

MAHARASHTRA STATE BOARD OF VOCATIONAL EDUCATION EXAMINATION, MUMBAI

1	Name of Course	Diploma Course in Electrician (Revise W.E.F.2017-18)								
2	Max no. of Students	25	Course Code - 302409							
3	Duration	2 year								
4	Course Type	Full Time								
5	No. of Days per week	6 days								
6	No. of hours per day	7 Hrs								
7	Space require	Theory Class Room – 200 sqft, Lab Sub.– 800 sqft, Lab Elective - 400 sqft Total = 1400 Sq.Ft.								
8	Entry qualification	S.S.C. Pass								
9	Objective of syllabus	To understand basic of electricity, To understand and use various electrician hand tool, To perform various task related to Electric fitting of residential and commercial building								
10	Employment opportunities	work as electrician in electricity board, various industrial organizations, and commercial organizations, can start own electrician practice								
11	Teachers Qualification	For Vocational Subject -B. E. Electrical or Equivalent and for Non Vocational Subject Master Degree in concern Subject.								
12] Teaching Scheme –										
Ppr		Subject Code	Clock Hours / Week		Total					
			Theory	Practical						
1	English (Communication Skill)	90000001	2 Hrs	1 Hrs	3 Hrs					
2	Elective – I		2 Hrs	1 Hrs	3 Hrs					
3	Elective – II		2 Hrs	1 Hrs	3 Hrs					
4	Basic Electricity and Measurement	30240011	3 Hrs	8 Hrs	11 Hrs					
5	Electrician Practice	30240012	3 Hrs	8 Hrs	11 Hrs					
6	Workshop Calculation, Science and Drawing	30240013	3 Hrs	8 Hrs	11 Hrs					
Total					42 Hrs					
13	Internship	Two Month Summer Internship from 1st May to 30th June is Compulsory.								
14] Examination Scheme – Final Examination will be based on syllabus of both years.										
P	Subject	Subject Code	Theory			Practical			Total	
			Duration	Max	Min	Duration	Max	Min	Max	Min
1	English (Communication Skill)	90000001	3 Hrs	70	25	3 Hrs	30	15	100	40
2	Elective – I		3 Hrs	70	25	3 Hrs	30	15	100	40
3	Elective – II		3 Hrs	70	25	3 Hrs	30	15	100	40
4	Basic Electricity and Measurement	30240011	3 Hrs	100	35	3 Hrs	100	50	200	85
5	Electrician Practice	30240012	3 Hrs	100	35	3 Hrs	100	50	200	85
6	Workshop Calculation, Science and Drawing	30240013	3 Hrs	100	35	3 Hrs	100	50	200	85
Total									900	375
15	Teachers – Three Teachers per batch for vocational component. For English, Elective-I & II guest faculty on clock hour basis.									
16	Student have to choose any one subject for Elective-I and Elective-II from below given subjects									
17	a) For Elective I – Student can choose any one subject		b) For Elective II – Student can choose any one subject							
	Code	Subject Name	Code	Subject Name						
	90000011	Applied Mathematics	90000021	Applied Sciences (Physics & Chemistry)						
	90000012	Business Economics	90000022	Computer Application						
	90000013	Physical Biology (Botany & Zoology)	90000023	Business Mathematics						
	90000014	Entrepreneurship								
	90000015	Psychology								

THEORY - I - Basic Electricity and Measurement - 1ST YEAR

(Subject Code – 30240011)

Sr no	UNIT	SUB UNIT	SCOPE & LIMITATION	Hours	Marks
1	Conducting Materials	1 Introduction	Introduction to conducting materials	3	4
		2 Classification	Copper and aluminium as low resistivity materials their electrical characteristics and application		
		3 Application	Electric resistance materials. Materials for lamp filaments and Brushes. Tungsten, Nichrome, Eureka, Selenium and Carbon as high resistivity materials, their electrical characteristics and application. Bare Conductors, O.H. Conductors, ACSR, Copper Aluminum G. I., , winding wires Bus Bars ,		
2	Insulating materials	1 Introduction	Introduction to insulating materials, Distinction between conductor, insulator and semi conductor, definitions of insulation resistance, dielectric strength breakdown voltage	3	4
		2 Classification	Classification of insulating materials according their insulating resistance, temperature withstanding capacity		
		3 Application	Various insulating Materials : Paper, plastic coated Paper. Empire cloth Leatherwood Cotton and silk, Rubber, PVC Porcelain, Bitumen, Micro, Bakelite, Ebonite, Marble, Glass Asbestos, Fiber glass-their uses and applications insulating tapes, Sleeves, insulating and impregnating Varnishes and paints- Their uses and application.		
3	Magnetic Materials	1 Introduction	Introduction of Magnetic Materials	3	4
		2 Classification	Classification of materials as Ferromagnetic materials, soft and hard magnetic material		
		3 Application	Various magnetic materials- Mild steel, silicon steel, Mu-metal, Perm alloy, Alnico as magnetic materials their properties and uses.		
4	Semiconductor materials	1 Introduction	Introduction of semiconductor materials	3	4
		2 Application	Electric properties of semi-conducting elements and compounds and their application. Zone refining and crystal growth.		

5	Special Application of materials	1 Contact material	Contact material- slip ring, force free spring, carbon brushes, Brush Holder, commutator, Switch gear, Contacts 5.2 Thermocouple materials, 5.3 Bimetal materials, 5.4 Soldering materials, Fuse materials	3	4
		2 Thermocouple materials	Thermocouple materials		
		3 Bimetal materials	Bimetal materials		
		4 Soldering materials, Fuse materials	Soldering materials, Fuse materials		
6	Cell and Batteries	1 Electro-Chemistry	Chemical effects of Electric current,	12	10
		2 Faraday's Laws of Electrolysis	Faraday's Laws of Electrolysis- E.C.E., Applications of Electrochemistry,		
		3 Introduction	Introduction Requirements of Cell and Batteries materials		
		4. Types of cells	Primary Cells description, Classification Primary Cells description, Classification		
		5 Secondary Cells	Classification Lead Acid Battery, Construction, Nickel Battery Maintenance free Battery		
		6 Application	Applications Maintenance, installation, write off procedures.		
		7 Care and maintenance	Testing, care and maintenance of battery,		
7	Electrostatics	1 Introduction of capacitors	Introduction to Capacitors, capacitance, energy stored in capacitor, application. Charging and discharging of capacitors.	6	6
		2 Combination of capacitors	Types of capacitors and their use in circuits. Series and parallel connection of capacitors		
8	Electric Current & Circuits	1 Introduction	Concepts & Types of circuit.	9	10

