SYLLABUS FOR THE TRADE OF ELECTRICIAN UNDER CTS – DURATION 2 YEARS

Week no.	Trade Theory	Trade Practical	Engineering Drawing	Workshop Calculation & science
1	**2**	**3**	**4**	**5**
1	Various safety measures involved in the Industry. Elementary first Aid. Concept of Standard	Implementation in the shop floor of the various safety measures. Visit to the different sections of the Institute Demonstration on elementary first aid. Artificial Respiration	Definition of Engineering Drawing. Uses of Engineering Drawing. Freehand sketching of straight lines, rectangle ,squares circle, polygons etc.	Units –Definition different types & system of units, F.P.S.,C.G.S&S.I-conversion
2	Identification of Trade – Hand tools-specifications	Demonstration of Trade hand tools. Identification of simple types – screws, nuts & bolts, chassis, clamps rivets etc. use, care & maintenance of various hand tools.	Geometrical construction of Square, Rectangle, Triangle, Circle, Ellipse, polygons, etc.	Applied workshop problems involving addition, subtraction, multiplication and division. Different type of materiel's their used in industry, their uses

				& properties.
3 & 4	Fundamental of electricity. Electron theory – free electron. Fundamental terms, definition, units & effects of electric current	Practice in using cutting pliers, screwdrivers etc. skinning the cables, and joint practice on single strand. Demonstration & Practice on bare conductors joint – such as Britannia, straight , tee, western union . Joints	------ Do ----	Applied workshop problems involving common fractions application of fraction to shop problem. Properties and uses of copper, zinc, lead, tin, aluminum, brass, bronze, solder, bearing metals, timber, and rubber.
5	Solders, flux and soldering technique. Resistors type of resistors & properties of resistors.	Practical in soldering measurement of 'R' and measurements of specific 'R' and Measurement of specification resistant. Application of Wheatstone bridge in measurement of Resistance	Lettering practice	Different type of insulators used in Electrical used industry Mass and Weight Difference between mass and weight. Specific Gravity & Density-related problem. Archimedes principle. Relation between Sp. Gravity and density.
6	Explanation definition and properties of	Demonstration and identification of types of	Different types of line. Drawing of	Rounding of decimal values uses

	convectors insulators and silicon conductors Types of wires as cables standard wire gauge classification of wires and cable insulations &voltage grades Precaution in using types of cable.	cable Demonstration practical and standard wire gauge. Practice, lugs. Examination and checking of cables and conductor and verification of materials according to the span.	different type of line	of approximation. Speed, velocity, Acceleration, Equations of motions related simple problem properties & uses of cast iron, wrought iron, plain carbon steel, etc
7	**Ohm's Law** Simple electrical circuits and problems. **Resistors-** Law of Resistance. Series and parallel circuits. **Kirchhoff's** Laws and	Verification of ohm's law verification of Kirchhoff's law. Verification of laws of series and parallel circuits. Verification of open circuits and close circuits network.	1st angle projection, 3rd angle projection views Isometric views.	Reduction of common fraction to decimal and vice-versa – related shop problems.
8	Concepts of ckts types of ckts as per property as per current flow ohms low Series reading of analogy digital Am meter and voltmeters only use of protective devices of ckts fuses and their types earthling etc. simple problems on ckts.	Practice on installation and overhauling common electrocution accessories . Fixing of switch holder plugs etc . in T. W. boards. Identification and use of wiring accessories.	Drawing of plan elevation & side views from isometric views.	L.C.M.,H.C. F Square root &Cube roots Newtonm,s Of motion and related problems.

	Conception of development of domestic ckts alarms a witch A lamp a fan a fan with individual switches etc two way switch.			
9	**Chemical** effect of electric current principle of electrolysis. Electrochemical equivalents explanation of anodes and cathodes Lead acid cell	Assembly of dry cell electrodes electrolytes. Grouping of dry cells for a specified voltage and current. Ni cadmium & Lithium cell. Practical on battery Charging,	----------Do ----------	Factorization, Simple algebraic problems Laws of parallelogram of forces.
10	Rechargeable dry cells, description, advantages and disadvantages, care and maintenance of cells grouping of specified voltage and current lead and cells	Routine care & maintenance of batteries	Dimensioning practice on orthographic views	Ratio & proportion related shop problem. Friction, Law opt fraction co – efficient of friction, angle of friction problem related to friction.
11	Lead acid cells general defects remedies Nickel Alake cells description charging power and	Charging of lead acid cell , filling of electrolytes, testing of charging, checking of discharged, checking and	Conventional symbols of Electrical installation as per	Average and related shop problem. Work , Power & Energy- Their units and

