Jack (4-wire) Paging: Conductor Jack External Music: Conductor Jack SMDR: RS-232C I/F Port (9 pin D-SUB) SMDR: Detail Recording: Date, Time, Extension Number, CO Line Number, Dialling Number, Call Duration, Account Code, Caller ID Voice Mail Ports: 2 Ports (APT or DTMF) DTMF Receiver: 2 DTMF Generator: 1 CO-CO Transfer path: 2 Power Failure Trasfer Ports: 1 Power Consumption: 45 W	01
45.	Telephone Set TIP (Digital)	30
46.	Facsimile(Fax Machine) Compatibility: ITU-T G3	01

	Paper Handling: A4/Letter Scanning speed: 208mm Resolution: Standard/fine/super fine/ photo Half tone: 64level Modem Speed: 9.6kbps with a automatic fallback Transmission Speed: Appox. 12 sec/page Compression System: MH,MR Document Memory: 28 pages Print method: Thermal transfer on plain paper Print Speed: 4PPM With all accessories and Operational Manual in English.																																					
47.	Logic Analyzer Specifications <table><tr><td>Timing Analysis</td><td>250MHz</td></tr><tr><td>State Analysis</td><td>200MHz</td></tr><tr><td>Bandwidth</td><td>200MHz</td></tr><tr><td>Channels</td><td>32CH</td></tr><tr><td>RAM Size</td><td>2M Bytes</td></tr><tr><td>Storage Depth per Channel</td><td>512K bits x 32CH</td></tr><tr><td>Maximum Input Voltage</td><td>±15V</td></tr><tr><td>Threshold Range</td><td>-4V~+4V</td></tr><tr><td>Data Skew (Channel to Channel)</td><td>4ns typical (±4ns Max)</td></tr><tr><td>Trigger Condition</td><td>Pattern / Edge / AND / OR</td></tr><tr><td>Trigger Counter</td><td>1~255</td></tr><tr><td>Pulse Width Trigger</td><td>Yes</td></tr><tr><td>Glitch Capture</td><td>4ns</td></tr><tr><td>Communication</td><td>USB 2.0</td></tr><tr><td>Power Source</td><td>110V AC ~ 240V AC</td></tr><tr><td>Frequency Range</td><td>50 ~ 60Hz</td></tr><tr><td>Power Consumption</td><td>18W (20W Max).</td></tr><tr><td colspan="2">With all accessories and Operational Manual in English.</td></tr></table>	Timing Analysis	250MHz	State Analysis	200MHz	Bandwidth	200MHz	Channels	32CH	RAM Size	2M Bytes	Storage Depth per Channel	512K bits x 32CH	Maximum Input Voltage	±15V	Threshold Range	-4V~+4V	Data Skew (Channel to Channel)	4ns typical (±4ns Max)	Trigger Condition	Pattern / Edge / AND / OR	Trigger Counter	1~255	Pulse Width Trigger	Yes	Glitch Capture	4ns	Communication	USB 2.0	Power Source	110V AC ~ 240V AC	Frequency Range	50 ~ 60Hz	Power Consumption	18W (20W Max).	With all accessories and Operational Manual in English.		01
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With all accessories and Operational Manual in English.																																						
48.	Q METER Frequency Range : 15.5kHz to 50MHz in 7 bands Frequency Counter Accuracy : ± (0.01% + 1 count) Q Measurements Range : 5 to 750 in 7 ranges Accuracy : ± 10% f.s. <20MHz ΔQ Range : 0 to 75 in 5 ranges Tuning capacitance : 19 to 480pF, overall Residual inductance : Approx. 0.009μH Inductance Measurement : 0.1μH to 1H in 7 ranges Dimensions : Approx. 430W x 220 H x 300D mm With all accessories and Operational Manual in English.	02																																				
49.	X-Y Recorder 1-pen, A4 X-Y recorder, front input The slewing speed and acceleration of the 1-pen in the Y-axis is 2200 mm/s (86.6 in/sec) 7.6 G, and 2000 mm/s (78.7 in/sec) 5.1 G in the X-axis	01																																				

	Specifications Drive System: Automatic null-balancing DC servo mechanism Writing Area (Effective Writing System): Ink writing using disposable felt-tip pen cartridges Error Between Ranges: Less than $\pm 0.1\%$ of pen deflection Deadband: Less than 0.1% of effective recording span Slewing Speed (Nominal): X-axis 2000mm/s, Y-axis 2200 mm/s Acceleration (Nominal): One-pen: X-axis 5.1 G, Y-axis 7.6 G Pen Lift: All pens simultaneously lifted or lowered by PEN UP-DOWN switch on front panel, or by an external contact or TTL level signal Input Ranges: 50 $\mu\text{V/cm}$; 0.1, 0.25, 0.5, 1, 2.5, 5, 10, 25, 50 mV/cm; 0.1, 0.25, 0.5, 1, 2.5, 5 V/cm (16 calibrated ranges plus continuous vernier between ranges) Zero Set: Adjustable to any point on the writing area Input Impedance: Approx 1 MΩ constant on all input ranges Maximum Source Resistance: 10 kΩ Zero Stability (Nominal): $\pm(1.5 \mu\text{V} \pm 0.02\%$ of effective recording span)/$^{\circ}\text{C}$ Maximum Allowable Input Voltage (Continuous): 50 Vdc on 50 $\mu\text{V/cm}$ to 50 mV/cm ranges, or 250 Vdc on 0.1 V/cm to 5 V/cm ranges Common Mode Rejection: More than 140 dB at power line frequency or at DC Normal Mode Rejection: More than 50 dB Offset Input: Selectable to $\pm 20, 40, 60, 80, 100 \text{ cm}$ ($\pm 7.87, 15.7, 23.6, 31.5, 39.4 \text{ in}$) (10 ranges) or 0 (OFF) by front-panel dial With all accessories and Operational Manual in English.	
50.	Air Conditioners 2 Ton, Split Type With all accessories and Installation	02
51.	DIGITAL COLOR STORAGE OSCILLOSCOPE WITH USB PORT: Bandwidth: 60MHz Rise Time: $\leq 5.8\text{ns}$ Sample Rate (Real-Time): 1S/s~500MS/s Record Length (MAX): 1M Input Channels: Two Digital Channel Characteristics: Real Time: 500MS/s, Equivalent: 25 GS/s Trigger Type: Edge, Pulse, Video and Alternate Connectivity and Storage: Standard: USB Device, USB Host and RS-232C. Waveform Math and Analysis: Add, Subtract, Multiply, Divide,	02

	Reverse and FFT, Connect to PC for extended analysis Display: 64k, Full color LCD 320 x 240 LCD Size: Diagonal 145mm (5.7 inches) Standard Accessories: Probe x 2 (1x, 10x switchable) Power Cord and English Manual	
52.	ANALOG TRAINER Specifications • Relevant DC & AC power supplies • AC power source 230 V, 50 Hz • Function generator a. Sine, Triangle and square waveform output b. Frequency range: 1Hz-100KHz in 5 decades c. With fine adjust, Amplitude and DC offset control d. Clock output 1Hz-100KHz in 5 decades • Breadboards with 1400 to 2000 tie points, through holes should be silver plated • 1K, 10 K and 100Kohm potentiometers With all accessories and Instructional and Student Manuals in English.	05
53.	DIGITAL ELECTRONICS TRAINER Specifications • Relevant DC & AC power supplies • TTL/CMOS mode selection switch • Pulse generator a. Duty Cycle : 50% b. Frequency range : 1Hz-1MHz in 6 decade c. TTL or CMOS output mode • Breadboards with 1660 tie points • TWO digits of 7-segment LED display • One single-shot pulser output switches • Two logic output switches • 8-bit LED indicators with buffer • 8 HI/LO data output switches • modules to expand the units capability With all accessories and Instructional and Student Manuals in English.	05
54.	Amplifiers & Electronics Circuit Trainer Hardware suitable for conduct of following experiment with relevant power supply, Instructional and Student Manuals. Experimental Capabilities :- Using electronic amplifiers, dc Gain and ac Gain Amplitude Distortion, Frequency & Phase Distortion Negative Feedback, Frequency Response, The a.c Amplifiers The Operational Amplifier, Push-pull Amplifiers, Passive Attenuators Applications, Common-emitter Amplifier, Emitter Follower Complementary Push-pull, Amplifier, Differential Amplifier Operational Amplifier, Astable Multivibrator, Phase-Shift Oscillator The Schmitt Trigger, Voltage Regulator, TTL NAND Gate Exclusive-OR Gate, Set-Reset Flip Flop, D Flip Flop Clocked SR Flip Flop and J-K Flip Flop	05
55.	Opto Electronics Trainer Hardware suitable for conduct of following experiment with relevant power supply, Instructional and Student Manuals. Opto Electronics Trainer should be supplied as follows :- Light Emitters : Tungsten Lamp.	05