		2 .Ohm's Law ,laws of resistance	Ohm's Law, Factors Controlling the 'R' of material. Effect of Temp., Law of Resistance, Resistivity etc. Polarity of 'IR' Drops. Internal Resistance, Potentiometer-Construction & Applications. Shunts		
9	Network Circuits	9 Kirchoff's Laws	Kirchoff's Laws (KCL, KVL), Simple problems	12	12
		2 Simple numerical Problems	Whetstone's Network, Meter Bridge & Applications. Simple numerical Problems		
10	Thermo-Electricity	1 Introduction	Introduction to Thermo- Electricity	6	6
		2. Heating effect of elect	Heating effect of elect. Current, Joule's Law Thermocouple, See-back effect, & Application.		
		3 Simple Calculations	Simple Calculations on Joule's Law Electric Power, Energy, Calculations on Power & Energy (Elect. Bills).		
11	Electro-magnetism	1 Introduction	Define-magnetism &classification of magnets. Properties, care and maintenance, methods of magnetizing magnetic material and Ferro magnetic substances. Introduction to Electro-magnetism	12	12
		2 Definitions	, Definitions Of Mag. Field strength, Flux density, Intensity of Magnetism,, MMF, Ampere-Turns, Reluctance. Etc. Comparison between Mag. Field & Elect. Field. Permeability, Laws of Magnetic Forces		
		3 Force on current carrying conductor in Mag. Field	Force on current carrying conductor in Mag. Field, Fleming's Left Hand Rule. Force between two parallel current carrying conductors, Solenoid. Ampere's Rule, Laplace's Law		
		4 Faraday's Laws of Electromagnetic Induction	Faraday's Laws of Electromagnet. Induction. Magnitude of Dynamically & Statically induced EMF, Eddy		

			current. Lenz's Law, Magnetic Losses		
12	A. C. Fundamentals	1 Introduction	Principles of Electro-magnetism corkscrew rule, right and left hand rules. Mg. Field of current carrying conductors and loop. Earth magnetism, solenoid its property. Magnetic terms Principle of Electro-magnetic Induction, Faraday's Law, Lenz's law.	18	12
		2 Generation of ac	Generation & Equation of Alternating Voltages & Currents, Definitions of Phase, Phase Difference, Max. / Peak Value, R.M.S. Value. Average Value etc. Vector algebra of A.C. Quantities.		
		3 Power Factor	Power Factor, and P. F. improvement methods, Advantages/ Disadvantages		
		4 A.C. Circuit	Characteristics of A.C. Circuit. Having Pure Resistance, Pure Inductance and Pure Capacitance		
		5 R-L-C ckts	A.C. Ckt. Having R, L & C in series A.C. Ckt. Having R, L & C in parallel, and Vector & Admittance method. Series & Parallel Resonance Circuit and Its Characteristics.A.C. Bridges.		
		6 Poly-Phase Circuit	Poly-Phase Circuit. Generation & Phase Sequence Star / Delta Connection & its Characteristics. Power in 3 Ph. System for Balance & Unbalance load.		
		7 Calculations	Problems on A.C. ckts. Both series & parallel power consumption, P.F. etc. Concept of poly-phase star & Delta Connection Line Voltage & phase voltage, current power in a3 ph. Ckt, power factor improvement		

13	Electrical Measuring Instruments & Measurements	1 Introduction	Introduction of Measuring instruments, Absolute & Secondary Instruments. Principles of Operation of Instruments. Types of Torques for Instruments. deflecting torque, controlling torque & damping torque types of measuring instruments,	15	12
		2 Working, construction of various instruments	Working principles of moving iron and moving coil voltmeters and ammeters, extension of instrument range, dynamometer type wattmeter, Ohm meter, range extension of meters		
		3 Types of Measuring Instruments	Working and application of P.F. meter Wattmeter Types - Energy meter --Energy meter digital -Frequency meter -Phase Sequence indicator -Multimeter --Analog and Digital - C.R.O, megger.		
		4 other instruments	Clip-On meter-construction, working, Megger, Earth Tester-Construction, Working & Applications		

PRACTICAL - I - Basic Electricity and Measurement - 1ST YEAR

(Subject Code – 30240011)

Sr. no.	Practical	Skills to be achieved	Time allotted
1	To study construction of LT cable.	1. Skin the cable. 2. Construction of L.T. cable	8
2	To study construction of HT cable.	1. Skin the cable. 2. Construction of H.T. cable	4
3	To study the various types of insulating material class wise	1. Various types of Insulating Material. 2. Material class	4
4	To find out the break down voltage of given transformer oil sample	1. Check the Oil. 2. Calculation of the break down voltage.	8
5	To study LT & HT overhead lines insulator	1. Use of Line Insulator. 2. Types of Line Insulator.	8
6	To study characteristics of various types of special Resistive material	1. Various types of Resistive Material. 2. Material class	8
7	To study Temperature sensitive resistive material	1. Various types of Resistive Material. 2. Temp. sensitive material.	12
8	To study Light sensitive resistive material.	1. Various types of Resistive Material. 2. Light. sensitive material.	12
9	To study negative resistance characteristic of semi conductors	1. Study of semi conductor. 2. Chara. Of semi conductor.	8
10	Collect any various magnetic materials e.g. Ferrite Core of Transformer & study.	1. Various magnetic material. 2. Study of Transformer core.	12
11	Study characteristics of various types of thermocouple & its material	1. Study of Thermocouple. 2. Material in thermocouple.	8
12	Study characteristics of Fuse material.	1. Meaning of Fuse. 2. Use of Fuse.	12
13	To prepare a chart of various types of batteries and troubleshooting	1. Study of Batteries. 2. Study of trouble shooting	8
14	To study the Lead acid Battery material	1. Study of Batteries. 2. Study of trouble shooting	16
15	To study related Indian Standard with Tech. Specifications, from related Websites of various engineering materials.	1. Study of Engg. Materials. 2. Study I.S.I. with related material.	16
16	To Prepare a sheet of Atomic Structure.	1. To prepare a sheet of Atomic structure.	16
17	To measure the potential difference of charged line.	1. To charge the line. 2. To measure the P.D. across the line.	12

18	To Determine The Resistivity of given material.	1. Study of Laws of Resistance. 2. Calculation of Specific Resistance.	12
19	To measure the length of given wire	1. Study of Laws of Resistance. 2. Calculation of Specific Resistance.	8
20	To measure the diameter of wire & calculate the cross section area of wire	1. Study of Laws of Resistance. 2. Calculation of Specific Resistance.	16
21	To measure the resistance of wire with Ohmmeter/multimeter	1. Use of Ohm meter. 2. Use Multimeter.	8
22	To study the concept of internal resistance of cell	1. Study of Internal Resistance. 2. Effect of Internal Resistance.	16
23	To make the connection of cells	1. Types of connection of Cell. 2. Connection of Cell.	12
24	To verify Kirchoff's current & voltage law	1. Connection of Circuit. 2. Verify the Theorem.	12
25	To verify Thevenins, Nortons and Superposition's theorem	1. Connection of Circuit. 2. Verify the Theorem.	8
26	To understanding the process of electrolysis.	1. Chemical effect of Electric Current. 2. Process of Electrolysis.	8
27	To know the concept of metal deposition through electricity passing	1. Chemical effect of Electric Current. 2. Process of Electrolysis.	16

**THEORY - I - Basic Electricity and Measurement - 2nd Year
(Subject Code – 30240011)**

Sr no	UNIT	SUB UNIT	SCOPE & LIMITATION	Hours	Marks
1	Electrical Measuring Instruments & Measurements	1 Instruments calibration	Calibration and its methods	12	6
2	Fitting	1 Introduction	Introduction to allied Trades Marking, use of chisel and hacksaw on flats, sheet metal filling practice, filling true to line	12	9
		2 Drilling	Drilling practice in hand drilling & power drilling machines. Grinding of drill bits. Practice in using tapes and dies, threading hexagonal and square nuts etc. cutting external threads on stud and on pipes riveting practice		