	capacity of cells efficiency of cell.	fully charged battery	BIS code & IEEE, IE norms Drawing of the typing diagram of plug and socket out. Graphical symbol used in electrician technology, Ckt	related problem
12	ALLIED TRADES:- Marking use of chisels and hacksaw on flats sheet metal fitting practical fitting true to line	Introduction: of fitting trade. safety precaution to be observed description as files hammers etc. hacksaw framer & blades their specification and grades. Care maintain ace of steel rule try square and files.	Drawing the typical diagram of D – type cartridge fuse, H.R.C. type fuse. Fuse curves Graphics as per relevant IS Standard. Symbols indicating the method of operation of the instruction and accessories as per relevant IS: Standard	Factorisation of Polynomials.(Simple Problems).
13	Sawing Planning practice in using firmer chisel and preparing sample half	Marking tools descriptions use types of drills descriptions of drilling machines proper use and care and maintains	Simple isometric Drawings, isometric views Of simple object-cubes,	Square roots Cube Roots by the method of Factorisation.

			Rectangular blocks etc.	Centrifugal &force. Related problems.
14	Drilling practice in hand Drilling &power drilling Machines. Grinding of drill Bits.	Types of drills description & Drilling machines , proper Use, care and maintenance.	Free hand sketching of Nuts &bolts with Dimensions from sample.	Standard algebraic Formula and related Problems. Moment of force.
15	Practice in using taps & dies, Threading hexagonal & square Nuts etc. Cutting external Threads on stud and on pipes, Riveting practice	Description of taps &dies, Types in rivets & riveted Joints. Use of thread gauge.	Free hand sketching of Rivets and washers with Dimensions from samples.	-DO- Couple and Torque. Related problems
16	Practice in using snips, Marking & cutting of straight & curved pieces in sheet Metals. Bending the edges of Sheets metals. Riveting Practice in sheet metal. Practice in making different Joints in sheet metal in Soldering the joints.	Description of marking & Cutting tools such as snubs Shears punches &other Tools like hammers, mallets Etc. Used by sheet metal Workers. Types of soldering Irons-their proper uses. Use of different bench tools Used by sheet metal worker. Soldering materials, fluxes And process.	Free hand sketching of Keys with dimensions from Samples. Free hand sketching of Screw threads with Dimensions from samples.	Percentage and related Shop problems Moment of Inertia, Radius of gyration. Mechanical properties Of metals- tenacity, Elasticity, hardness, Compressibility and

				Ductility, etc.
17 & 18	Magnetism – classification of Magnets, methods of Magnetizing, magnetic Materials. Properties, care & Maintenance, method of magnetizing magnetic material. Para & Diamagnetism and Ferro material Principle. Of electro – magnetism, Maxwell's corkscrew rule, Fleming left & right hand rules, magnetism field of loop & solenoid. **MMF ,** flux density, Reluctance**. B.H.** curve, Hysteresis, eddy current. Principal of electro-magnetic induction , faraday law, lenz's law.	Tracing the magnetic field set up by & current carrying conductor and a loop. Tracing the field of an electromagnet and study the current no. of turns etc. Assembly / winding of a simple electromagnet Identification and testing of parts of D.C. generators demonstration and use of ohm meter. Demonstration on effect eddy current of different sample. Assembly/ winding of a simple electro magnet. Identification of different types of capacitors. Charging &discharging of	Drawing the typical symbols used in electrical circuit. Graphical symbol used in electro technology , kinds of distribution system and method of connections	Solving of Quadratic equation. Simple problems on movement of inertia.

	Electrostatics – capacitor different types, functions and uses.	capacitor using DC voltage and lamp.		
19	**Resistance - different** types of resistors used in electrical ckts. Specification of resistance and tolerance. Effect of variation of temperature on resistance different method of measuring the value of resistance.	Measurement of resistance by different methods - a) using Wheatstone bridge b) by voltage dropped method Experiment to demonstrate the variation of resistance of a meta! With the change of the temperature. -Measure of R by dropped method - series &shunt ckts – use of millimeter	-DO-	Simple problem on profit and loss. Levers – its different types and their advantages. Simple related problems.
20 &21	Working principal and circuits of common domestic equipments & appliances	Connection of calling bell, buzzer, alarms, electric iron, heater, light and fan etc. Rewinding/assembly of different electrical appliances. Study, Maintained and repair of domestic equipments- Electric kettle	Detailed diagram of calling bell electromagnet etc.	Simple problems on profit & loss. Mechanical advantage, velocity ratio, efficiency of different types of levers.