	LED's : Red, Green, Yellow, Bi-colour (red/green), Red, 3mm pair (2mA/standard). Photo Detectors : Photodiode, Phototransistor, Light-dependent Resistor (LDR). Optocouplers : Transistor output. Darlington output. Driver Modules : Type 741 Operational Amplifier, Flasher Module using Type 555 timer. Active & Passive : A range of transistors, diodes, capacitors and resistors. Components :- The range of practical work includes assignments covering the following topics, all of which are fully described in the accompanying manual: Light Emitter characteristics LED driving requirements LED's in Series & Parallel LED's in ac circuits Flasher circuits Photo-detection circuits Opto couplers Filament lamp characteristics	
56.	Operational Trainer Hardware suitable for conduct of following experiment with relevant power supply, Instructional and Student Manuals. Equipment discusses work in the following areas: * Operational Amplifier feedback & Slewing rate requirements * Frequency response, Input offset voltage * Common mode rejection ratio Experimental Capabilities :- Operational Amplifier characteristics, Adder or summing amplifier Inverting & non-inverting modes, dc voltage follower Open loop voltage gain, Differential dc amplifier Common mode rejection ratio (CMRR), Analogue integration and Sign changer or inverter differentiation, Scale changer Linear & Non-linear oscillators	05
57.	Virtual Instrument Unit Unit designed to provide the users with a complete set of virtual instruments. These run on the student's PC and provide two virtual multimeters, an oscilloscope with spectrum analyzer capability, a function generator, data logger and graph application. The windows-based software must be supplied with the unit provides the following on-screen, virtual instrumentation: Two built-in virtual multimeters, each providing: - Fully-separate meters with floating inputs 2mm socket connections - Digital or Analog meter display - Auto or manual range selection - AC and DC measurements - Voltage ranges 60V, 20V, 2V, 200mV - Current ranges 2A, 200mA, 20mA, 2mA, 200μA - Resistance ranges 20MΩ, 2MΩ, 200KΩ, 20kΩ, 2kΩ, 200Ω - Continuity range with audible buzzer - Diode test range - Overvoltage and overcurrent protection - Copy and paste of meter display - Realistic on-screen virtual instrument One built-in virtual oscilloscope, providing:	05

	• Two channels at up to 20MHz sampling rate • >1MHz -3dB input bandwidth • 1MΩ // 30pF input impedance • BNC sockets for standard x1 / x10 probes • DC, AC or GND input coupling • Voltage ranges 5mV/dvi to 20V/div • Invert and 1+2 modes • Timebase ranges 0.5μs/div to 1s/div • Timebase Off and X-Y display modes • Rollover mode on slow ranges • Trigger on Auto, Channel1, channel2 or External Trigger • Cursors for voltage, time and frequency measurement • Spectrum analyzer mode with linear or dB scaling • Storage and recall of waveforms on the PC • Copy and paste of scope display • Realistic on-screen virtual instrument One built-in virtual generator providing • Frequency range 0.2Hz to 2MHz • Sine, square and triangle output • Output impedance 50Ω • -20dB and -40dB attenuators • BNC socket connection • DC offset control • Realistic on-screen virtual instrument A virtual data logger providing: • Logging capability for multimeters and oscilloscope • Start/stop on time, trigger event or both • Instrument displays are active while logging • Optional audible indication • Launch grapher to display captured data with a single click A graph providing: • Full integration with the data logger • Display of graph separately or overlaid • Many built-in data processing functions • External data graphing capability Items supplied with the virtual instrument unit include: • 1 x Virtual instrument hardware • 1 x Software installation disk • 1 x Power supply adapter • 1 x USB connection cable • 2 x Oscilloscope probes (switchable x 1/x10) • 2 x Red 2mm-2mm multimeter leads • 2 x Black 2mm-2mm multimeter leads • 1 x Instructional and student manual.	
58.	All-In-One (AIO) Computer Core i7 12th Generation 27 inch Display: 27" diagonal FHD display, 1920 x 1080 resolution, IPS, three-sided micro-edge, BrightView, 250 nits, 72% NTSC Processor: 12th Gen Intel Core i7-1255U processor, 10 cores, up to 4.70 GHz with Intel Turbo Boost Technology, 12 MB L3 cache Memory and Storage: 16 GB DDR4-3200 MHz RAM, 1 TB PCIe NVMe SSD Graphics: Integrated Intel Iris Xe Graphics Ports:	5

	1 SuperSpeed USB Type-A 5Gbps signaling rate	
	2 M.2 (1 for SSD, 1 for WLAN)	
	Integrated 10/100/1000 GbE LAN	
	Realtek 802.11a/b/g/n/ac (1x1) Wi-Fi and Bluetooth 4.2 combo	
	Webcam: HP True Vision 720p FHD IR privacy camera with integrated dual array digital microphones	
	Operating System: Windows 10 Home 64 or Windows 11 Pro	
	Accessories:	
	HP 225 White Wired Keyboard and Mouse Combo	
	Power adapter (65W Smart AC or 90W Smart AC)	
59.	Chemical Safety Gloves Material: Nitrile or Latex Thickness: 0.5-1.0 mm Length: 24-30 cm Size: 8-10 (Medium-Large) Resistance: Chemical resistant, puncture resistant	25
60.	Chemical Safety Glasses Lens Material: Polycarbonate Frame Material: Plastic Lens Size: 50-60 mm Frame Size: Medium-Large Protection: Chemical splash protection, UV protection	25
61.	Soldering Iron Tips Type: Various shapes and sizes (e.g., conical, chisel, fine point) Material: Copper, Nickel, or Iron Size: 0.1-5.0 mm (diameter) Temperature Range: Up to 450°C	25
62.	Metal Soldering Iron Stand Material: Metal (e.g., steel, aluminum) Size: 10-15 cm (height), 5-10 cm (base diameter) Weight: 200-500 grams Temperature Resistance: Up to 450°C	25
63.	Third Hand for Soldering Type: Adjustable arm with clips or clamps Material: Metal (e.g., steel, aluminum) Size: 20-30 cm (height), 10-20 cm (base diameter) Weight: 500-1000 grams Adjustability: 360° rotation, adjustable arm length	5
64.	PCB Drilling bits Type: Twist drill bits, straight shank Material: High-Speed Steel (HSS) or Solid Carbide Size Range: 0.1-3.0 mm (diameter) Shank Diameter: 3-6 mm	

	Length: 30-60 mm	
65.	PCB Milling bits Type: End mills, ball nose or flat end Material: Solid Carbide or High-Speed Steel (HSS) Size Range: 0.1-6.0 mm (diameter) Shank Diameter: 3-10 mm Length: 30-100 mm	25
66.	Manual PCB Shear Cutter Type: Manual shear cutter with replaceable blades Material: High-quality steel Size: 20-30 cm (length), 5-10 cm (width) Weight: 500-1000 grams Cutting Capacity: Up to 1.6 mm thickness	5
67.	Multifunctional Wire Crimping Cutting Stripping Plier Type: Combination plier with crimping, cutting, and stripping functions Material: High-quality steel Size: 15-20 cm (length), 5-10 cm (width) Weight: 200-500 grams Crimping Range: 0.1-10.0 mm ² Cutting Capacity: Up to 2.0 mm diameter	5
68.	Adjustable PCB Clamp Holder Type: Adjustable clamp with rubber pads Material: Metal (e.g., steel, aluminum) Size: 10-20 cm (length), 5-10 cm (width) Weight: 200-500 grams Adjustability: 360° rotation, adjustable clamp width	5
69.	CNC PCB Solder Paste Dispensing Machine Type: Automated solder paste dispensing machine Dispensing System: Precision pump-based system Dispensing Accuracy: ±0.1 mm Paste Capacity: 10-30 cc PCB Size: Up to 400 x 300 mm Repeatability: ±0.05 mm Software: Compatible with Gerber, DXF, and other formats	5
70.	CNC PCB Pick-and-Place Machine Type: High-speed pick-and-place machine Placement Accuracy: ±0.05 mm Component Size: 0201-50x50 mm PCB Size: Up to 500 x 400 mm Placement Speed: Up to 30,000 cph Feeder Capacity: Up to 120 feeders Software: Compatible with Gerber, DXF, and other formats	5
71.	CNC PCB Reflow Oven Machine	5