3	Carpentry	1 Introduction	Sawing and planing practice. Practice in using firmer chisel and preparing simple half lap joint.	9	6
			Practice in using snips, marking and cutting of straight and curved pieces in sheet metals. Bending the edges of sheets metals. Riveting practice in sheet metal. Practice in marking different joints in sheet metal in soldering the joints.		
4	Thermo-couple	1 Thermo-couple	Working of thermo-couple and its uses,	6	6
5	A.C. ckts	1 A.C. ckts	Problems on A.C. ckts. Both series & parallel power consumption, P.F. etc. Concept of poly-phase star & Delta Connection Line Voltage & phase voltage, current power in a3 ph. Ckt, power factor improvement	15	12
6	A.C Winding	A.C Winding	A.C Winding terms, Armature winding terms, coil side, end coil & grouping of coils. Connection to adjacent poles, connected armature winding, alternate pole connection, armature winding – Lap & wave connected.	15	15
7	D.C. Winding	D.C. Winding	D.C. Winding terms, pole pitch, coil pitch back pitch. Front pitch-Progressive & retrogressive winding.	12	12
8	Controlling devices	controlling devices	Study of the arc controlling devices. Explanation and classification & uses of miniature relays & protector devices. Use of electro-magnetic clutches. Explanation and principle of operation.	12	12
9	Rectifier and stabilizer	1 Rectifier	P – N- junction. Diode-classification of Diodes-Reversed Bias and Forward Bias. Rectifier ckt. – Half wave, Full wave and Bridge ckt. L.E.D. and Solar cells. Filter ckts-passive filter. Oscilloscope	12	12

		2 Other devices	Working principle and practical applications of U.J.T., F.E.T., S.C.R. Diac & Triac.		
		3 Stabilizer	Power Supply Stabilizer		
			Define-converter-inverter, M.G. Set-description-Characters, specifications-running & Maintenance.		
10	Transistors	Transistors	Working of transistor-Types of Transistors, Characters of transistors, Biasing of Transistors. Mode of use of transistor	12	12
			Amplifiers. How a transistor works as an amplifier. Signals-Pulse shapers cascade system		
11	Oscillator		Oscillator-working principle Explanation of stages and types	6	3

**PRACTICAL - I - Basic Electricity and Measurement - 2nd Year
(Subject Code – 30240011)**

Sr no	Practical	Skills to be achieved	Time allotted
1	To understand the relations between current passing & heat generated	1. Connection of circuit. 2. Calculate Heat generated.	12
2	To calculate the Joule's constant by formula	1. Connection of circuit. 2. Calculate Heat generated.	12
3	To find out the direction of mag. field around conductor	1. To prepare Electro magnet. 2. Find out direction of magnetic field.	12
4	To observe the direction of torque of conductor	1. To prepare Electro magnet. 2. Find out direction of magnetic field.	12
5	To verify the Faraday's 1st law of elect. mag. Induction	1. To prepare Electro magnet. 2. Find out direction of magnetic field.	12
6	To verify the Faraday's 2nd law of elect. mag. Induction	1. To prepare Electro magnet. 2. Find out direction of magnetic field. 3. Find out the E.M.F. induced.	12
7	To study Series combination of capacitor.	1. Connection of capacitor 2. Calculate equivalent capacitance	12

8	To study Parallel combination of capacitor.	1.Connection of capacitor 2.Calculate equivalent capacitance	12
9	To trace & measure the Peak value of A.C. sine wave	1. Connection of circuit. 2. Calculate Peak Value.	8
10	To calculate the R.M.S. & Average value	1. Connection of circuit. 2. Calculate Peak Value.	12
11	To study the characteristics of A.C. circuit	1. Connection of circuit. 2. Calculate Peak Value.	16
12	To calculate impedance of A.C. Circuit.	1. Connection of circuit. 2. Calculate Impedance.	8
13	Verification of Improvement of P. F. by using Capacitors	1. Concept of Power Factor. 2. Improvement of Capacitor. 3. Use of Capacitor.	8
14	To verify the characteristics of star connection	1.Connection of Circuit. 2. Star Connection. 3. Purpose of neutral.	8
15	To verify the characteristics of delta connection	1.Connection of Circuit. 2. Star Connection. 3. Relation between Phase Voltage & Line Voltage.	12
16	To measure the power of 3 ph balance load	1. Connection of Circuit. 2. Meaning of balance load. 3. Power Measurement.	20
17	To measure the power of 3 ph unbalance load	1. Connection of Circuit. 2. Meaning of unbalance load. 3. Power Measurement.	10
18	To calculate the P.F. of load using formula.	1. Connection of Circuit. 2. Calculation of Power Factor.	10
19	To calibrate the given 1 ph. Energy meter.	1. Connection of Circuit. 2. Calibration of Energy meter.	20
20	To study types of meters	1. Dismantle of Meter. 2. Study of Meters.	20
21	To study instrument transformer.	1. Connectin of Meters. 2. Study of Instruments Transformer. 3. Concept of C.T & P.T.	10
22	To use clip-on meter.	1. Use of Clip on Meter. 2. Measurement of High Value Current.	10
23	To study & use of Megger	1. Study Of Megger. 2. Use of Megger.	

THEORY - II - Electrician Practice - 1st Year

(Subject Code – 30240012)

Sr no	UNIT	SUB UNIT	SCOPE & LIMITATION	Hours	Marks
1	Safety	1 Introduction	Familiarization with Trade, Instructor, Supervisor, Foreman, Principal. Activities, of the institute, importance of the trade, future prospect etc. Duties and responsibilities of trainees,	6	6
		2 Safety	Safety measures to be observed. Elementary first aid. Concept of standard and standardization.		
		3 Earthing	Earthing its importance, types, measurement of earth resistance.		
2	Hand tools	1 Introduction	Identification of trade, hand tools – specifications	6	6
		2 Application	Uses. Care and maintenance of hand tools		
3	Atomic structure	1 Introduction	Matter, Atoms-structure,	6	5
		2 Electron theory	Importance of physics-basic principles- Fundamental of electricity electron theory- solar system-elements, free electrons-		
4	Work power, energy	1 Definitions	Fundamental terms, definitions, units & effects of electric current. Work, power, energy.	6	12
		2 Effects of electric current	Various types of effects of electric current		
		3 Calculations	Work, power, energy. electricity consumption		
5	Soldering	1 Introduction	Introduction Solders, flux and brazing. .	6	6
		2 Soldering technique	soldering technique equipments required for soldering, safety precaution		
		3 Brazing	Materials, safety precaution		

6	Types of wires, cables	1 Types of wires	Types of wires & cables standard wire gauge.	12	12
		2 classification of wires	Classification of wires & cables-insulation and voltage grades -Low, medium and high voltage precautions in using various types of cables		
7	Common electrical accessories	1 introduction	Introduction of Common electrical accessories, their specifications, Common insulating material as per B.I.S.	15	15
		2 Electrical accessories	Various accessories used in wiring, their application		
		3 protective devices	use-of protective devices -Fuses & their types, ELCB,MCB		
8	Electric circuits	1 Types of electric circuit	Concept of ckts.-types of ckts as per property as per current flow .Conception of developments of domestic ckts, Alarm & a switch, A lamp, A fan with individual switches etc./Two way switch	15	15
		2 Connection of meters	Connection of meters in electric circuit, reading of analog/digital Ammeter and voltmeters wattmeter, energy meter, megger etc		
		3 ohms law	Ohm's law, series and parallel circuits, Resistors types of resistors & properties of resistors, Laws of resistance		
		4 Kirchhoff's Law	Application of Kirchhoff's Law, Simple problems on circuits. Wheat stone bridge and its application.		
9	Cells and batteries	1 Introduction	Chemicals effect of electric current-principles of electrolysis. Faraday's Law of electrolysis. Electro-chemical equivalents. Explanation of Anodes and cathodes. Rechargeable dry cell-description advantages and disadvantages	15	12