		-do-heater / immersion heater -do- hot plate		
22 & 23	D.C. Machines – general concept of electrical machines. Principal of D.C. generator Use of armature, field coil, yoke, and commentator, slip ring brushes laminated core. Explanation of D.C. Generators – types – parts. E.M.F. equation self excitation and separately excited Generators –practical uses. Brief description of series, shunt and compound generators.	Identification and study of the parts of a D.C. machine Practicing dismantling and assembling in D.C. machine	Sketching of brush and brush gear of D.C. Machines. Layout D.C. panel board arrangement lettering numbers alphabets. Sketching of D.C. 3- point face plate starter top scale.	MENSURATION Perimeter and area of square and rectangle. Simple problem on straight and bell cranked levers

24	Expl. Of armature reaction, interlopes and their uses , Connection of interlopes, communication	Connection of shunts generators, measurement of voltage- Demonstration on field excitation- connection of compound generator – voltage measurement – cumulative and differential – no load & load characteristics of series, shunt and compound generators. Controlling and protecting DC Generator	Graphic symbol for rotating m/cs and transformers.	Perimeter and area of triangle. Simple machines- determination of effiency of simple m/cs. Like winch, pulley blocks, wheels and compound axle.
25	DC Motors – terms used in D.C. motor torque speed Back- e.m.f. etc. there relations practical application. Related problems.	Demonstration and practice on identification of parts and terminals. Study of the characteristics of DC motors.	-do-	-do-

26 & 27	Types , characteristic and practical application of D.C. motors Special precaution to be taken in DC Series motors. Starters used in d.c.motors.	Study of 3 point & 4 point Starters Connection , starting , running , speed control of motors . Testing of DC motors	Reading of simple blue prints	Circumference and area of circuit Transmission of motion through belt pulley , gears extend related problems.
28 & 29	Types of speed control of DC motors in industry Word Leonard control, Thruster/electronic controls. Materials,	Study of Thruster /electronic control of dc motor. -Routine maintenance.	Free hand Isometric Sketching of Simple objects with dimensions. Sketching of D.C. -4-point starter to scale.	Calculation of volume and weight of simple solid bodies cubes, cuboids, solid and hollow cylinder and related shop Problems.

Achievement

1. Should be able to identify D.C……..M/cs , measure resistance.
2. Should be able to build up voltage in a D.C Generator
3. Should be able to connect,
   Test and run a D.C motor and reverse its direction of rotation by a starter.

30	Insulating materials- properties common insulting materials, classifications	Insulating materials- properties common insulting materials, classifications	-Do-	-Do-
31 & 32	Electric Wirings, importance, IEE rules. Types of wirings both domestic& industrial Specifications for wiring Grading of cables and current ratings. Principle of laying out in domestic wiring testing by meager	practice in casing, capping. Conduit wiring with Minimum to more number of points. -Use of two way switches -Testing of insulation by two lamp method & meager. -Fixing of calling Bells/buzzers.	simple objects. Layout arrangements of D.C. Generators & motors, control panel	Trigonometry functions & Ratios. Use of trigonometric tables- Applied problems. Definition of Stress, Strain, Young's modulus, Bulk modulus, Factor of safety- Their related problems.

33 & 34	Earthling- Principle of different methods of earthling. Importance of Earthling. -Earth Leakage Relay.	Earthling – Practice on installation of earthling system and testing of earthling system. -Using an Earth Leakage Relay	Free hand sketching of staircase wiring.	Simple problems on Heights & Distances using trigonometric ratios. Heat and temperature, Thermometric scale centigrade, Fahrenheit & Kelvin scale and their conversion. Names and uses of temperature measuring instruments used in workshop.
35 & 37	Alternating Current- Comparison D.C & A.C. , Advantages of A.C. Alternating current & related terms frequency Instantaneous value, R.M.S. Average value, Peak factor, form factor.	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. Experiment on poly phase ckts. Current, voltage & power measurement in poly-phase ckts.	Free hand sketching of simple Geometrical shapes & hollow shapes. Drawing of simple electrical ckts. Using electrical	Calculation of areas of triangles, etc. With the aid of trigonometry. Calorimetric, Latent Heat – Their related problems.

	Generation of sine wave, phase and phase difference. Inductive & Capacitative reactance X_l & Xc, Impedance (Z) , power factor,(P.f); Vector diagram. Active and Reactive power, Simple problems on A.C. circuits, single phase & three- phase system etc. Problems on A.C. ckts1. Both series & parallel power consumption P.F. etc. Concept three – phase Star & Delta connection Line voltag3e, current & power in a 3 ph ckt, with Balanced and unbalanced load.	Measurement of energy in single & poly – phase ckts. - Use of phase sequence meter. - Use of single phase preventer	symbols. & hollow bodies. Drawing sine waves. Views of simple solid and hollow bodies' ckt. Dinging of battery charging ckts .With all Details of panel board. Blue print reading.	