	Type: High-temperature reflow oven	
	Temperature Range: 100-280°C	
	Temperature Accuracy: $\pm 1^{\circ}\text{C}$	
	PCB Size: Up to 400 x 300 mm	
	Heating Zones: 6-8 zones	
	Cooling System: Forced air cooling	
	Software: Compatible with Gerber, DXF, and other formats	
72.	CNC PCB Wave Soldering Machine	5
	Type: Automatic wave soldering machine	
	Solder Temperature: 230-280°C	
	Solder Wave Height: 1-5 mm	
	PCB Size: Up to 400 x 300 mm	
	Soldering Speed: Up to 2.5 m/min	
	Fluxer System: Automatic fluxer with adjustable spray nozzle	
	Software: Compatible with Gerber, DXF, and other formats	
73.	CNC PCB Milling and Drilling Machine	5
	Type: High-precision CNC milling and drilling machine	
	Spindle Speed: 10,000-30,000 rpm	
	Spindle Power: 1-3 kW	
	PCB Size: Up to 500 x 400 mm	
	Milling Accuracy: ± 0.01 mm	
	Drilling Accuracy: ± 0.01 mm	
	Software: Compatible with Gerber, DXF, and other formats	
74.	Bench Type PCB Drill Machine	5
	Type: Manual or semi-automatic drill press	
	Spindle Speed: 1,000-5,000 rpm	
	Drill Bit Capacity: Up to 3.0 mm diameter	
	PCB Size: Up to 300 x 200 mm	
	Drilling Accuracy: ± 0.1 mm	
	Safety Features: Emergency stop, drill bit guard	
75.	PCB Fabrication Kit	5
76.	Pliers Combination, side cutter, long nose, flat nose, insulation remover Insulated handle 1000 Volt. L/6in	10 each
77.	Tweezers 6",9" rounded grooved tip stainless steel body	10 each
78.	Needle File Set. Length of files= 160 mm. Each File has different cross section such as hard, square, three square, half round, round, wording (flat) & Knife with cutting face 28 teeth per cm, provided in a plastic wallet.	10
79.	Steel Foot rule Length 12" high grade rust less steel rule, with permanent marking in easy to read figures.	10
80.	Persain screw driver 06 pices watch maker type	10
81.	Wire gauge Standard Japan	10
82.	Screw Driver Kit	10

	Set of 9 pices consist of three Philip type, three Flat type, Two nut driver and one poker with plastic handle housed in a plastic body.	
83.	Diagonal Cutter , insulated handle 1000 Volt. L/6in	10
84.	Screw Driver Flat Type , Size 4 in. Tip 1/4 in.	20
85.	Screw Driver Flat Type , Size 6 in. Tip 1/8 in.	20
86.	Screw Driver Philips Type , Size 4 in. Tip 1/4 in.	20
87.	Screw Driver Philips Type , Size 6 in. Tip 1/8 in.	20
88.	Table Lamp with magnifying glass and Florescent Tube , Lens 124 mm	10
89.	Analog Communication Trainer Curriculum Objectives - To understand the basic theory of analog communication system - Design and implementation ability training of analog modulator and demodulator. - To understand the applications of analog modulator and demodulator. Curriculum Outline - Design and implementation of second order active filters and RF oscillators. - Design ad implementation of AM and FM modulator and demodulator. - Design and implementation of DCB-SC and SSB modulator and demodulator. - Design and implementation of TDM ad FDM multiplexer and demultiplexer. - Design and implementation of frequency converter and signal recovery circuits. Second Order Active Filters Experiment 1 : Second Order Active Low-pass Filter (Low-Pass –3 dB Frequency : 1 kHz ~ 3 kHz.) Experiment 2 : Second Order Active High-pass Filter (High-pass –3 dB Frequency : 5kHz ~ 10 kHz.) Experiment 3 : Second Order Active Bandpass Filter (Center Frequency : 10 kHz ~ 100 kHz, Bandwidth : 6 kHz ~ 60 kHz.) Experiment 4 : Second Order Active Bandstop Filter (Cutoff Frequency : 10 kHz ~ 100 kHz, Bandwidth : 6 kHz ~ 60 kHz.) RF Oscillators Experiment 1 : Colpitts Oscillator (Oscillation Frequency : 1 MHz ~ 9 MHz.) Experiment 2 : Hartley Oscillator (Oscillation Frequency : 500 kHz ~ 1.8 MHz.) Experiment 3 : Crystal Oscillator (Oscillation Frequency : 500 kHz ~ 1.8 MHz.) Experiment 4 : Voltage Controlled oscillator (Oscillation Frequency : 3.5 MHz ~ 4 MHz.) AM Modulator Experiment 1 : Transistor AM Modulator (Carrier Signal : 1.5 kHz ~ 2 kHz, Audio Signal : 500 Hz ~ 1 kHz.) Experiment 2 : MC 1496 AM Modulator (Carrier Signal : 1.5 kHz ~ 1 kHz, Audio Signal : 500 Hz ~ 1 kHz.) AM Demodulator Experiment 1 : AM Diode Detector (Carrier Signal : 300 kHz, Audio Signal : 500 Hz ~ 2kHz.) Experiment 2 : AM Product Detector (Carrier Signal : 500 kHz ~ 1 MHz, Audio Signal : 500 Hz ~ 1 kHz.) DSB-SC and SSB Modulator Experiment 1 : DSB-SC Modulator (Carrier Signal : 100 kHz ~ 500 kHz, Audio Signal : 500 Hz ~ 1 kHz.) Experiment 2 : SSB Modulator (Carrier Signal : 200 kHz, Audio Signal : 500 Hz ~ 1 kHz.) DSB-SC ad SSB Demodulator Experiment 1 : DSB-SC Product Detector (Carrier Signal : 100 kHz ~ 500 kHz,	05

	Audio Signal : 500 Hz ~ 1 kHz.) Experiment 2 : SSB Product Detector (Carrier Signal : 200 kHz, Audio Signal : 500 Hz ~ 1 kHz.) FM Modulator Experiment 1 : MC4046 FM Modulator (Carrier Signal : 20 kHz, Audio Signal : 1 kHz.) Experiment 2 : LM566 FM Modulator (Carrier Signal : 20 kHz, Audio Signal : 500 Hz ~ 700 Hz.) FM Demodulator Experiment 1 : MC4046 FM Demodulator (Carrier Signal : 20 kHz, Audio Signal : 1 kHz.) Experiment 2 : LM565 FM Demodulator (Carrier Signal : 20 kHz, Audio Signal : 500 Hz ~ 700 kHz.) TDM Multiplexer Experiment 1 : Waveform Generator (Sine Wave Signal Generator : 13 kHz, Triangle Wave Signal Generator : 2.3 kHz, Square Wave Signal Generator : 2.3 kHz.) Experiment 2 : TDM Multiplexer (Transmission Channels : 3 Channels, Switching Time : 500 ms ~ 50 ms.) TDM Demultiplexer Experiment 1 : TDM Demultiplexer (Transmission Channels : 3 Channels, Switching Time : 500ms ~ 50 ms.) TDM Multiplexer Experiment 1 : FDM Signal Generator (Carrier Signal : 500 kHz ~ 1.5 MHz, Audio Signal : 500 Hz ~ 1.5 kHz.) Experiment 2 : DSB-SC Modulated Signal Generator (Carrier Signal : 500 kHz ~ 1.5 MHz, Audio Signal : 500 Hz ~ 1.5 kHz.) Experiment 3 : FDM Multiplexer (Modulation Type: DSB-SC Signal, Transmission Bandwidth : 2MHz.) TDM Demultiplexer Experiment 1 : FDM Demultiplexer (Modulation Type : DSB-Sc Signal, Demultiplexing Type : Product Demultiplexer.) Analog-to-digital Converter Experiment 1 : ADC0804 Analog-to-digital Converter (Resolution : 8 bits, Analog Input Voltage : 0 V ~ 5 V.) Experiment 2 : ADC0809 Analog-to-digital Converter (Resolution : 8 bits, Analog Input Voltage : 0 V ~ 5 V, Clock Frequency : 120 kHz.) Digital-to-analog Converter Experiment 1 : R-2R Digital-to-analog Converter (Digital Input : 4 bits, Analog Output : 0 V ~ 5 V.) Experiment 2 : Unipolar DAC 0800 Digital-to-analog Converter (Digital Input : 8 bits, Analog Output: 0 V ~ 5 V, Step Value : 0.019 V.) Experiment 3 : Bipolar DAC 0800 Digital-to-analog Converter (Digital Input : 8 bits, Analog Output: -5 V ~ 5 V, Step Value : 0.038 V.) Frequency Converter Experiment 1 : Frequency Multiplier (Carrier Signal : 10 kHz.) Experiment 2 : Up/Down Frequency Converter (Carrier Signal @ LO port : 100 kHz; Carrier Signal @ RF port : 120 kHz.)	
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	Signal Recovery Experiment 1 : Carrier Signal Recovery Circuit (Carrier Signal : 10 kHz.) Experiment 2 : Clock Recovery Circuit (Clock Signal : TTL, Encoded Signal : Manchester, Clock Frequency : 5 kHz ~ 10 kHz.)	
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Applied Electronics Lab.