		2 Grouping of cells	Grouping of cells of specified voltage and current.		
		3 lead acid cells	Lead acid cell-description methods of charging- precautions to be taken & testing equipment. Lead Acid cells general defects & remedies. Care and maintenance of cells.		
		4 Nickel Alkali cell	Nickel Alkali cell-description charging. Power & capacity of cells. Efficiency of cells. Care and maintenance of cells.		
10	Illumination	1 Introduction Illumination	Explanation of light white lights-illumination factors, intensity of light –importance of light. Human eye factor	18	18
		2 Types lamps	Mercury vapour, sodium vapour, Fluorescent tube. Neon sign halogen CFL		
		3 Types of lighting	Types of lighting Direct & indirect lighting Decoration lighting Estimating placement of lights and fans and rating Fault finding techniques in Decoration lighting, Commercial displays		

PRACTICAL - II - Electrician Practice - 1st Year

(Subject Code – 30240012)

Sr no	Practical	SKILLS TO BE ACHIEVED	Time allotted
1	Visit to the different sections of the institute	1 Layout of the institute, 2 introduction to other sections	8
2	Demonstration on elementary first aid. Artificial respiration	1. Application of first aid . 2. Artificial respiration.	8
3	Demonstration on trade hand tools. Identification of simple types-screws, nuts and bolts, chasis, clamps, rivets etc.	1 identification of the tools. 2 use different hand tools. 3 care and maintenance	8
4	Practice in using steel rules, cutting pliers, screw drivers etc. skinning the cables, and joint practice on single strand.	2 identification of the tools. 2 use different hand tools. 3 care and maintenance	8
5	Demonstration & practice on bare conductors such as- Britania joint	1 Mark the length of insulation to be removed 2 To join single strand conductor 3 To join bare conductor 4 prepare Britannia joint 5 prepare straight joint	8
6	Demonstration & practice on bare conductors such as- Tee Joint,	1 Mark the length of insulation to be removed 2 To join single strand conductor 3 To join bare conductor 4 prepare Tee joint	8
7	Demonstration & practice on bare conductors such as- Western union joint.	1 Mark the length of insulation to be removed 2 To join single strand conductor 3 To join bare conductor 4 prepare Western Union joint	8
8	Practice in soldering	1 soldering practice	8
9	Measurement of 'R' and measurement of specific 'R'.	1 connection of voltmeter 2 connection of ammeter 3 measure the resistance 4 measurement of specific resistance	8
10	Demonstration and identification of types of cables & use of wire gauge	1. Identify the Cables. 2. Use of Wire Gauge.	8
11	Practice in crimping Thimbles, lugs .	1. Skin the Cable. 2.Crimping the lugs.	8
12	Demonstration and practice on fixing common electrical accessories.	1 identification of specified electrical accessories 2 use of electrical accessories	12

13	Verification & Ohm's Law	1. Connection of Meter. 2. Measure Voltage & current 3. Verify Ohm's Law.	8
14	Practice in testing and connecting domestic appliances	1. Connection of domestic appliances. 2. Testing of domestic appliances.	8
15	Grouping of dry cells for a specified voltage and current	1. Connection of cells. 2. Grouping Of dry cell.	12
16	Preparation of battery charging & testing of cells	1. Battery Charging . 2. Testing of Cells.	8
17	Marking tools description & use. Types of drills description & drilling machines, proper use, care and maintenance	1. Use of drill machines 2. Care and maintenance of drill machine	8
18	Description of taps and dies types in rivets and riveted joints. Use of thread gauge.	1. Use of tap & dies 2. Types of rivets & riveted joints 3. Use of thread gauge	16
19	Description of carpenter's common hand tools such as saws planes, chisels mallet claw hammer, marking, dividing and holding tools their care and maintenance.	1. identification of marking tools 2 use of marking ,holding & cutting tools 3 care and maintenance	16
20	Tracing the magnetic Field of a needle & bar magnet & Practice in magnetising mg. Materials.	1. Trace the Magnetic Field. 2. Practice in Magnetising Material.	8
21	Tracing the magnetic field set up by a current carrying conductor and a loop.	1. Trace the Magnetic Field. 2. Practice in Magnetising Material.	8
22	Tracing the field of an Electro-magnet and study the variation of field strength by varying current number of turns etc.	1. Trace the Magnetic Field. 2. Practice in Magnetising Material. 3. Prepare electro magnet. 4. Calculation of Field Strength.	12
23	To demonstrate variation of 'R' of a metal with the change of temperature. Concept development Expl. on specific resistance of a metal.	1. Calculation of 'R'. 2. Concept of Specific Resistance.	16
24	Demonstration and use of Ohm meter	1. Use of Ohm meter. 2. Measure Electrical quantity.	12
25	Practice in dismantling the D.C. generators	1. Identify parts of d.c. machine 2. function of parts of d.c. machine	12
26	Study of parts of the D.C. generators & Voltage Building	1. Identify parts of D.C. Generator. 2. function of parts of D.C. Generator.	12

27	Identification of terminals of D.C. Generators by Megger	1 testing of D.C. Generator. 2.trace the armature & field terminals.	8
28	To study different types of D.C. generators.	1. Identify parts of D.C. Generator. 2.function of parts of D.C. Generator.	16

THEORY - II - Electrician Practice - 2nd Year

(Subject Code – 30240012)

Sr no	UNIT	SUB UNIT	SCOPE & LIMITATION	Hours	Marks
1	D C Generator	1 Introduction	Principle of D. C. generator. Fleming's right hand rules..	9	9
		2 Construction	Construction details of dc machine r-function -parts. E.M.F. equation-		
		3 Types	Types and characters of D.C. generators self excitation and separately excited Generators-practical uses.- Series Generators and types -Shunt Generators and types -Their applications-Simple problems on generator types, capacity etc.		
		4 Armature reaction	Define,. Armature reaction, interpoles and their uses, connection of interpoles, commutation.		
2	D C Motor	1 Introduction	Electromagnetic drag. Fleming's left hand rule .Principle of D.C. motor	12	12
		2 Types	Types of dc motor, Types , characters and practical application of D.C. motors Terms used in D.C. motor Torque, speed ,		
		3 Back EMF	Back -e.m.f. etc. their relation practical application, Related problems		
			Starting of D.C. MOTORS-3 point & 4 point starters		
		4 Speed control	Types of speed control , their advantages & disadvantages & industrial application		

3	Wiring	1 Introduction	Introduction electrical wirings, I.E.E. rules Principle of laying out in domestic wiring	18	18
		2 Types of wiring	Types of wiring both domestic & industrial Specification for wiring accessories – wires cables, buttons etc. IS 732 –1963/5		
		3 Wiring systems	C.T.S. system P.V.C. concealed system Maintenance & Repairing data sheet preparation, testing by megger		
			Specification, standards for conduits & accessories., laying diagram for industrial conduit wiring		
		4 Conduit wiring	Procedures of layout of conduit wiring as per IS 732 –1963. Use of flame proof and explosion proof. Installation of P.V.C. conduit switches. Types of Earthing –technique , their relative advantages		
		5 Circuit breakers	Types, specifications, advantages of different types of circuit breakers construction and maintenance..		
		6 Over head service lines	I.E.E. rules for over head service lines Installation Lighting arrestor/lighting conductor		
		7 U.G. Cables	U.G. Cables and laying techniques		
		8 Multistoried house wiring	Multistoried house wiring system. Fault finding & repair. Repairing of domestic electrical appliances.		
			, Dynamos, Generators etc.		
		Electrical appliances	Working principle and construction of Domestic and agricultural appliances-their maintenance		
4	Earthing	Earthing	Earthing as per I.E. rules Testing & Inspections of Installations as per I.E. Rules. Improvement on earthing IS-3043-1966.	6	6