38-41	**<u>TRANSFORMERS</u>** Working principal of Transformer, classification C.T., P.T. Instrument and Auto Transformer /Varian Construction, Single phase and Poly phase. E.M.F. equation, parallel operation of transformer, their connection. Regulation and efficiency, Calling of transformer protective devices. Specifications, simple problems on e.m.f. Equation, turn ratio, regulations and efficiency. Special transformers. **Transformer –** construction cores winding shielding, auxiliary parts breather, conservator buckshot relay, other protective devices calling of transformer .	Identification of types of transformers. Connection to transformer efficiencies of transformers testing of transformers parallel operation of transformer. Use of C.T.&P.T. use of Instrument transformer. I Conducting No-load and short circuit tests. Testing of single phase and Three Phase. Transformer – Cleaning and maintenance of Transformers, Changing of oil,	Exercises on Blue print reading of connection to motors through Ammeter, voltmeter & .W.K. meters. Exercises on Blue print reading, tracing the wiring diagram of an alternator & reproducing it in proper sequin with protective equipment sketching the synchronizer connection. Free hand sketching of simple objects related to the trades.	Use of trigonometric formulae and applied problems. Expansion of Solid, Liquid and Gases – Their related problems.

	Transformer oil tasting and Tap transformer off load and load. Transformer bushings and termination.			
42-44	**ALTERNATOR -** Explanation of alternation, Prime mover, type's regulation, phases specification of alternators and brushless alternation. Automatic Voltage Regulator.	Demonstration on alternation, voltage Building, load characters & regulation. Practice on installation, running and maintenance of Alternators.	Diagram of connection to a squirrel cage induction motor. Sketching the connection diagram of controlling & protective for Induction motors. Development of winding diagram for a two-pole D.C. dynamo or motor. Preparation of working drawing from sketches.	Drawing & reading of simple graphs. Transmission of heat – Conduction, Convection and Radiation.

45-47	**Electrical measuring Instruments**- -Types Deflecting torque, controlling torque & damping torque , -Moving coil permanent magnets -Moving iron -Range extension -Millimeter -Wattmeter -P.F>meter -Intergrading type, digital energy meter-meager. -Energy meter -Frequency meter -Tri vector meter -Max Demand meter -Phase Sequence indicator -millimeter- analog and Digital – C.R.O,	Study of M. C. P. M. meter -do- Millimeter -do- Wattmeter, P F meter -do- Energy meter -do- frequency meter -do- Calibration of meter -do- Millimeter -do- C.R.O -do Maximum Demand meter -do- phase sequence indicator -do- Digital Instruments	Sketching of simple objects related to trades. Sketching of different shape of coil. Further practice in Blue print reading. Drawing development diagram for single-phase A.C.motors.	**Logarithms**-Use of Logarithmic tables for multiplication & division. Different forms of energy, Thermal, mechanical and electrical from one to another.

48-49	Explanation of light White light-illumination factors, intensity of light –importance of light, human eye factor units. Types illumination & lamps-neon sign halogen, mercury vapour, sodium vapour, fluorescent tube CFL, solar lamp application, concept of engery-characters watt ages, fixing places. Types of lighting. Decoration lighting drum switches, direct & indirect lighting-efficiency in lumens per watt, colour available. thumb rule calculation of lumens. Estimating placement of lights and fans and ratings.	Installation of- -do-neon sign -do-mercury vapour (H.P.& L.P.) -do-sodium vapour -do- Halogen lamps -do- Sign tube, Double tube Practice on decoration Lighting Principle of layout of lighting installation.	Drawing the development diagram for D.C. simplex lap & wave3 winding	Applied workshop problems involving, use of logarithmic tables.