Sr. No.	Name of Item with brief Specifications	Quantity
90.	Portable Type Multirange Frequency Meter Class of accuracy 0.5 % Scale length 120 mm to 135 mm Scale linear calibrated AC Voltage ranges 115-230-400-500 V Measuring ranges 25-125 Hz, 45-65 Hz, 100-500 Hz Mirror under lay, Sensitive moving-coil movement is made with taut-band bearing, wires should be protected by dampers	05
91.	MULTIMETER (Analog) - AC/DC voltage - DC current - Resistance up to 20MΩ - Transistor check - Audible continuity - Fuse protection on all ranges - hFE and dB measurement Specifications DC Voltage Ranges : 0 to 1000V, $\pm 3\%$ FSD, in different steps AC Voltage Ranges : 0 to 1000V, $\pm 4\%$ FSD, in different steps DC Current Ranges : 0 to 250 mA $\pm 3\%$ FSD, in different steps and provided with 10 A terminal Resistance Ranges : 0-20M Ω , $\pm 3\%$ FSD Transistor Test : NPN, PNP and Polarity Test Accessories : Test leads and instructional manual	25
92.	Multi meter Digital 3-1/2digit 4000 count LCD Display Auto power off (Enable or Disable) DCV 400mV to 1000V ACV 400mV to 1000V DCA 400 μ A to 10A ACA 400 μ A to 10A Resistance 400 Ω to 40 M Ω Capacitance nF upto 1000 μ F Frequency 50 Hz to 1MHz With all accessories and Operational Manual in English.	10
93.	AC/DC DIGITAL CLAMP METERS Features - Relevant Measurement Items are Displayed while Current and Voltage Measurements. - Connectable to Oscilloscopes or Recorders.	05

	Input/Output impedance : 50 ohms Input/Output Connection Plugs : SO ~ 239 With all accessories and Operational Manual in English.	
95.	POWER FACTOR METER Portable Type Multi-range Power Factor Meter (Single Phase) Class of accuracy 1.5 ~ of 90 degrees Scale length 120 to 135 mm Scale directly in $\cos \phi$ and ϕ AC Voltage ranges 5-10 A Measuring ranges 150-300-450 AC V Factor $\cos \phi$ i. 0.2-1-0.8 c. Mirror under lay, cross-coiled ferrodynamic movement with spring bearings and oil damping. Make USA/Europe. With all accessories and operational Manual in English	05
96.	Digital Multimeter dual display bench type 50000 counts dual display True RMS (AC, AC+DC) Frequency measurement to 500kHz Resistance measurement from 500 ohm to 50M ohm dBm measurements with variable reference impedance from 2 ohm - 8000 ohm Dynamic recording (Min/Max) Measurement rate selectable Data Hold RS-232 DCV 500mV-1000V ACV 500mV-1000V DCA 500uA-20A ACA 500uA-20A dBm 0.2dBm Resistance 500 Ω -50M Ω Frequency 500Hz-500kHz With all accessories and Operational Manual in English.	05
97.	Digital Regulated DC Power Supply (Dual) Output Voltage 0 ~ 30 V (Variable) Output Current 0 ~ 3 A (Variable) Fixed V/A 5V/3A With short circuit protection. With all accessories and Operational Manual in English.	05
98.	Multi output Digital Regulated DC Power Supply (Triple output, Tracking System) Outputs: Double output: 0 to 30V, 0 to 5A Single output: 0 to 60V, 0 to 5A Single output: 0 to 30V, 0 to 10A Fixed output: 5V/3A With short Circuit protection. With all accessories and Operational Manual in English.	05
99.	Dual regulated DC Power Supply Input Voltage: 220VAC $\pm 10\%$, 50 Hz ± 2 Hz Output Voltage: 0~ 30 V x 2 Output Current 0~ 5A x 2 Output polarity : Positive and Negative Voltage regulation: $\leq 5 \times 10^{-5}$ mV ,CC 5×10^{-5} mV. load regulation: $\leq 5 \times 10^{-5}$ mV ,CC 5×10^{-5} mV. Ripple & Noise: CV < 0.5 mV rms, CC < 2mA rms Protection: Current limiting Voltage Indication Accuracy: LCD $\pm 1\%$ + 2 Digits Current Indication Accuracy: LCD $\pm 2\%$ + 2 digits With all accessories and Operational /Instruction Manual in English.	05

100.	Soldering Iron 25 watt, 230 volt With non oxidizing bit and wooden/ Taffelon/ Backolite handle	50
101.	Solder Sucker Metal Body, pumping size 150 mm	20
102.	Soldering Gun 60W, 220/230 V Switchable Instant heating	10
103.	Soldering and Desoldering Station. Soldering and Desoldering station equipped with a temperature controlled heating element and an impulse pump supplying an electronically regulated high temperature air flow. Temp. adjusted : 100C to 400 C in step range Air flow Regulator : 0.2 to 4.2 liter /min Input : 240V, 50 Hz Output : 24V, 80 Watt Accessories supplied : 1.5 – 2.5 mm dia. nozzle, 4mm slot and heat shrink deflector 10 mm dia. , a hot air hand piece and a holder. With all accessories and Operational Manual in English.	05
104.	Bread Board Standard 1400 to 2000 tie points, through holes should be silver plated	50
105.	Digital Microprocessor controlled Soldering Station: Electro Static Discharge Safe Temperature Lock facility Iron stand with Compartment for tip cleaner mat Zero voltage switching, for reduce power noise interference Transient voltage suppressor, to protect electronic circuits Ceramic heater with an insulated resistance of over 300M at a temperature 400°C and excellent isolating transformer 24VAC Temperature Range: 175°C to 500°C (347°F to 932°F) Power Consumption: 60W Output Voltage: AC24V Ceramic Heater: AC24V 50W Grounding Potential: <2mV Grounding Resistance: <2Ω Complete with Stand and standard accessories.	02
106.	COLOR BAR PATTERN GENERATOR (PAL) • 1000 TV Line Monoscope pattern, with eight standard patterns, switchable. • RGB output and Y/C isolated output • H sweep and Pulse-bar signal • RF output With all accessories and Operational Manual in English.	05
107.	CRT HIGH VOLTAGE TEST PROBE • DC 40KV • 600MΩ Impedance • 25KV ±2%, 40KV ±3% • T.C. 200 ppm/°C • Positive Polarity only • Resolution 1KV • Need not power Specification Input impedance (20 ±5°C, RH < 80%) 600MΩ Maximum operation voltage 40KV DC Polarity Positive only Display Analog indicate Accuracy Factory calibrator 25KV ±2%	05