5	Alternator	1 Introduction of Alternator	Explanation of alternator prime/mover type advantages,	12	9
		2 Parts of alternator	Construction details of alternator, rating of alternator regulation, phase sequence,		
6	Transformer	1 Introduction transformer	Explanation & definition of transformer, working,	15	15
		2 Types of transformer	Construction ,Classification, Function of each parts Auto Transformers Instrument Transformers- CT, PT, Characteristics, Applications, Testing		
		3 E.M.F. equations	E.M.F. equations simple problems on E.M.F. equation, turns ratio		
		4 poly phase transformer	Construction, types of poly phase and their connection, Cooling, protective devices efficiencies, Transformer construction cores winding shielding, auxiliary parts-breather, conservator buchhaltz relay, other protective devices. Cooling of transformer. Transformer oil testing and top changing off load and on load. Transformer bushings and termination, parallel operation Transformer		
7	A.C. motors	1 Introduction A.C. motors	Explanation of A.C. motors , comparison with D.C. classification – pulsating field & split phasing. Working principle	18	18
		2 Single phase motors	Construction of 1-ph Motors Single phase motors Split capacitors, repulsion and series motor working principle – parts- characters starting- running & reversing. Stepper motor & Universal Repulsion motor-advantages principle-characters, Fault Location & Rectification		
		3 Three Phase Motor	Slip Squirrel Cage-Double Squirrel Cage Induction Motor & their Characteristic. Slip-ring induction motor-Construction & Characteristic Starting & controlling devices.		

PRACTICAL - II - Electrician Practice - 2nd Year

(Subject Code – 30240012)

Srno	Practical	SKILLS TO BE ACHIEVED	Time allotted
1	Demonstration and practice in identification and testing of D.C. motor parts & terminals. Running, speed control & reversing	1. Identify parts of d.c. machine 2. function of parts of d.c. machine	4
2	Study of the characteristics of D.C. Motors	1. Dismantle d.c. machine 2. Assemble d.c. machine	4
3	connection, starting, speed control of motors with starters	1. Connection of starter. 2. Measure the speed. 3. Speed Control of Motor.	4
4	Use of tachometers revolution counters with stop watch	1. Use of Tachometer. 2. Measure the speed.	4
5	Identification and use of wiring accessories	1. Identify the Accessories. 2. Use of Accessories.	4
6	Practice in C.T.S. wiring with minimum to more number of points	1. Practice of Wiring.	4
7	Repairing and testing of domestic electrical appliances	1. Dismantle appliances. 2. Assemble appliances. 3. Fault finding.	4
8	Measurement of earth resistance	1. Connection of pf Meter. 2. Measurement of Earth resistance.	4
9	Demonstration of sine wave, instantaneous values etc. Study of the behavior of R, X _L , & X _C in A.C. ckts, both in series and in parallel	1. Connection of load. 2. Calculation of Impedance.	8
10	Explanation on poly phase ckts. Current, voltage & power measurement in poly-phase ckts.	1. Connection of Poly Phase Circuit. 2. Power measurement.	8
11	Demonstration on alternators parts voltage building, load character & regulation	1. Dismantle alternator. 2. Study of parts. 3. Load characteristics. 4. Calculation of regulation.	8
12	Identification of types of transformers. Connection of transformers	1. Identify the winding. 2. Connection of Transformer.	8
13	use of Instrument transformer & Use of C.T. & P.T.	1. Use of C.T. 2. Use of P.T. 3. connection of CT/PT in the ckt	8
14	Identification of induction motors (I –ph-) squirrel cage type & split phase type	1. testing of dc motor 2. maintenance d.c. motor	12
15	Demonstration of stepper & universal motor	1. Identify types of transformers 2. connect transformer	12
16	Demonstration on scales on meters	1. Scale reading. 2. Calibration of meters.	8

17	Study of moving Coil & Moving iron meters.	1. Scale reading. 2. Calibration of meters. 3. Comparison of moving coil & moving Iron meters.	8
18	Study of intensity of light	1. Use of Lux Meter. 2. Measure the intensity of light. 3. Calculation of illumination.	12
19	Practice in Decoration & lighting –do-S.N. & R.N. lamps	1. Preparation of lighting Scheme. 2. Use in decoration & lighting.	8
20	Installation of conduit pipe wiring for lighting and power circuits for both 230 V & 440 V Practice in Earthing	1. Preparation of Conduit wiring. 2. Provision of Earthing. 3. Need of earthing.	12
21	Measurement of earth resistance & Insulation resistance.	1. Use of Megger 2. use of earth tester	8
22	Making forma, coil insulation, slot insulation, Insertion of coils in slots, coil connection Practice, in single layer concentric winding.	1. Making of forma 2. Coil preparation 3. Coil insulation 4. Coil connection	16
23	Winding practice in distributed type, testing for faults, Growled testing-baking impregnating & varnishing.	1. Making of forma 2. Coil preparation 3. Coil insulation 4. Coil connection	12
24	Expts.. On A.C. ckts. 1 ph and poly phase	1. Concept of single phase & poly phase circuit	8
25	Expts. On Improvement of P.F. Measuring of power & energy in 1-ph & poly phase.	1. Importance of power factor 2. Power factor improvement 3. Measurement of energy	8
26	Building up of voltage in an alternator & to find out No-load & Load characteristics	1. voltage building in Alternator 2. Characteristics of Alternator	8
27	Cleaning & maintenance of transformer-changing of silica gel, Conducting No.-load & short ckt tests. Testing & 1-ph & poly ph. Transformers.	1. Maintenance of transformer 2. Changing of silica gel 3. Different test on transformer 4. Calculation of losses	8
28	Measuring the line & the ph. Voltage in star & Data connection. Study of Star-Delta Starter	1. Connection in star & delta 2. Measurment of voltage 3. Working of star delta starter	8
29	Testing of Insulation of motor with H. V. Tester, Identification, connection, testing, running & reversing of repulsion motor.	1. Use of HV tester 2. Connection of motor 3. Change the direction of motor	8
30	Starting, running and building up voltage & loading of M.G. set. Maintenance of M.G. sets.	1. Start MG set 2. Building of voltage 3. Maintenance of MG set	8

31	Development of sequence of operation in detecting electrical & mechanical troubles in motors and Generators. Overhauling of A.C. and D.C. m/cs.	1. Overhauling of AC machine 2. Fault finding 3. Trace mechanical problem	8
32	Study of different ckt. breakers.	1. Use of circuite braker 2. Function of C.B.	8
33	Practice of fixing lightening arrestors and lightening conductors.	1. Purpose of lightening arrestor 2. Fixing of lightening arrestor	4
34	Identification of semiconductor. Diodes-symbol codes-Tests on Diodes. Characters of Diodes.	1. Identify semi conductor 2. Testing of diodes	4
35	Study of Half wave rectifier ckt	1. Circuit of rectifier 2. Function of rectifier	4
36	Study of a transistors-Identification of construction and terminals.	1. Study of transistor 2. construction of transitor	4
37	Assembly & testing of a single stage Amplifier and checking in an oscilloscope. Study of Types of wave shapes.	1. Assembly of Amplifier 2. Testing of Amplifier 3. Use of oscilloscope	4
38	Study of oscillator ckt.	1. study of oscillator 2. Fuction of oscillator	8

