Annexure-I

Electrical Engineering Lab

Item code	Title	Specification	Quantity
1	Moving Iron Voltmeter (portable)	The meter should be housed in a wood/abonite case, critically damped mirror backed scale, knife edged pointer approximate length of scale 150 mm, accuracy (±) 1% of fsd. Range 0 – 300V.	6Nos.
2	Moving Iron Ammeter (portable)	The meter should be housed in a wood/ebonite case, critically damped, suitable for 45-55 Hz, mirror backed scale, knife edge pointer, approximate length of scale 150 mm accuracy (±) 1% of fsd. Range a) 0 – 500 mA b) 0 – 1 amp c) 0 – 5 amp d) 0 – 15 amp	6 Nos. each
3	Wattmeter (single phase dynamo meter type)	The meter should be housed in a wood/ebonite case, criticallydlamped suitable for use in a supply of 45 – 55 Hz, mirror backed scale, knife – edged pointer approximate length of scale 150 mm; accuracy (±) 1% fsd Range 75/150/300 V, 1A/2.5A/5 Amp.	6 Nos.
4	Megger (D.C.)	With hand driven d.c. generator a) generated voltage for megger is 500 V D.C. for household wiring b) generated voltage for megger is 1 KV D.C. for 400 V devices specially for 400 V induction motor/alternator c) 2.5 KV D.C. generated voltage for megger specially for the testing of CT and PT	 2 Nos. 2 Nos. 2 Nos.
5	Earth Resistance Testing Set	Complete with the earth resistance testing megger, hand driven a.c. generator of voltage prescribed by Burau of Standard specification with a) copper/brass spikes of standard length with conductive protective coating b) connecting cables	2 sets
6	Single phase energy meter	Current coil 10 Amp Voltage of potential coil = 250 V Meter constant not less than 600 ISI Mark	6 Nos.
7	Three phase energy meter	Arrangement for p.f. correction and brake magnet adjustment should be provide; voltage of potential coil = 250 V Current = 10 Amp Meter content not les than 600 ISI mark	2 Nos.
8	Digital Ammeter	Input configuration : Bipolar Accuracy : ± 0.5% full range Resolution : 1 in ± 1999 counter Sampling rate : 3 samples/second	

		Ranges (D.C.) a) ± 199.9 mA input = 100 ohms b) ± 199.9 mA input impedance 10 ohms c) ± 199.9 mA input impedance 0.1 ohms d) ± 1.999 mA input impedance 0.1 ohms e) ± 19.99 mA input impedance 0.01 ohms	 2 Nos. 2 Nos. 2 Nos. 2 Nos. 2 Nos.
9	Digital Ammeter	AC of ranges as stated above	2 Nos. each
10	Digital Voltmeter	Input configuration : Bipolar Accuracy : arrange ± 0.5% of full range Resolution : 1 in ± 1999 counts Sampling rate : 3 samples/sec. Ranges (D.C.) Rages (D.C.) a) ± 199.9 mV (1000 M ohms) b) ± 1.999 V (1000 M ohms) c) ± 19.99 V (10 M ohms) d) ± 199.9 V (10 M ohms) e) ± 1000 V (10 M ohms)	2 Nos. 2 Nos. 2 Nos. 2 Nos. 2 Nos.
11	Digital Voltmeter	A.C. as stated above	2 Nos. each Total = 10 Nos.
12	Single phase Auto Transformer (variac)	Input : 230 V, 50 Hz Output : 0 to 270 V Current ranges; a) 4 Amp b) 8 Amp c) 10 Amp	 2 Nos. 2 Nos. 2 Nos.
13	Power Capacitor	500 V grade, accuracy 10%; 5 K var; bank of 5 units of equal value to be connected parallely through switches	5 Nos.
14	Variable Inductor (Iron cored)	Single phase, 250 V mounted on m. 5 structure with terminals brought out, with mechanical arrangement for continuous variation of the value. Total rating = 2.5 KVA based on 50 Hz supply	2 Nos.
15	Fixed Value resistors	Accuracy ± 0.5%,m 1 Amp, fixed on bakelite case with brass terminals Range (a) 1 Ω (b) 5 Ω (c) 10 Ω (g) 500 Ω	4 Nos. each
16	Wire Wound Rheostat	Suitably fitted with jockey and terminals. The Resistance materials are wound on ceramic tube a) 10 Ω 20 Amp b) 20 Ω 20 Amp c) 40 Ω 2.5 Amp d) 100 Ω 1 Amp e) 500 Ω 0.5 Amp f) 1000 Ω 0.25 Amp	4 Nos. each Total = 24 Nos.
17	Digital LCR Meter Auto ranging	a) To measure RLC and Q b) Modes series or parallel equated circuit c) Frequency 100 Hz/120 Hz/1 KHz for different range component	2 Nos.