	FULL scale 40KV $\pm 3\%$ Temperature Coefficient $\leq 200\text{ppm} / ^\circ\text{C}$ Maximum loading Current $\leq 70\mu\text{A}$ Maximum loading power $\leq 3\text{watt}$ Voltage Range 40KV / 1 Range Voltage resolution 1KV With all accessories and Operational Manual in English.	
108.	IC Tester (Digital) • Easy-operating Tester, particularly be designed for the Digital IC • Supported Device : 74 / 40 45 41 / 44 Serial • Small, portable, light and power-saving, usable with batteries • Average search time : about 1 second • display : 16 characters in 1 line LCD • Test Pins : 14 to 24 pins Accessories 3. Main unit 4. Operation manual	05
109.	IC Tester (Linear) • Easy-operating Tester, particularly be designed for the Linear IC (OP-Amp, Comparator, Special Function Device, Transistor Array) • Small, portable, light and power-saving, usable with batteries • Average search time : 0.8 second • display : 16 characters in 1 line • Test Pins : 8 to 16 pins • Tester voltage : $\pm 5\text{V}$ • Equipped with empty-load test, and function of Auto Power Off Accessories Main unit DC 9V / 500mA power adaptor Operation manual	05
110.	FUNCTION GENERATOR • 0.01Hz to 15MHz in 8 steps • Frequency, symmetry, sweep, DC offset and amplitude function • Built-in 50Mhz frequency counter Out put Frequency : 0.01Hz to 15MHz, 8 Ranges Waveforms : Sine, Triangle, Square, Ramp, Pulse, TTL Amplitude : $10\text{V}_{\text{p-p}}@50\Omega$ Display Display Mode : 6 digits of Seven-Segment LED Modulation : FM/AM Frequency Counter Mode : Internal /External Range : 5Hz~50MHz Time Base : 10MHz With all accessories and Operational Manual in English.	10
111.	AF OSCILLATOR • Frequency range 10Hz ~ 1MHz (5 ranges) • Frequency accuracy $\pm (5\% + 1\text{Hz})$ • Output voltage : sine wave 7Vrms (open circuit), square wave $10\text{V}_{\text{p-p}}$ (open circuit)	05

	• Distortion 0.1% • Output impedance 600Ω • External sync 1/V rms minimum With all accessories and Operational Manual in English.	
112.	Blower Electric Motor ¼ or 1/3 H.P. Single Phase 230V /50 Hz Portable Plastic Body with Handle. Provision of sucker and blower. 1200/1300 rpm. With all accessories and Operational Manual in English.	02
113.	Color TV 20 / 21 in (Flat Screen) RF System: D/K, I, BG Colour System: PAL, SECAM, NTSC 3.58/4.43 Channel Frequencies: VHF L 48.25 to 168.25 MHz VHF H 175.25 to 463.25 MHz UHF 471.25 to 855.25 MHz Provided with Tele Text decoder Antenna input impedance: 75 ohm Power input: Ac 130 to 260 V 50/60 Hz with standard plug useable in Pakistan With : Remote Control Schematic diagram in English Service Manual in English	10
114.	CCTV Consist of color camera with composite video out / PAL (BG) system, Camera Stand and inter connection cables and 2 colour monitor size 20/ 21 inch. With all accessories and Operational Manual in English.	02
115.	Video Camera With all accessories and Operational Manual in English.	02
116.	Video Recording Light 1000 W with cooling system.	02
117.	Chip Extractor	10
118.	Electric Drill Machine Cordless drill machine with 10mm, 3 jaws chuck supplied with rechargeable Nickel Cadmium battery pack, charging unit, chuck key and driver bits 2 speed and reversible. With all accessories and Operational Manual in English.	02
119.	Digital Satellite Receiver Free-to-Air DiSEq version 1.0 and 0/12V switching. Symbol rate: 1~45Mbps Tele-Text support Front panel: 4 Digital Display Antenna Positioning Help menu RS 232 port for software Upgrading through PC Auto FEC, PID, detection & Manual entry of PID value. RF signal (PAL,B/G,,I,D/K,NTSCM) 2000 channel Memory with 31 satellites Data Memory capability. <i>C-Band LNB Specifications</i> Input Frequency: 3.4 ~ 4.2GHz Output Frequency: 950-1750MHz LO Frequency: 5.15GHz Stability: ±2MHz Polarity: Switched H&V Conversion Gain: 65 db (TYP) Noise Figure : 13K Gain Flatness: ±0.75db/36MHz Image Rejection : 45 db Output Impedance: 75 Ohms Output V.S.W.R: 2.5:1 Operating Temperature: -30 ~ +60C Humidity: 0 ~100 %	02

	DC Supply Voltage : 10~13.5V(v). 15~25V(H) Current : 140mA RF Input Connector: Wave Guide WC-229 IF Output Connector: TYPE 'F' FEMALE KU-BAND LNB Input Frequency: 10.7-12.75GHz L/O Frequency: 9.75/10.6GHz Output frequency: 950-2150MHz Model: R10V (40mm) Dish: 10feet Fiber With all accessories and Operational Manual in English.																						
120.	Video Tape Recorder PAL, SECAM, NTSC playback VHS system. Portable battery operated. With all accessories and Operational Manual in English.	02																					
121.	GRID DIP METER Frequency range 1.5MHz to 250MHz in 6 bands as follows:- <table> <tr> <th>Band</th><th>Range</th><th>Colour Code</th></tr> <tr> <td>A</td><td>1.5MHz 59 4MHz</td><td>Red</td></tr> <tr> <td>B</td><td>3.3MHz 8 MHz</td><td>Orange</td></tr> <tr> <td>C</td><td>6.8MHz 18 MHz</td><td>Yellow</td></tr> <tr> <td>D</td><td>18MHz 45 MHz</td><td>Green</td></tr> <tr> <td>E</td><td>45MHz 110 MHz</td><td>Blue</td></tr> <tr> <td>F</td><td>100MHz 250 MHz</td><td>Violet</td></tr> </table> With all accessories and Operational Manual in English.	Band	Range	Colour Code	A	1.5MHz 59 4MHz	Red	B	3.3MHz 8 MHz	Orange	C	6.8MHz 18 MHz	Yellow	D	18MHz 45 MHz	Green	E	45MHz 110 MHz	Blue	F	100MHz 250 MHz	Violet	02
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122.	I.F.T. Alignment tool kit With all accessories and Operational Manual in English.	02																					
123.	TACHOMETER (Digital) • 5 Digits LCD display • Light reflex measurement • Range from 10.00 to 99,999 RPM • Measuring distance 50 to 300mm • Event counter elapsed time • Max/Min/Hold : True average • Auto range RPM • Optical measurement & contact Measurement • Event counter (0 ~ 99,999) • RS-232 interface • Contact RPM and circumferential velocity measurement in one simple adaptor General Specification Battery : Four 1.5 V battery (AA, UM3) Time Base : 4,000MHz quartz crystal Operating temperature : 0 °C ~ 50°C (32°F~122°F) Reflective light : Red LED Accessories : Carrying case x 1, reflective tape x 1 Instruction manual x 1, (Software& RS-232 cable) With all accessories and Operational Manual in English.	02																					
124.	Spectrum Analyzer: Frequency Range: 150KHz to 1.3GHz, Resolution bandwidth of 280KHz or 15KHz, -93dbm typical noise floor at -20dBm reference level, Fully adjustable center frequency and span in 1KHz steps, Zero span mode with AM and FM audio demodulation, Sweep modes of normal, single, peak hold and average, Twin markers with readout of absolute & difference values, Smart marker movement with	01																					