THEORY - III - Workshop Calculation, Science and Drawing - 1ST Year

(Subject Code – 30240013)

Sr no	UNIT	SUB UNIT	SCOPE & LIMITATION	Hours	Marks
1	Arithmetic	1 Simple arithmetic-Basic operations	Simple arithmetic addition, subtraction, Multiplication, Division of whole and partial number. Fraction & decimals , conversion of fraction to decimals and vice versa/ Decimals, Division, multiplication LCM/MCM	6	4
2	Square roots	2 Square roots	Square roots, power Multiplication power root of a number	3	4
3	Ratio and proportions	1 Ratio and proportions	Ratio and proportions, ratio, finding forms and ratio proportions direct and inverse proportions Application of ratio and proportion to shop problems	6	4
			Pythagoras theorem, properties of similar triangles.		
4	Algebra	1 basic operations	Introduction, expressions, symbols addition, subtraction, multiplication, division important formulae	6	6
		2 Factors	Factors and equations-types of factorizations		
5	Metals	2 Metals and their properties	Properties of C.I. & its types, uses. properties of Non –ferrous metals and how its identifications. Properties of metal and their applications	9	6
			Properties of copper, Zinc , mild steel , aluminum etc.		
			Properties of Brass steel , bearing metals, Properties of C.I steel etc.		
6	Work , power , energy	Work , power , energy	Calculations on Work , power , energy	3	4
7	Dynamics	Dynamics	Equation of Motion, velocity and problems	9	6
8	Simultaneous equations	Simultaneous equations	Introduction, Methods ,examples	6	6

9	Quadratic equation	Quadratic equation	Introduction, Methods ,examples	6	6
10	Strength of materials		Meaning to stress, strain, energy, elasticity Stress and its important factors example.	3	4
11	Simple Machines	1 Introduction	Simple Machines – basic principles, velocity ratio. Mechanical advantages, efficient simple problems.	9	8
			Simple machines like winch pulley & compound axel etc. with examples.		
12	Heat treatment	Heat treatment	Heat treatment of steel-hardening, appealing, tempering, normalizing, case hardening-standard and measurements-equations-simple simultaneous quadratic.	6	6
			Atmospheric pressure. Pressure gauge pressure & absolute pressure.		
			Power & exponent & laws of exponent.		
13	Density	1 density	Density of solid and liquids simple experiments and determination.	6	6
		2 specific gravity	Specific gravity principle of Archimedes.		
			Relation between specific gravity and density. Simple experimental determination. Volume, mass, density applied problems		
14	Geometry	Geometry	Geometry- Fundamental geometrical definitions angles and properties of angles, triangles and properties of triangles.	3	4
			ENGINEERING DRAWING		
15	Engineering drawing	1 Engineering drawing	Introduction Reading of simple drawing , Engineering drawing & its importance and instruments used in drawing	3	4
		2 Use of tools	use of drawing tools simple geometrical construction		
16	Geometrical	Geometrical	Geometrical construction regular	9	8

	construction	construction	polygon circles		
			Geometrical construction of polygon inscribed circles		
			Curves and types of curves & their application and method of drawing curves		
			Geometrical construction, cycloid, hyperbola parabola curves, ellipse. Methods of ellipse		
17	Free hand sketch	Free hand sketch	Free hand sketch of lines, polygons , ellipse etc.	9	8
			Free hand sketch of basic tools cutting tools, measuring tools and simple geometrical const. cone, pyramid , frustum / prism etc. / sphere		
18	Lettering		Letters and its types and drawing of letters	3	4

PRACTICAL - III -Workshop Calculation, Science and Drawing - 1ST Year

(Subject Code – 30240013)

Sr no	Practical	SKILLS TO BE ACHIEVED	Time allotted
1	use of drawing tools simple geometrical construction	1. To study different line supports.2.types of line supports.	8
2	Geometrical construction regular polygon circlesGeometrical construction of polygon inscribed circles	1.To study components required for over head line.2.study the properties of the components	8
3	Geometrical construction of polygon inscribed circles	1.To study function of lightening arrestor.2.installation of L.A.	4
4	Curves and types of curves & their application and method of drawing curves	1. To study the different tools.2.use of these tools for transmission line.	8
5	Geometrical construction, cycloid, hyperbola parabola curves, ellipse.	1. Study different types of generating stations.2.differentiate between generating stations.	12
6	Free hand sketch of lines, polygons , ellipse etc.	1.Function of M.C.B.2.Use of M.C.B.	4
7	Free hand sketch of basic tools and simple geometrical const. cone, pyramid , frustum / prism etc. / sphere	1.Function of O.C.B.2.Use of O.C.B.	4
8	Letters and its types and drawing of letters	1. Calculation of losses.2.calculation of efficiency of transformer.	8
9	Simple dimensions with technics and location of parts as per dimensions , angle , taper	1. Need of synchronizing.2.conditions for synchronization.	8
10	Transforming of various measurement, linear , Angular , Circular etc	1. Need of synchronizing.2.conditions for synchronization.	8
11	Isometric drawing on simple blocks	1. Need of joining conductor.2.preparation of joint.3.complete the joint.	8
12	Free hand sketches of trade related hand tools cutting tools, measuring tools	1. Need of joining conductor.2.preparation of joint.3.complete the joint.	8
13	Free hand sketches of trades related hand tools m measuring tools	1. Function of insulator.2.install the insulator.	8
14		1. Function of insulator.2.install the insulator.	12

15		1. Function of insulator.2.install the insulator.	12
16		1. Measure the voltage of line.2.differentiate between the lines according to voltage.	8
17		1. Skinning of service wire.2.install the service wire.	8
18		1. Purpose of transmission.2.study the material required for line.3.install the line.	12
19		1. Discharge the line.2.climbing on the pole/line supports.	16
20		1. Trace the position of pole.2.digging in the ground.3.install the stay.	12
21		1.Use of safety hand tools.2.change the D.O.	4
22		1. Connectivity of major transmission line.2.study the loop of lines in our state.	8
23		1. Connectivity of major transmission line.2.study the loop of lines in our Nation.3.requirement of grid system.	8
24		1. Study the rules.2.I.E.rules to be followed for transmission.	8
25		1. Study the types of substations.2.need of substation.3.working of substations.	8
26		1. Study the parts of generator.2.test & maintain the generator.	8
27		1. Study the parts of alternator.2.test & maintain the alternator.	8
28		1. Study the different accessories in the power station.2.test & maintain the accessories.	8
29		1. Test the battery.2.check the charging status.3. Replace the faulty parts.	4
30		1. Study the parts of synchronous motor.2.test & maintain the synchronous motor.	8
31		1. Study the different accessories in the sub station.2.test & maintain the accessories.	8

32		1. Study the parts of panel board.2.test & maintain the panel board.	8
33		1. Purpose of earthing.2.measure earth resistance.	8
34		1. Study the different accessories in the sub station.2.test & maintain the accessories.	8

THEORY - III - Workshop Calculation, Science and Drawing – 2nd Year

(Subject Code – 30240013)