50	REVISION & INDUSTRIAL TOUR
51-52	TEST

Achievement

1. The trainees should be able to install and connect Transformers, parallel connection, carry out necessary maintenance,

2. Able to connect and use CT & PT.
3. Able to carry out installation, Running and maintenance of Alternators.

4. Able to install different instrument for measurement of Voltage, Current, Power, Power, factor and energy, etc.

5. Able to use Analog and Digital MultiMate, C.R.O.

6. Able to install florescent lamp, Sodium Vapour Lamp, neon Sign, Decorative Lights.

53-54	TRANSFORMER Winding Principle of different winding techniques.	Practice on winding of Transformers of different types and ratings.	Practice in reading panel diagram. Practice in reading ckts Containing resistance Resistance inductances. Practice in reading typical example of ckts containing R,X,& C.	Practice in the use of logarithmic tables for multiplication division square root cube root. Insulating material including transformer oil.
55-56	D.C. m/c winding pole pitch coil pitch back pitch front pitch Lap & wave winding Progressive and retrogressive winding.	Proactive on different types of winding growler testing Baking Impregnation and varnishing Testing for faults. .	Further practice in blue print reading drawing the development diagram for simple lap and wave winding.	Calculation of Volume weight of simple solid bodies by using logarithm further problems on menstruation. Insulating materials synthetic brief description and

				properties of electrical materials such as silicon Nichrome silver etc
57-58	SYNCHRONOUS MOTOR- Working principle effect of change of excitation and load. Application in industry in power factor improvement.	Practice on starting running connection to bus bar – Study on effect of changing the field excitation and power factor correction of Industrial load.	Tracing of wiring diagram of an alternator and reproducing it.	Properties of triangles of triangles and circles tangent etc. Insulating materials synthetic. Brief description and properties of electrical materials such as silicon nichrome silver etc.
Achievements:- 1) Carryout simple winding, re-winding of detected faults in Transformers, D.C.M/c's. 2) Able to install starting and running D.C. motors, Synchronous motors, power facto correction.				

59-61	Induction motor Working principle Squirrel Cage Induction motor Slip ring induction motor. Construction and characteristics starting and speed control. D.O.L Starter Star /Delta starter Autotransformer starter. Single phase induction motor- Working principle different method of starting and running (Capacitor start/Capacitor run shaded pole technique). FHP motor.	Induction Motor study of Squirrel cage and Slip ring Induction motor, Measurement of slip P.F. at various loads Practice on connection of D.O.L. starter star / Delta starter Autotransformer starter and starting running & speed control. Connection of single phase motor identification testing running and reversing.	Drawing the schematic diagram of automatic voltage regulators of A.C. generators Drawing the schematic diagram of A.C. 3-ph reversing magnetic starter. Sketching a breather Free hand sketching of transformer and auxiliary parts and sectional views.	Problems on menstruation related to solid bodies of Prism Pyramid sphere etc. Forms and properties of matter. The molecule and atoms.
62-63	**A.C.** m/c Winding **–** Armature winding terms, coil side, and coil and grouping of adjacent poles, connected armature winding	Making forma coil insulation, Insertion of coil in slots coil connection practice on single layer concentric winding Baking impregnating and	Drawing the schematic diagram of the starting and controlling gears of slipping and Sq. cage Ind. Motor	Trigonometric function Use of trigonometric tables applied problems Calculation of areas of triangles and

	alternate pole connection armature winding.	varnishing.	.IS.3914-1967Drawing the schematic diagram of auroras former starter push button starter and Star Delta Starter	polygon problems on Menstruation.
64	**Universal motor-** advantages principal, characteristics, applications in domestic appliances and industry, Fault Location and Rectification.	Identification, connection, testing, running and reversing of universal motor. Practice of winding / rewinding	Drawing the schematic diagram of plow and pipe earthling I.S.3043. Wiring diagram of the connection of arrangement and push button control of two speed AC motor. IS: 3914-1967.	Simple problems involving Trigonometric function.

65	Converter-inverter, M.G. Set-description-Characteristics, specifications-running and maintenance.	Starting running and building up voltage and loading of M-G set. Maintenance of M-g Sets.	Drawing the schematic diagram of 4 typical D.C speed regulators for shunt and compound motors. –Do- Magnetic controller with dynamic breaking.	Laws of Indices and related problems Inclined plane, parallelogram laws of Forces- their related problems.
Achievements:- 1. Should be able to install different induction motors along with DOL/ Star5 Delta starters. 2. Should be able to starting, running and Speed control of different types of induction motors. 3. Should be able to carry out Wiring, rewinding of single phase and three phase induction motors. 4. Should be able to carry out wiring, rewinding of Universal motors. 5. Should be able to installation, starting, running and maintenance of M.G. Set.				
66-67	Techniques, procedures of Layout of conduit wiring as per I.S-732-1963. Use of flame proof and explosion of P.V.C conduct switches.	Practice on Installation of conduit pipe wiring for lighting and power circuits for both 23V & 400V.	Schematic diagram of magnetically rated. D.C. motors with three- push bottom control station. –do- Lumina sent	Further problems on menstruation. Heat treatment processes.