	selectable peak tracking, Unlimited storage for waveforms, set-ups and screens, Data transfer to PC for analysis, documentation or printing. With all accessories and Operational Manual in English.																																					
125.	Logic Analyzer Specifications <table><tr><td>Timing Analysis</td><td>250MHz</td></tr><tr><td>State Analysis</td><td>200MHz</td></tr><tr><td>Bandwidth</td><td>200MHz</td></tr><tr><td>Channels</td><td>32CH</td></tr><tr><td>RAM Size</td><td>2M Bytes</td></tr><tr><td>Storage Depth per Channel</td><td>512K bits x 32CH</td></tr><tr><td>Maximum Input Voltage</td><td>±15V</td></tr><tr><td>Threshold Range</td><td>-4V~+4V</td></tr><tr><td>Data Skew (Channel to Channel)</td><td>4ns typical (±4ns Max)</td></tr><tr><td>Trigger Condition</td><td>Pattern / Edge / AND / OR</td></tr><tr><td>Trigger Counter</td><td>1~255</td></tr><tr><td>Pulse Width Trigger</td><td>Yes</td></tr><tr><td>Glitch Capture</td><td>4ns</td></tr><tr><td>Communication</td><td>USB 2.0</td></tr><tr><td>Power Source</td><td>110V AC ~ 240V AC</td></tr><tr><td>Frequency Range</td><td>50 ~ 60Hz</td></tr><tr><td>Power Consumption</td><td>18W (20W Max).</td></tr><tr><td colspan="2">With all accessories and operational manual in English</td></tr></table>	Timing Analysis	250MHz	State Analysis	200MHz	Bandwidth	200MHz	Channels	32CH	RAM Size	2M Bytes	Storage Depth per Channel	512K bits x 32CH	Maximum Input Voltage	±15V	Threshold Range	-4V~+4V	Data Skew (Channel to Channel)	4ns typical (±4ns Max)	Trigger Condition	Pattern / Edge / AND / OR	Trigger Counter	1~255	Pulse Width Trigger	Yes	Glitch Capture	4ns	Communication	USB 2.0	Power Source	110V AC ~ 240V AC	Frequency Range	50 ~ 60Hz	Power Consumption	18W (20W Max).	With all accessories and operational manual in English		02
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With all accessories and operational manual in English																																						
126.	X-Y Recorder 1-pen, A4 X-Y recorder, front input The slewing speed and acceleration of the 1-pen in the Y-axis is 2200 mm/s (86.6 in/sec) 7.6 G, and 2000 mm/s (78.7 in/sec) 5.1 G in the X-axis Specifications Drive System: Automatic null-balancing DC servo mechanism Writing Area (Effective) Writing System: Ink writing using disposable felt-tip pen cartridges Error Between Ranges: Less than ±0.1% of pen deflection Deadband: Less than 0.1% of effective recording span Slewing Speed (Nominal): X-axis 2000mm/s, Y-axis 2200 mm/s Acceleration (Nominal): One-pen: X-axis 5.1 G, Y-axis 7.6 G Pen Lift: All pens simultaneously lifted or lowered by PEN UP-DOWN switch on front panel, or by an external contact or TTL level signal Input Ranges: 50 μV/cm; 0.1, 0.25, 0.5, 1, 2.5, 5, 10, 25, 50 mV/cm; 0.1, 0.25, 0.5, 1, 2.5, 5 V/cm (16 calibrated ranges plus continuous vernier between ranges) Zero Set: Adjustable to any point on the writing area Input Impedance: Approx 1 MΩ constant on all input ranges Maximum Source Resistance: 10 kΩ	01																																				

	Zero Stability (Nominal): $\pm(1.5 \mu\text{V} \pm 0.02\% \text{ of effective recording span})/^{\circ}\text{C}$ Maximum Allowable Input Voltage (Continuous): 50 Vdc on 50 $\mu\text{V}/\text{cm}$ to 50 mV/cm ranges, or 250 Vdc on 0.1 V/cm to 5 V/cm ranges Common Mode Rejection: More than 140 dB at power line frequency or at DC Normal Mode Rejection: More than 50 dB Offset Input: Selectable to $\pm 20, 40, 60, 80, 100 \text{ cm}$ ($\pm 7.87, 15.7, 23.6, 31.5, 39.4 \text{ in}$) (10 ranges) or 0 (OFF) by front-panel dial With all accessories and operational Manual in English	
127.	Antenna Impedance Meter/LCR Meter hand held type: Specification Ranging Mode Auto & Manual Ranging Test Frequency 120/ 1kHz Resistance Range 10 Ω , 100 Ω , 1k Ω , 10k Ω , 100k Ω , 1 Ω , 10M Ω Accuracy 120/ 1kHz; 100k Ω ~1k Ω $\pm(0.5\%+3\text{dgt})$ Capacitance Range 10mF, 1000 μF , 100 μF , 10 μF , 1000nF Accuracy 120Hz Cx: $\pm(0.7\%\text{rdg}+100/\text{Cx}+3\text{rdgs})$, DF<0.5 Inductance Range 10000H, 1000H, 100H, 10H, 1H, 100mH, 10mH, 1mH With all accessories and operational Manual in English	02
128.	SWR/ POWER METER RF • wide frequency range from 1.8 ~ 500 MHz • Wide power measurement range from 20mW – 2W • Residual SWR very small • Built in BNC monitor terminal Specifications Frequency Range : 1.8 – 500 MHz Power Measurement Range : 20mW/200mW/2W 3 range switchable Impeadance : 50 Ω V.S.W.R. : less than 1.15 Accuracy : $\pm 10\%$ of full scale Connector : N type Monitor output BNC typ Dimension : 160 (W) x 83(H) x 125(D) mm	02
129.	Workstation Computer P-IV (Intel 2.4 GHz. Cor to Qtaz, Intel DG 33 FBC Board, 2GB DDR Kingston, 250 GB Hard Disk, 7200rpm, Apachi Modem, DVD R/W , Key Board, Mouse, ATX tower Casing)	10
130.	UPS Frequency: 50/60 Hz $\pm 1 \text{ Hz}$ Input Voltage: 230 Vac Input Current: 6A Output Voltage: 230 Vac Output Current: 5.4 A 1800 VA Back up time not less than 15 minutes. With all accessories and Operational Manual in English.	10
131.	Air Conditioners	02

	2 Ton, Split Type With all accessories and Installation																																																																																		
132.	DIGITAL COLOR STORAGE OSCILLOSCOPE WITH USB PORT: Bandwidth: 60MHz Rise Time: ≤5.8ns Sample Rate (Real-Time): 1S/s~500MS/s Record Length (MAX): 1M Input Channels: Two Digital Channel Characteristics: Real Time: 500MS/s, Equivalent: 25 GS/s Trigger Type: Edge, Pulse, Video and Alternate Connectivity and Storage: Standard: USB Device, USB Host and RS-232C. Optional: LAN and GPIB Waveform Math and Analysis: Add, Subtract, Multiply, Divide, Reverse and FFT, Connect to a PC for extended analysis Display: 64k, Full color LCD 320 x 240 LCD Size: Diagonal 145mm (5.7 inches) Standard Accessories: Probe x 2 (1x, 10x switchable) Power Cord and English Manual	02																																																																																	
133.	Digital Insulation Tester Compact, powerfull, versatile 4-Range Insulation Tester • Wide Range of Insulation Measurement with Enhanced safety • Comparator Function • Data memory Function (up to 100 data) Specifications <table><tr><td>Sampling Rate</td><td>4000 count LCD, Maximum reading 4000</td></tr><tr><td>Power Supply</td><td>2 times / sec</td></tr><tr><td>Fuse</td><td>1.5V R6P or AA Batteries (x 8)</td></tr><tr><td>Accessories</td><td>Standard</td></tr></table> <table><tr><td rowspan="5">Insulation Resistance</td><td>Rated Test Voltage (DC)</td><td>125 V</td><td>250 V</td><td>500 V</td><td>1000V</td></tr><tr><td>Max. Effective Reading</td><td>200MΩ</td><td></td><td>2000MΩ</td><td></td></tr><tr><td>Center Reading</td><td>5MΩ</td><td></td><td>50MΩ</td><td></td></tr><tr><td>1st effective range</td><td>0.200 to 10 MΩ</td><td></td><td>0.200 to 100 MΩ</td><td></td></tr><tr><td>Accuracy</td><td></td><td>±3%rdg ±4dgt</td><td></td><td></td></tr><tr><td rowspan="5">Low Resistance</td><td>2nd effective range</td><td>0 to 0.199 MΩ,</td><td>0 to 0.199 MΩ,</td><td>100.1 to 2000 MΩ</td><td></td></tr><tr><td>Accuracy</td><td></td><td>±5%rdg ±5dgt</td><td></td><td></td></tr><tr><td>Display Range (Auto-ranging)</td><td></td><td>400 .0Ω</td><td></td><td></td></tr><tr><td>Accuracy (After 0Ω Adjustment)</td><td></td><td>±3%rdg ±5dgt</td><td></td><td></td></tr><tr><td>Measurement Cur rent</td><td></td><td>Approx. 10mA</td><td></td><td></td></tr><tr><td rowspan="4">AC / DC Voltage</td><td>Open Circuit Voltage</td><td></td><td>6V or more</td><td></td><td></td></tr><tr><td>Range</td><td></td><td>AUTO (10V to 600 V)</td><td></td><td></td></tr><tr><td>Accuracy</td><td></td><td>±3%rdg±5dgt</td><td></td><td></td></tr><tr><td>I n put Resistance</td><td></td><td>Approx. 660kΩ</td><td></td><td></td></tr></table> With all accessories and Operational Manual in English.	Sampling Rate	4000 count LCD, Maximum reading 4000	Power Supply	2 times / sec	Fuse	1.5V R6P or AA Batteries (x 8)	Accessories	Standard	Insulation Resistance	Rated Test Voltage (DC)	125 V	250 V	500 V	1000V	Max. Effective Reading	200MΩ		2000MΩ		Center Reading	5MΩ		50MΩ		1st effective range	0.200 to 10 MΩ		0.200 to 100 MΩ		Accuracy		±3%rdg ±4dgt			Low Resistance	2nd effective range	0 to 0.199 MΩ,	0 to 0.199 MΩ,	100.1 to 2000 MΩ		Accuracy		±5%rdg ±5dgt			Display Range (Auto-ranging)		400 .0Ω			Accuracy (After 0Ω Adjustment)		±3%rdg ±5dgt			Measurement Cur rent		Approx. 10mA			AC / DC Voltage	Open Circuit Voltage		6V or more			Range		AUTO (10V to 600 V)			Accuracy		±3%rdg±5dgt			I n put Resistance		Approx. 660kΩ			02
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134.	Earth Tester analog Automatic Earth Tester FEATURES • VOLTAGE DROP SYSTEM enables to measure EARTH RESISTANCE automatically with one press of POWER Switch only.	02																																																																																	