		d) Accuracy of measured frequency; 0.025% nominal e) Voltage applied on component not more than 0.3V rms f) Display 4 digit LED with automatic decimal point	
18	Auto Cut off Battery Charger	Thyristor controlled, 6 V & 12 V charging current 10A (Max) Input 230 V, 50 Hz	1 No.
19	Lead Acid Battery	a) 6 V 60 Ah b) 12 V 120 Ah	4 Nos. 2 Nos.
20	Tachometer(hand hold)	Range : 0 – 200 – 2000 – 5000 rpm	2 Nos.
21	Digital Multimeter	• 3¾ digit LCD display • 0.5% basic d.c. accuracy • DC voltage to 1000 V resolution 100 mV • AC voltage to 750 V resolution 100 mV • DC/AC current to 10 A resolution 0.1 mA • Resistance to 4000 MΩ • Frequency range to 4 MHz • Auto power off • Max/Min coverage recording • Audible readout diode test • High energy fuse	8 Nos.
22	Took Kit	Complete with Wrenches, screw driver, hammer catcher (bearing puler)	2 sets
23	High Voltage oil testing set	Output – 60 KV AC 0 – 60 KV AC Input – 230V, 50 Hz a) High Tension transformer oil cooled type with suitable mounting arrangement b) Oil testing cup preferably made of glass with highly polished brass balls terminals, the gap may be adjustable externally c) Should be supplied with standard gauge for gap adjustment d) The control unit must be provided with single phase variac, thermal overload contractor units indicating lamp and meter	1 set
24	Automatic winding m/c	Must have the following facilities a) Digital counter b) Gauge setting arrangement c) Number of turn setting arrangement d) Provided with fhp motor for driving the winding m/c e) Coil of 46 SWG to 8 SWG	1 set
25	Dual Trace Oscilloscope	Bandwidth : 20 MHz Channels : 2 Time Base : Single Sweep speed :10 ns/div. To 0.5 sec/div. Vertical sensitivity : 2 mV – 5V/div. T.V. line & Field Trigger – yes Cursors/Readouts : yes Channel 1 out : yes	6 Nos.

		Automatic triggers : yes	
26	Function Generators	Frequency range : 0.01 Hz – 11 MHz Output : sine, square triangle/TTL pulse External sweep should be provided VFC (FM) input should be provided AM input – yes	6 set
27	Digital insulation tester	Should be provided with a) Solid state generator b) Digital readout	1 no.
28	Electronic Energy Meter	10 amp. 230 volt. 50 HZ	3 nos.
29	Network Theoream Training Board	This board must have the facilities for following practices (to study) Input 230 V 50 Hz output regulated a) component Identification b) circuit board operation c) currents in a two element branch circuit d) voltage in a three element series circuit e) algebraic sum of voltages in a series circuit f) generating loop equation g) generating node equations h) Kirchhoff's voltage low with a two source circuit i) Kirchhoff's current law with a two source circuit j) mesh solution for two source circuit k) superposition solution for two sources circuit l) Millman's theorem solution of two source circuit m) minimum resistance voltage of a bridge circuit n) Norton's theorem connection or vice versa o) transformation of delta and wye p) patch chord and multi socket q) Thevenin's equivalent derivation r) The venin's to Worton & Norton to Thevenin's conversion	6 Nos.
30	AC fundamentals training board	This training board must contain the following facilities to study (must be provided with AC power supply of 50 Hz or variable frequency output a) Series RLC circuit b) Parallel RLC circuits c) Series resonance circuit d) Bandwidth of a series RLC circuit e) Resonance frequency in parallel LC circuit f) Factor and bandwidth g) Power factor h) Low pass filters i) High pass filter j) Band pass filter k) Band stop filters	6 Nos.