			Lamps.	
68-69	Fuse/cut out /kit Kat-function, characteristics, and materials. H.R.C Fuses- application. Contactors- Miniature circuit breakers. Relays-thermal, Electromagnetic, solid state relays, Control Relays and protective Relays.	Study of fuses. Study of contactors, MCB. Study of relays of different types.	Sketching indicating instruments. Drawing the diagram o0f a distribution transformer. Typical wiring diagram for drum and controller operation of A.C wound rotor motor.	Resolution and composition of forces Representation of force by vectors, simple problems on lifting tackles like jib wall, crane- Solution of problems with the aid of vectors.
70-75	Industrial wiring. Code of practice & relevant span. Wiring of electric motor, control panel, etc. Types, specifications, advantages of different types of circuit brackets construction and maintenance. I.E.E rules for overhead service lines, study of U.G cables and laying techniques. Working principle and construction domestic and	Practice on wiring of electric motor, control panel, etc. Study of different circuit breakers. Laying and installation of overhead and underground cables. Protective and control relays, contactors, circuit breaker, etc.	Layout diagram of a substation. Sketching different shapes of coils, Sketches indicating possible faults in stator winding. Drawing the development diagram for dupler lap and wave winding with brush position.	Examples of simple supported load. General condition of equilibriums for series of forces on a body.

	agricultural appliances-their maintenance.			
76	Corona, Lightning arrestor/lighting conductor, Horn gap.	Practice of fixing lightening arrestors and lightening conductors, Horn gap.	Single line diagram of substation feeders. Connection diagram of typical overload current relays. Key diagram of a power station. Central controlling panel.	Centre of gravity simple experiments, stable, unstable and neutral equilibrium.
Achievement: 1. Should be able to carry out wiring of contactors, relays, circuit breaks, control panel, wiring of Industrial/ Domestic equipment. 2. Should be able to carry out installation of lighting arrestor, Horn gap, etc.				
77	Introduction to Basic electronics-Semiconductor energy level atomic structure 'p'&'N' type of materials-p- N-junction. Diodes- classification of Diodes- Revered Bias and Forward Bias, Heat sink, Specification of Diode-Pirating.	Identification of semiconductors, Diodes Studying Characteristics of Diodes using multimeter. I.s, 2032 of VIII1965.	Drawing D.I.S symbols for electronic components. DIODE, TRANSISTOR Zener diode, S.C.R I.C etc.	Mechanical advantage velocity ratio, ratio, efficiency of simple pulley wheel screw jack and winch. Simple harmonic motion n- motion of a pendulum, spring, vibrating body.
78-80	Explanation and importance of D.C.	Study of half wave rectifier ckt.	Filling of m/cs history card and	Simple estimation of the requirement

	Rectifier ckt. half wave, full wave and Bridge ckt. L.E.D. and Solar cells. Filter ckts-passive filter. Working principle and uses of an oscilloscope.	-do-full “ “ “ -do-Bridge “ “ “ -do-Filter ckts -do-Oscilloscope -do-Different wave shapes and their values using C.R.O.	maintenance cards and inventory control cards.	of materials etc. as applicable to the trade. Problem on estimation and costing.
81-82	Explanation of principal of working of a transistor-types of transistors Characters of a transistors Biasing OF USE of transistors. Specification and rating of transistors.	Study of a transistors Identification of construction and terminals. Testing of Transistors Study of the characters of transistors.	Drawing of B.I.S./I.S.I. symbols for Electronic devices Drawing of half wave, Full wave and Bridge ckts.	---do--
83-84	Explanation of transistors Amplifiers, Amplifiers. - class A,B&C power amplifier.	Assembly and testing of a single stage Amplifier and checking in an oscilloscope. Study of types of wave shapes. – do—Cascade Amplifier. Uses of standard I.C Amplifier 810	Drawing ckts for a single stage Amplifiers and Multi stage Amplifier and types of signals.	Magnetism , Magnetic material , magnetic field, flux density, magnetic moment, permeability Susceptibility, electro magnet (solenoid)- practical applications.
85	Explanation of oscillator-	Study of oscillator circuit		