Sr no	UNIT	SUB UNIT	SCOPE & LIMITATION	Hours	Marks
1	Heat and its effect	Heat and its effect	Heat & temp. Thermometric scales their conversions. Temp. Measuring instruments.	6	6
			Quantity of specific heat of solids liquids & gases. Heat loss and heat gain with simple problem		
2	Mensurations	Mensurations	Mensurations, plain figures-triangles, square rectangles, parallelogram. Solid figures-prism, cylinder, pyramid, cone. Calculations	12	15
3	Trigonometry	Trigonometry	Trigonometry, Trigonometrically ratios use of trigonometry table.	12	9
			Finding height and distance trigonometrically		
			Area of triangle by trigonometry.		
			Application of trigonometry to shop problems.		
			Application of trigonometry to shop problems.		
4	Force	Force	Newton's laws of motion Triangle of forces. Parallelogram of forces.	9	9
			Composition and resolution of forces.		
			Representation of forces by vectors. Simple problem on lifting tackles like jib cranes, wall crane and solution of		

			problem with the aid of vectors.		
			Simple problems on strength and crank lever.		
			Center of gravity-simple experimental determination stable-unstable and neutral equilibrium simple explanation.		
5	Friction	Friction	Friction-co-efficient of friction. Simple problem related to friction	3	5
6	Graph	Graph	Graphs-Abscissa & ordinates, graphs of straight line, related to 2 sets of varying quantities.	6	4
7			Shop problems on estimation of material, time taken for machining a job elementary time and motion study.		
8	Transmission of power	Transmission of power	Transmission of power by belt pulley and gear drive.	3	4
			ENGINEERING DRAWING		
9	Surface development	Surface development	Surface development of simple geometrical solids like cube, rectangular block, cone, pyramid, cylinder, prism etc.	12	12
			Interpenetrating of solids and conventional application of intersectional curves on drawings.		
10	Screw thread	1 Screw thread	Screw thread their standard forms as per I.S. external and internal thread conventions on the feature for drawings as per I.S.I. Sketches for bolts nuts screw and other screw screwed members	9	9
		2 Riveted joints	Riveted joints Riveted joints butt Standard rivet forms as per ISI		
		3 Sketches	Sketches of keys, cutter and pin joints.		
			. Sketches for simple pipe unions with simple pipe line drawings		

11	Blue print reading	Blue print reading	Blue print reading simple exercises related to missing lines	3	3
12	Isometric drawing	1 Isometric drawing	Pictorial drawing Isometric drawings of simple block Isometric drawing on simple blocks, completed jobs	15	12
13	Orthographic drawing	1 Orthographic drawing	orthographic drawing application of both first angle and third angle methods in representing the drawing for simple & complex machine blocks given for exercise with dimensions	15	12
			Exercises for different sectional views on the given orthographic drawing of machine parts, castings etc.		

**PRACTICAL - III - Workshop Calculation, Science and Drawing – 2nd Year
(Subject Code – 30240013)**

Srno	Practical	SKILLS TO BE ACHIEVED	Time allotted
1		1. Test the transformer.2.maintain the transformer.3.run the transformer.	12
2		1. Need of parallel connection.2.condition of parallel connection.3.connection & run the transformer.	8
3		1. Test the oil.2.filteration of oil.3.replacement of oil.	8
4		1. Requirement of panel board.2.install & test the panel board.	8
5		1. Requirement of panel board. 2.Test & repair the panel board.	8
6		1. Requirement of panel board.2.install & test the panel board.	8
7		1. Requirement of panel board.2. Test & repair the panel board.	8

8		1. Conditions of laying the cable.2.study the types of laying the cables.	8
9		1. Conditions of laying the cable.2.study the types of laying the cables.	12
10		1. Remove the armour of cable.2.skinning of cable.3. Fixing of gland.	8
11		1. Study the methods of fault finding.2.test & repair the faults.	12
12		1. Study the types of joining the cables.2.join the cable.	12
13		1. Study the function of circuit breaker.2.test & repair the circuit breaker.	8
14		1. Dismantle the transformer from foundation.2.check the technical specifications.3.replace the transformer.	12
15		1. Study the formation of cable.2.function of each part of cable.	12
16		1. Calculate the load.2.requirement of accessories required for installation of meter.3.install the meter.	12
17		1. Calculate the load.2.requirement of accessories required for installation of meter.3.install the meter.	12
18		1. Connection of meters.2.measurement of power.	12
19		1. Connection of meters.2.measurement of frequency.	4
20		1. Connection of meters.2.measurement of power factor.	4
21		1. Connection of meters.2.measurement of earth resistance.3.use of earth tester.	4
22		1. Requirement of earthing.2.prepare the earthing.3.install the ear thing.	8
23		1. Requirement of earthing.2.prepare the earthing.3.install the ear thing.	8

24		1. Connection of meters.2.read the meters.3.calculate the ratio.	8
25		1. Connection of meters.2.read the meters.3.calculate the ratio.	8
26		1. Connection of meters.2.take open ckt. Test.3.calculate iron losses.	8
27		1. Connection of meters.2.take short ckt. Test.3.calculate copper losses.	8
28		1. Connection of meters.2.read the meters.3.calculate the voltage regulation.	8
29		1. Find out iron losses.2.find out copper losses.3.calculate the efficiency.	8
30		1.Function of M.C.B.2.Use of M.C.B.	8
31		1.Function of O.C.B.2.Use of O.C.B.	8
32		1. Find out iron losses.2.find out copper losses.3.calculate the efficiency.	8

List of Tools & Equipment for The Trade of Electrician

SL. No.	Items	Quantity
	Tool Kit	
1	Rule wooden 4 fold 60 mm	10
2	Scriber 150 mm x 4 mm (Knurled centre position)	10
3	Pincer 150 mm	10
4	Plier insulated 150 mm	10
5	Screw driver 150 mm	10
6	Punch centre 150 mm x 9 mm	10
7	Knife double bladed electrician	10
8	Hammer, cross pein 115 grams with handle	10
9	Electrician connector, screw driver 100 mm insulated handle thin stem.	10
10	Electrician testing pencil I Ineon Tester	10
11	Heavy duty screw driver 200 mm	10
12	Electrician screw driver 250 mm thin stem insulated handle	10
13	Rule steel 300 mm	10

14	Saw tenon 250 mm	10
15	Hammer ball pein 0.75 kg with handle	10
16	Firmer chisel wood 12 mm	10
17	Gimlet 6 mm	10
18	Bradawl	10
19	Plier sude cutting 150 mm	10

Shop tools, Instruments & Machinery

1	C. Clamps 200 mm, 150 mm, 100 mm	2
2	Spanner 150 mm adjustable 15 degree as cly-burns	2
3	Blow lamp 0.5 litre	2
4	Melting pot	1
5	Ladder	2
6	Chisel cold flat 12 mm x 200 mm	2
7	Chisel wood firmer 25 mm and 6 mm	4
8	Drill machine hand 0 to 6 mm capacity	2
9	Electric drill machine portable 6 mm capacity	1
10	Pillar electric drill machine 12 mm capacity	1
11	Allen key	1 Set
12	Oil can 0.12 litre	2
13	Grease gun	1
14	Out side micrometer 0 to 25 mm	1
15	Bench grinder motorized	1
16	Rawl plug tool and bit	2 Set
17	Pullypuller	1
18	Bearing puller	1
19	Multi meter 0 to 1000 M Ohms 2.5 to 5000 volts	1
20	Ammeter 1 MA to 500 MA	1
21	Ammeter 0 to 1 amp. D.C.	1
22	K.W. meter 0 to 1 K.W. capacity with C.T. 1:2	1
23	Single phase power factor meter	1
24	Frequency meter	1
25	Tong tester (Clipon meter)	1
26	Mill Voltmeter centre zero 100-0-100 m volt	1
27	Spring balance 0 to 15 kg. And 0 to 2.5 kg.	2 Set
28	Stop watch	1
29	Techno-meter or revolution counter with stop watch	1