	Digital Systems Trainer Familiarisation, Registers, Up/Down counters and decoders Using the Arithmetic Logic Unit (ALU) Addition and Subtraction, Data storage and retrieval A simple computer fetch-execute cycle Analogue Systems Trainer Familiarisation, Digital to Analogue Conversion (DAC) Binary Weighted Resistor Network, Use of Analogue Switches R - 2R Networks, Integrated Circuit, Analogue to Digital Conversion DAC and Comparator, Single Slope Integrator, Dual Slope Integrator With built in relevant power supplies and relevant hardware for above mentioned practical and with Instructional and Student Manuals in English	
138.	APPLICATION WITH FAULT FINDING & ELECTRONICS SERVICING TRAINER Experimental Capabilities :- The structured courseware is to be provided on CD ROM. A textbook on fault diagnosis should also be provided. Applications with Fault Finding Fault combinations :- * Incorrect Component & Incorrect Value Component * Open Circuit, Reverse connection, Short Circuit Following Circuits to be provided :- * Digital to Analogue converter, Diode circuits * Light emitting diode flasher, Logic Interface * Regulated Power Supply Circuits * Single Stage Amplifier, Wave form generator * Two stage Amplifier with overall feedback Electronic Servicing Following Circuits to be provided :- * 555 Timer, Astable Multi-vibrator, Asynchronous Counter * Bridge Rectifier with series regulator * Bridge Rectifier with smoothing, Colpitts Oscillator * Combination Logic Circuit - 1 & 2, Constable Multi-vibrator * Crystal Oscillator, Differential Amplifier, Op-amp Integrator * Injunction Transistor Oscillator, RC Phase Shift Oscillator, * Schmitt Trigger, Shift Register, Single Stage Audio Amplifier With built in relevant power supplies and relevant hardware for above mentioned practical and with Instructional and Student Manuals in English	10
139.	FIBER OPTIC COMMUNICATION TRAINER 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. • 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. With built in relevant power supplies and relevant hardware for above mentioned practical and with Instructional and Student Manuals in English	05

140.	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 Study topics: • 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 and Loop antenna With built in relevant power supplies and relevant hardware for above mentioned practical and with Instructional and Student Manuals in English	10
141.	TRANSDUCERS AND INSTRUMENTATION TRAINER <u>Topic Areas:</u> • An introduction to basic control systems. • Input transducers - an evaluation of the various devices provided. • Output transducers - practical investigation of the various devices provided. • Display devices - practical investigation of the devices provided, applications in practical systems, evaluation of input requirements. • Signal conditioning circuitry - in depth investigation/analysis of the numerous signal conditioning circuits provided, including properties of amplifiers, buffers and inverters, input/output requirements of the circuits provided, proper use of comparators, oscillators and filters and matching instrumentation circuits to the input and output transducers. • Control system evaluation - investigation of control system characteristics including ON/OFF, proportional, proportional + derivative and full proportional + integral + derivative control systems. • Practical control systems - design and implementation of speed control systems, positional control systems, temperature control systems and light level control systems. <u>Input Transducers</u> • Carbon track, wirewound and precision rotary potentiometers. • Slide potentiometers. • NTC thermistors. • Type 'K' thermocouples. • I.C. temperature sensor. • Photoconductive and photovoltaic cell. • Phototransistor. • PIN photodiode. • Linear variable differential transformer. • Linear variable capacitor. • Strain gauge. • Air flow and air pressure sensors.	05

	• Slotted opto sensor. • Reflective opto sensor. • Inductive proximity sensor. • Hall effect sensor. • Precision servo potentiometer. • Tachogenerator. • Humidity sensor. • Dynamic microphone. • Ultrasonic receiver. <u>Output Devices</u> • Heater. • Filament Lamp. • DC motor. • Solenoid air valve. • Ultrasonic transmitter. • Buzzer. • Loudspeaker. • Relay. • Solenoid. • Counter/timer unit with LED display. • Bargraph voltage indicator. • Analog 10V center-zero meter. <u>Signal Conditioning</u> • Buffers. • Inverters. • Comparator with switchable hysteresis. • Amplifiers with gain and offset control. • Current amplifier. • Summing amplifier. • Differential amplifier. • Instrumentation amplifiers. • AC and power amplifiers. • Oscillator 40kHz. • Filter 40kHz. • Low-pass filter with switchable time constant. • Precision full-wave rectifier. • Sample and hold circuit. • Integrator with switchable time constant. • Differentiator with switchable time constant. • Converters: V/F, F/V, V/I, I/V. • Alarm oscillator with switchable latching. • Electronic switch. Complete with relevant power supply andset of 4mm leads, Computer Aided Instructions, Technical manual, Curriculum text, instructor manual and student workbook	
142.	DATA ACQUISITION FOR TRANSDUCERS AND INSTRUMENTATION TRAINER Complete with a curriculum manual and virtual instrument. A comprehensive range of PC-linked activities that include the following topics: • Use of VLAB2 Windows®-based virtual oscilloscope and data logger unit. • Monitoring and logging of responses from the following: ▪ Temperature control. ▪ Light level control. ▪ Proportional motor position control.	05

	▪ Proportional-integral motor position control. ▪ Proportional-derivative motor position control. ▪ PID motor position control. ▪ Motor speed control.	
	• Programmable Logic Controller Provides a complete, structured solution to the problem of training today's industrial control engineers and technicians in the programming and troubleshooting of PLC applications. • Industrial-grade controller. • Industrially relevant applications trainer. • Sequence switch module for direct control of PLC inputs. • Remote programming interface package for a personal computer. • Quiet source of compressed air. • Structured self-paced curriculum manual. Teaching set comprises the following products: • AB ML1500 MicroLogix 1500 controller, remote programming software and interface cable. • PC45 AM Applications trainer. • PC11 Sequence switch module. • PC49 Manually operated compressed air pump. • PC45/ML IM Curriculum manual. <u>MicroLogix 1500</u> MicroLogix 1500 controller provides 12 inputs and 12 outputs, and carries a comprehensive range of on-board facilities, including timers, counters and sequencer functions. The controller is supplied complete with Windows®-based remote programming software, which is used to program, monitor, edit and troubleshoot sequences for each of the practical exercises provided in the curriculum manual. An interface cable that connects the computer to the controller for downloading of programs, is also included. with Instructional and Student Manuals in English	05
143.	ROBOTICS AND AUTOMATION TRAINING SYSTEM <u>Topic areas include:</u> • Manual Control of a Robot • Flowcharts and Programs • Sensing, Decisions and Counting • Open and Closed Loop Control • Transportation Around the Work-cell • Manipulating Parts • Industrial Robots • Computer Integrated Manufacturing • Pre-programmed Sequences • Problem Solving <u>Activities include:</u> • Manually control a robot. • Use a flowchart to write a computer program in BASIC. • Use the input from a sensor with the IF command in a BASIC program. • Identify the purpose of belt drives. • Write programs for open and closed loop control systems. • Identify different types of sensors used in the work-cell. • Identify economic and practical reasons why robots are used in industry. • Write a program to control a robot using inputs from a keyboard. • Identify how Computer Integrated Manufacturing (CIM) can be incorporated into manufacturing	05

	systems. With built in relevant power supplies and relevant hardware for above mentioned practical and with Instructional and Student Manuals in English	
144.	Telecommunication Trainer Experimental Capabilities: Analog Basics: 1. Amplitude Modulation (AM) • Modulation: 2 Methods • Envelop Detection • Product Detection (Coherent) • AM in a noisy channel 2. Double Side Band (DSB) • Suppressed Carrier • Product Detection (Coherent) • DSB in a noisy channel 3. Single Side Band (SSB) • Generation only (upper & lower) 4. Phase Modulation (PM) • Armstrong's Phase modular 5. Phase Division Modulation (PDM) • Phase division demodulation 6. Frequency Modulation (FM) • Generation by VCO (Wideband) • Demodulation by PLL • Demodulation by Zero crossing method 7. Pulse amplitude Modulation (PAM) • Sampling theorem / Nyquist • Aliasing • Reconstruction • Time division multiplexing (TDM) 8. Pulse Width Modulation (PWM) 9. Speech and Audio Messages • Message inversion • Message translation 10. Superhetrodyne Principles Intro to Advance Analog 11. Carrier acquisition Using PLL 12. Signal to Noise Ratio (SNR) • Intro to concept: Require optional PC-Based instrument	05