	working principal Explanation of stages and types. Mulitvibrator – applications.	Voltage measurement current And study wave shapes in scope.	--do--	--do--
86	OP-AMP –Working principle and application. Timer I.C.555	Study of various Pomp. Application and Timers.	-do-	Electricity, Effects of electric current.
87-89	Explanation and working principle and practical applications of U.J.T.,F.E.T., S.C.R Diac, Triac, power MOSFET, G.t.o& I.G.B.T.	Studies of simple ckts containing U.J.T for triggering. –do- FETas an amplifier. –do- Power control ckts by S.C.R &Diac, triac, I.G.B.T	Drawing of ckts containing U.J.T F.E.T &Simple power control ckts.	--do--
90	D.C/A.C Power control using power transistor, thyristor. Voltage stabilizer, U.P.S. DC/AC motor drives using transistor/ thyristor.	Demonstration on DC/AC power control using transistor/thruster. Study of voltage stabilizer, UPS. Study of DC/AC motor drives, speed control etc. Uses of SCR and other modern semiconductor devices in controlling speed of motors and in changing the direction of rotation of motors.		Meaning of Horse power &Brake horsepower. Simple problems on work, power &energy.
91-92	Power Supply Stabilizer, Ferro resistant circuit.	Demonstration on power supply stabilizer. Study	--do--	Rectifier, Maximum,

	DC/AC motor drives using Thruster/Transistor control.	Op DC./AC. Motor Drives.		Average, R.M.S current in rectifiers, from factor, ripple factor.
93-94	Digital Electronics – Binary numbers, logic gates and combinational ckts Flip Flops, Counter, REGISTER &Timer.	Study of Logic gates and ckts. Flip Flops, Counter, Register &Timer. Using digital I.C chips	Free hand drawing of Logic gates and circuits.	Number system decimal and binary, Hexa decimal. B.CD code, conversation from decimal to binary and vice-versa.
	Achievement: Should be able to assemble, test and rectify the faults of simple Electronic Circuits- power supply ckts, amplifiers and control ckts, Motor Drives.			
95-96	Complete House- Wiring layout. Circuit splitting load wire I.E.E Rules. Multistoried system. Fault finding and trouble shooting of domestic electrical appliances.	Practice in wiring and of institute and hostel hotel, residential building. Layout and repairing of workshop electrical installation. Practice on Auto wiring.	Drawing of simple lap and wave winding.	--do--
97	Decorative lighting Fault finding techniques in Decoration lighting.	Installation Fault finding practice	--do--	--do--

98	INDUSTRIAL VISIT &STUDY TOUR
99-100	Fault Finding in simple Electronic ckts. &Controls attached in the electrical controls.

101-103	REVISION
104	T E S T

LIST OF TOOLS & EQUIPMENT FOR TRADE OF ELECTRICIAN

Sl. No.	Items	Quantity

1.	Rule wooden 4 fold 60 mm	16
2.	Plier insulated 150 mm	16
3.	Plier side cutting 150 mm	16
4.	Screw driver 100 mm	16
5.	Screw driver 150 mm	16
6.	Electrician connector, screw driver 100 mm insulated handle thin stem	16
7.	Heavy duty screw driver 200 mm	16
8.	Electrician screw driver 250 mm thin stem insulated handle	16
9.	Punch centre 150 mm * 9 mm	16
10.	Knife double bladed Electrician	16
11.	Neon Tester	16
12.	Rule steel 300 mm	16
13.	Saw tenon 250 mm	16
14.	Hammer, cross peen 115 grams with handle	16
15.	Hammer ball peen 0.75 Kg. with handle	16
16.	Firmer chisel wood 12 mm	16
17.	Gimlet 6 mm	16
18.	Bradwal	16
19.	Scriber 150 mm * 4 mm (Knurled centre position)	16
20.	Pincer 150 mm	16
	SHOP TOOLS INSTRUMENTS & MACHINERY	
1.	C. Clamp 200 mm, 150 mm and 100 mm	2 nos. each
2.	Spanner 150 mm adjustable 15 degree	2 nos.
3.	Blow lamp 0.5 litre	2 nos.
4.	Melting pot	1 no
5.	Ladle	2 nos.
6.	Chisel cold firmer 25 mm * 200 mm	2 nos.

7.	Chisel 25 mm & 6 mm	4 nos.
8.	Drill machine hand 0 to mm capacity	1 no
9.	Electric drill machine portable 6 mm capacity	1 no
10.	Pillar electric drill machine 12 mm capacity	1 no
11.	Allen key	1 set
12.	Oil can 0.12 litre	2 nos.
13.	Grease gun	1 no
14.	Outside micrometer 0 to 25 mm	1 no
15.	Bench grinder motorized	1 no
16.	Rawl plug tool & bit	2 set
17.	Pulley puller	1 no
18.	Bearing puller	1 no
19.	Hygrometer	2 set
20.	Thermoter 0 to 100 deg. centigrade	1 no
21.	Scissors blade 150 mm	4 nos.
22.	Crimping tool	1 set.
23.	Wire stripper 20 cm	1 no.
24.	Chisel cold flat 12 mm	4 nos.
25.	Mallet hard wood 0.50 kg.	4 nos.
26.	Hammer Exeter type 0.40 kg.	8 nos.
27.	Hacksaw frame 200 mm, 300 mm adjustable	4 nos.(2 each)
28.	Square try 150 mm blade	4 nos.
29.	Divider 150 mm, outside &inside calliper	2each
30.	Plier flat nose 100 mm	4 nos.
31.	Pliers gas round nose 100 mm	4 nos.
32.	Pliers gas 150 mm	4 nos.
33.	Snip straight 150 mm	4 nos.