30	Scissors blade 150 mm	4
31	Crimping tool	1 Set
32	Screw driver 100 mm	4
33	Chisel cold flat 12 mm	4
34	Mallet hard wood 0.50 kg.	4
35	Hammer exetor type 0.40 kg. With handle	3
36	Hacksaw frame 200 mm, 300 mm adjustable	4 (2 each)
37	Square try 150 mm blade	4
38	Divider 150 mm, outside & inside calliper	3 (each)
39	Plier flat nose 100 mm	4
40	Plier Gas round nose 100 mm	4
41	Plier Gas 150 mm	4
42	Tweezer 100 mm	4
43	Snip straight 150 mm	2
44	Snip bent 150 mm	2
45	Spanner D.E.W./W standard set	2
46	Drill hand brace 0 to 100 mm	4
47	Drill S.s. Twist block 3 mm, 5 mm, 6 mm set of 3	4
48	Lane, smoothing cutters, 50 mm	4
49	Gauge, wire imperial	2
50	File flat 200 mm 2 nd cut	3
51	File half round 200 mm 2 nd cut	4
52	File half round 200 mm smooth	4
53	File round 200 mm 2 nd cut	4
54	File round 100 mm 2 nd cut	4
55	File flat 150 rough	4
56	File flat 250 mm smooth	4
57	File flat 250 mm rough	4
58	File flat 250 mm bastard	4
59	Rasp, half round 200 bastard	4
60	Iron, soldering 225 grams 125 watt	4
61	Vice hand 50 mm jaw	4
62	Stock and dies conduit	1
63	Ammeter M.C. 0-25 A.D.C.	1
64	Ammeter M.c. 0-5 A.D.c.	1
65	D.C. energy meter 220 V 5 A W/H or A/H type	1
66	A.C. voltmeter M.I. 0-500 V	1
67	A.C. Ammeter M.I. 0-25 A	1

68	A.c. Ammeter M.I. 0-5 A	1
69	A.C. Energy meter (single phase 5 amp. 230 V)	1
70	Megger 500 volts	1
71	Wheat stone bridge complete with galvanometer and battery	1
72	Fan A.C. 230 vlt 1200 mm	2
73	Fan D.C. 220 volt 1200 mm	2
74	Bath impregnating	1
75	Oven stoving	2
76	Vice, table jaw 100 mm	3
77	Lockers with 3 drawers (Standard size)	2
78	Bench working 2.5x1.20x0.75 meters	4
79	Almirah 2.5x1.20x0.50 meter.	1
80	Instructor's table	1
81	Instructor's chair	2
82	Fire extinguisher	2
83	Fire buckets	4
84	Metal rack 180x150x45 cm	4
85	Wire stripper 20 cm	1
86	Copper bit soldering iron 0.25 kg.	4
87	Domestic appliances :	2
	(a) Electric hot plate 1500 watt. 220 V with temperature control	
	(b) Electric kettle, 100 watts, 230 V	2
	(c) Electric iron 1200 watts, 230 V with temperature control	2
	(d) Immersion heater 750/1000/1500 W-230 V	2
	(e) Geyser 25 litre 240 V (Storage type)	
	(f) B.A. taps and dies 0-2-4-6-8 sizes	1 Set
88	Spring balance 0-1 kg.	1
89	Laboratory type induction coil 6 volt to 800-10,000 volt	1
90	Series type Ohm meter 0-2000 approximate	1
91	Shunt type Ohm meter 0-25 approximate	1
92	3-point D.C. starters	1
93	4-point D.C. starters	1
94	Pipe cutter to cut pipes upto 5 cm dia	4
95	Pipe cutter to cut pipes upto 5 cm dia	1
96	Cut out, reverse current, over load voltage relays	1 each

97	Stock and die set for 20 mm to 50 mm G.I. pipe	1 Set
98	Starters for 3-phase, 400 V, 50 cycles, 2 to 5 H.P. A.C. motors (a) (a) Auto transformer type starter (b) (b) Star delta starter with manual, Semi-auto & Automatic (c) (c) Direct on line starter	1 1 1
99	Motor A.C. series type 230 V, 50 cycles, ¼ HP with starter and switch	1
100	Electrical machine trainer Suitable for demonstrating the construction and functioning of different types of DC machines and AC machines (single phase and three phase). Should be complete with friction brake dynamo meter, instrument panel and power supply units.	1 per institute
101	Scientific Calculator	2 Nos.
102	Multi meter	2 Nos. (Large size)
103	Motor generator set consisting of : Motor induction squirrel cage, 7 HP 400 volts, 50-cycles, 3-phase with star delta starter and switch directly coupled to DC shunt generator 5 KW 440 volts, and switch board mounted with regulator, air circuit breaker, ammeter, voltmeter knife blade switches and fuses, set complete with case iron and plate, fixing bolts, foundation bolts and flexible coupling.	1
104	Motor generator set consisting of : Motor shunt 5 HP, 440 Volts with starting compensator and switch directly coupled to generator AC 3.5 KVA, 400/230 volts, 3-phase, 4 wire, 0.3 PF 50 cycles with exciter and 1 switch board mounted with regulator, circuit breaker, ammeter, voltmeter frequency meter, knife blade switch and fuses etc. Set complete with cast iron bed plate, fixing bolts, foundation bolts, 7 flexible coupling.	1
105	Motor series DC, 220 volts, 0.5 to 2 HP 0.5 to 2 HP.	1
106	Motor shunt DC 220 volt 2 to 3 HP	2

107	Motor of AC squirrel cage, 3-phase, 400 volt, 50 cycles, 2 to 3 HP with star delta starter & triple pole iron clad switch fuse.	1
108	Motor AC phase-wound slip ring type 5 HP 400 volts, 3-phase, 50 cycles with starter and switch.	1
109	Motor DC compound-wound, 220 volt 2 to 3 HP with starter 7 switch	2
110	Motor AC single phase, 230, volt, 1 HP repulsion type complete with starter and switch.	1
111	Motor AC single phase 230 volt, 50 cycles series type with starter/switch 1 HP.	1
112	Motor AC single phase 230 volt, 50 cycles capacitor type with starter switch 1 HP.	1
113	Motor universal 230 volt, 50 cycles with starter/ switch 1 HP	1
114	Transformer single phase, 3 KVA, 230/115 volts, 50 cycles core type, air cooled with tapings for scd. Connection.	3
115	Transformer three phase, 5 KVA 400/230 volts, 50-cycles, delta and star, shell type oil cooled	2
116	Current transformer	2
117	Potential transformer	2
118	Used DC generators-series, shunt and compound type for overhauling practice	1 each
119	D.C. shunt generator, 2.5 KW, 220 V with control panel	1
120	D.C. compound generator, 2.5 KW 250 V with control panel including field rheostat, voltmeter, ammeter and circuit breaker	1
121	Variable auto transformer 0-250 V, 5 amps	2
122	Diesel generator, 5 KVA, with change over switch, current circuit breaker, water cooled with armature, star-delta connections.	1
123	Oscilloscope	1
124	Function Generator	1
125	Oil testing Kit	1 No.
126	Flux meter	1 No.
127	Stepper motor	1 No.
128	Earth leakage ckt. breaker	1 No.

129	Desoldering gum	4 Nos.
130	A.C.B. 5 KVA	1 No.
131	O.C.B. 5 KVA	1 No.
132	M.C.B. 5 KVA	1 No.
133	V.C.B. 5 KVA	1 No.
134	Thyrister drive 1 H.P. with techogenerator	1 No.
135	Voltage Stabilizer manual and automatic	1 No. each