13. Quadrature Amplitude • Modulation QAM • Modulation • Demodulation Digital Basics 14. Pulse Coding Modulation (PCM) • Encoding • Decoding & reconstruction • Sampling Rate • Aliasing, undersampling and oversampling • Synchronization 15. Time Division Multiplexing (PCM-TDM) 16. Amplitude Shift Keying (ASK) • Modulation • Envelop Recovery • Synchronous Recovery 17. Binary Phase Shift Keying (BPSK) • Modulation • Demodulation 18. Frequency Shift Keying (FSK) • Modulation • Envelop recovery 19. Introduction to GFSK 20. Pulse shaping 21. Data Recovery • Noisy Channel (NSR)- requires optional PC-Based Instrument 22. Intersymbol Interface (ISI) • Eye Patterns / diagrams Intro to Advance Digital 23. Differential Phase Shift Keying (DPSK) • Modulation • Demodulation 24. Quadrature Phase Shift Keying (QPSK) • Modulation • Demodulation 25. Spread Spectrum (SS) • Introduction to direct sequence spread sequence (DSSS)	
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	26. Line Coding • NRZ-L • Alternate Mark inversion (AMI) • Manchester (Bi-Phase) • Differential Encoding (NRZ-M) 27. Frequency Synthesis • With PLL 28. PN Sequence Spectrum Display • Requires optional PC-Based instrument option 29. Noise Generation With built in relevant power supplies and relevant hardware for above mentioned practical and with Instructional and Student Manuals in English	
145.	Transmission Line Trainer • Attenuation • Delay using a pulse input • Matching using a pulse input • Reactive termination • Noise in communications systems • AC coupling of pulse inputs • Matching and frequency response • Standing waves • Transformer matching • Low pass filter effect • Transmission line oscillators • Time domain reflectometry (TDR) • Troubleshooting of transmission line faults. • Instructor's Solution Book With built in relevant power supplies and relevant hardware for above mentioned practical and with Instructional and Student Manuals in English	05
146.	ANTENNA SYSTEM DEMONSTRATOR Experimental Topics 1. The Basic Dipole Antenna 2. vertical and folded Dipoles 3. Driven (Yagi) Antennas 4. Directional Antennas 5. Transmission Lines 6. Propagation of RF Energy in the Atmosphere Equipment (Included) Antennas and Transmission Lines Panel Laboratory Manual Transmitting Dipole Antenna Ground Plane and Reflector Yagi Antenna Reflector Rod Field-Strength Meter Components Kit (Resistors) Cloth Tape With built in relevant power supplies and relevant hardware for above mentioned practical and with	05

	Instructional and Student Manuals in English	
147.	Black and White TV Trainer Specifications Type Black & White Broadcast System PAL-CCIR Size of CRT 14 Inch Power Requirements 220-110/50-60Hz/1Ph 63 Watt Antenna Impedance 75 OHM Channels VHF Channel 1-11 UHF Channel 21-69 Sound System Built-in speaker for dynamic Hi-Fi sound Fault System 30 Faults	05
148.	Color TV Trainer TV receiver National/Panasonic or other Broadcast system multi system Size of CRT 20 inch Power requirements 220-110/50-60Hz/1Ph 93 Watt Antenna impedance 75 Ohm Channels VHF channel 1 - 11 UHF channel 21 - 69 Sound system built-in speaker for dynamic Hi-Fi sound built-in speaker for dynamic Hi-Fi sound Fault system 30 faults	05
149.	Pliers Combination, side cutter, long nose, flat nose, insulation remover Insulated handle 1000 Volt. L/6in	25 each
150.	Tweezers 6",9" rounded grooved tip stainless steel body	10 each
151.	Needle File Set. Length of files= 160 mm. Each File has different cross section such as hard, square, three square, half round, round, wording (flat) & Knife with cutting face 28 teeth per cm, provided in a plastic wallet.	25
152.	Steel Foot rule Length 12" high grade rust less steel rule, with permanent marking in easy to read figures.	10
153.	Persain screw driver 06 pices watch maker type	10
154.	Wire gauge Standard Japan	10
155.	Screw Driver Kit Set of 9 pices consist of three Philip type, three Flat type, Two nut driver and one poker with plastic handle housed in a plastic body.	10
156.	Diagonal Cutter , insulated handle 1000 Volt. L/6in	10
157.	Screw Driver Flat Type , Size 4 in. Tip 1/4 in.	20
158.	Screw Driver Flat Type , Size 6 in. Tip 1/8 in.	20
159.	Screw Driver Philips Type , Size 4 in. Tip 1/4 in.	20
160.	Screw Driver Philips Type , Size 6 in. Tip 1/8 in.	20
161.	Table Lamp with magnifying glass and Florescent Tube , Lens 124 mm	10
162.	Wire Stripper Automatic self-adjusting, insulated grip, strips wire 10-24 AWG, built-in wire cutter, 8" length	5
163.	Ring Spanner Set 12-piece chrome vanadium steel, sizes 6-32mm, offset ring ends, corrosion-resistant finish, housed in canvas roll pouch	5
164.	Earth Resistance Tester (Digital) LCD display, measuring range 0-2000Ω, auto-ranging, data hold function, low battery indicator, includes test leads and ground stakes	2
165.	Phase Sequence Meter 3-phase indication, non-contact voltage detection, LED indicators, auto	5

	power-off, operating voltage 100-600V AC, compact ergonomic design	
166.	Lugs Punching Machine (Hydraulic and Manual) Dual-action crimping head, 12-ton capacity, dies for cable sizes 16-400mm ² , quick-release system, ergonomic handle, lightweight aluminum body	5
167.	Energy Meter Digital Single Phase LCD display, accuracy class 1.0, voltage 240V AC, current rating 5-30A, frequency 50Hz, tamper detection, multiple tariff capability	2
168.	Charge Controller PWM 40A rated, 12/24V auto detection, LED status indicators, temperature compensation, electronic protection, battery types: sealed/gel/flooded	5
169.	Solar Hybrid Inverter 2000W output, pure sine wave, MPPT tracking efficiency >99%, LCD display, multiple charge modes, RS485 communication port, parallel capability	2
170.	DRY Battery 12V, 60AH AGM technology, maintenance-free, cycle life 1200+ charges, low self-discharge, terminal type: F10	4
171.	Solar PV Module Mono PERC Half Cut N-Type 580W maximum power, efficiency 21.4%, 144 half-cut cells, tempered glass 3.2mm, IP68 junction box, 25-year performance warranty	10
172.	Solar Panel Structure (L2) Hot-dipped galvanized steel, wind resistance 150km/h, adjustable tilt 10-30°, compatible with 72-cell modules, hardware included	10
173.	Watt Meter (Digital) LED display, 3-phase measurement capability, accuracy class 0.5, voltage range 50-500V, current range 0.1-5A, auto-ranging	5
174.	VAR Meter Digital display, 0-50kVAR range, accuracy ±1.5%, panel mount design, 96×96mm face, auxiliary supply 230V AC	5
175.	Digital Power Factor Meter LED display, measuring range 0.5 lag to 0.5 lead, accuracy class 1.0, auto-ranging,	5
176.	Rotary Change Over 2-pole, 50A rating, manual operation, 3-position (I-0-II), front plate mounting, IP54 protection class	5
177.	HART Communicator handheld, HART 7.0 compatible, graphic LCD, rechargeable battery	2
178.	Milliampere Source 0-24mA range, ±0.05% accuracy, 24V loop power, HART compatible	2
179.	Deadweight Tester 0-10,000 psi hydraulic calibrator, 0.025% accuracy, dual-piston, includes weights and hand pump	5
180.	Temperature Calibration Bath -30°C to 200°C range, ±0.01°C stability, 12L capacity, digital PID controller, LCD display, integrated cooling system	4