31	Instrumentation Trainer	Must contain the following 1) a) LVDT experimental module b) LVRT experimental module 2) a) Temperature transducer trainer (neat transducer) a) Kit J type thermocouple module b) RTD temperature transducer trainer c) AD 590 temperature transducer trainer 3) Opto electronic transducer kit 4) Dual relay module 5) Dual stepper motor module (must be compatible with standard 8085 A training kit) 6) Analog simulator module 7) Strain gauge experimental module 8) Control System demonstration module 9) Variable area capacitor trainer 10) Analyser potentio circuit transducer module 11) Load cell experimental module 12) Torque transducer module	3 sets
32	Standard wire gauge BSW and M.M		2 sets each
33	Decade capacitor box	400 V; 0 to 11.111 μf in 6 Ranges (x10 H, to 1 μf in 10 steps in 6 ranges	4 Nos.
34	Air cored Inductor	0-100 μH in steps & 10 μH to 10 H in steps of 1 H ?	4 Nos.
35	Decade Resistor box		4 Nos.
36	High Voltage Insulation Tester	Selectable voltage range 100/250/500/1000/1500/2000/2500/5000V Broad measuring range for 10 KΩ Guard terminal for elimination of surface current Should conform IS 2992 Power supply 6 x 1.5 V	2Nos.
37	Flux Meters	Digital display Measurement range : 1m tester 1.999 test Accurately better than 4% Battery operated Complete with Hall Effect Proof	2Nos.
38	Digital Tongue Tester	AC/DC current to 200A rms AC/DC voltage to 750 V rms Frequency measurement 101 KH Power measurement 20 KW/20 KVA Power facture to 0.32 K	
39	Murray Loop Test set	Complete with a) Wheatstone Bridge Circuit b) D.C. Regulated Power Supply c) Galvanometer/Detector Circuit d) Faulty cable e) Earthing system to create earth fault	2 sets
40	Kelvin's Double Bridge	Complete with a) D.C. Regulated Power Supply b) Sensitive Galvanometer Null	2 sets

		Detection c) Resistance (Known value) with current lead and potential lead d) Other Bridge components	
41	Continuously variable DC voltage source	input 230V 50 HZ output de Volt 0-250V & current 10 Amp.	2 sets
42	D.C. Regulated powers supply	a) 5 V, 2 Amp. (b) 0 ± 15 V D.C. regulated 500 mA continuously variable and remain constant all its set value even at full load condition	6 Nos. each
43	Single phase power transformer	1 KVA, Input 230 V, 50 Hz output; 110 V + 110 V.	3 Nos.
44	Three phase power transformer	2.5 KVA, Input 400V 50 Hz Delta connected winding with a provision for star connection. Output phase voltage 230 V and line voltage 400 V (Natural air cored with Input and output terminals brought out and connected on suitable arranged terminal boards with terminal marking. (tap changing facilities at the rate of 10 % must be provided)	2 Nos
45	LCRRQ Meter (Microprocessor based)	Test parameter : L.C.R & Q Measurement frequency : 100 Hz or 1 KHz Mode of Measurement : Series on parallel equivalent Measurement Range : 0.1 μH to 9999 H for inductance 0.3 pF to 9999 μF for capacitance 0.01 Ω to 100 M π for resistance Q factor : 0.1 to 99 Power supply : 240 V ac ± 10%, 50 Hz (should accompany calibration certificate)	2 Nos.
46	Cable fault detector and Locator	Fault test range upto 10 Km pulse voltage 15 V p-p, pulse width range 8 ns to 2000 ns, five digit LED display for indicating the distances	1 set
47	Digital Frequency Meter	8 digit display, frequency range, 1 Hz to 10 M Hz import to 10 M Hz import impedance 50 ohm to 1 M ohm; gate time 0.01 sec. To 10 sec.; Decade steps accuracy + 1 count + time base carrier	2 sets.
48	Hand tool set	Consisting of precision pliers, long nose pliers, cutting pliers,150 mm size, screw drivers flat head 100 mm to 300 mm, screw drivers cross – head 75 mm to 200 mm Hack saw frame, suitable for 12 mm blade, hammer 250gm, to 500 gms, wire strippers, spanners, double ended set of 7 Flat half round rough & smooth 150 to 300 mm jewelers hacksaw frame suitable for 12 mm blade, hammer 250gm, to 500 gms, wire strippers, spanners, double ended set of 7 Flat half round rough & smooth 150 to 300 mm jewelers hacksaw frame	5 sets.

49	Soldering set	a. soldering Iron (leak proof) b. Soldering gm 2 nos. c. De-soldering pump – 5 nos. d. Soldering material = 1 kg. 60 : 40	10 Nos.
50	Hand drill	e) 230 V, 50 Hz fractional Horse power motor driven, maximum drill bit size 10 mm	2 Nos.
51	Electronic Tri-vector meter	Suitable for measuring a) Power, Active Power, Reactive power for single phase 230 V, 50 Hz, three phase 400 V, 50 Hz supply b) Digital readout c) Accuracy 1% d) Labelled terminals for load connection e) Selection switch for changing mode of operation f) With calibration certificate	1 No.
52	Measurement of 3-phase power (both balance & unbalance) by using: Two wattmeters Three wattmeter	Panel consists of variable ac supply digital voltmeter, digital ammeter , digital wattmeter and variable loading arrangement	1No.
53	Measurement of inductance by Maxwell / Owen's bridge.	Maxwell bridge	1No.
54	Determination of an unknown capacitance with the help of Schering Bridge network	Schering bridge	1No.
55.	Determination of Q factor of resonant circuit	Complete experimental setup	1No.