34.	Tweezers 100 mm	2 nos.
35.	Snip bent 150 mm	2 nos.
36.	Spanner D.E metric standard set	2 nos.
37.	Drill S.S Twist block 2 mm 5 mm 6 mm set of 3	4 nos.
38.	Plane smoothing cutters 50mm	4 sets
39.	Plane smoothing cutters 50 mm	4 nos.
40.	Gauge wire imperial	2 nos.
41.	File flat 200 mm 2nd	8 nos.
42.	File half round 200mm	4 nos.
43.	File round 200 mm 2nd cut	4 nos.
44.	File flat 150rough	4 nos.
45.	File flat 250 mm bestirred	4 nos.
46.	File flat 250 mm smooth	4 nos.
47.	Rasp half round 200 bestirred	4 nos.
48.	Iron soldering 25 watt 65 watt 125 watt	4 each.
49.	Copper bit soldering iron 0.25 k.g	4 nos.
50.	Desoldering gun	4 nos.
51.	Vice hand 50 mm jaw	4 nos.
52.	Vice table jaw 100 mm	8 nos.
53.	Vice hand 50 mm jaw	4 nos.
54.	Pipe cutter to cut pipes up to 5 c.m. dia	4 nos.
55.	Pipe cutter to cut Pipes above 5 c.m dia	1 no.
56.	Stock and die set for 20 mm to 50 mm G.I Pipe	1 sets
57.	Stock and dies Conduit	1 n.o.
58.	Muliti meter 0 to 100 mm Ohms, 2.5 to 500 Volt	6 nos
59.	Digital Multi meter (3 1/2 digits)	2 nos
60.	A.C. Voltmeter center zero 1000-0-100 m Volit	1 no.
61.	Mill voltmeter centre zero 100-0-100m volt	1 no.

62.	D.C. milliammeter 0-500ma	1 no.
63.	D.C.Ammeter MC 0-I A	1 no
64.	Ammeter MC 0-5 A	1 no.
65.	Ammeter MC 0-15-25	1 no.
66.	A.C. Ammeter M.I.. 0-5A	1 no.
67.	A.C. Ammeter M.I.. 0-15-25A	1 no.
68.	K.W. Meter 0-1-3 Kw	2 nos.
69.	A.C. Energy meter (single phase 5 amp.230 V)	1 no.
70.	Single phase power factor meter	1 no
71.	Frequency meter	1 no.
72.	Tacho meter with stop watch	2 no.
73.	Current transformer	2 no.
74.	Potential transformer	2no
75.	Growler	1 no
76.	Tong tester/clamp meter 0-100 Amp.AC	1 no.
77.	Megger 500 volts	1 no.
78.	Wheat stone bridge complete with galvanometer and battery	1 no.
79.	Relays –over current, under voltage,etc 100 amp.	2 each.
80.	Contactor 3phase,440 volt,16 amp.2 NO &2NC auxiliary contacts	2 nos.
81.	Contactor3 phase,440 volt,32 amp.2NO&2NC auxiliary contacts	2 nos.
82.	Limit switch	2 nos.
83.	Rotary switch 16A	2nos.
84.	Load bank-5 KW (lamp/heater type)	2 nos.
85.	Brake test arrangement with two spring balance of 0 to 25 kg rating	2 sets
86.	Knife switch DPDT fitted with fuse terminals’ 16 amp	12 nos.
87.	Knife switch TPDT fitted with	12 nos.
88.	DC power supply 0-100 volt,5 amp	2 nos.
89.	Inverter 1KVA input 12 volt DC, output 220 volt AC with 12 battery	1 nos.

90.	Voltage stabilizer-input 150-230 volt AC, output 220 volt AC	
91.	Rheostat 0-1 ohm, 5 amp.; 0-10 ohm., 5amp.; 0-25 ohm I amp.;0-300 ohm., lamp	
92.	Domestic application a)Electric hot plate 1500 watt. 220 With temperature control. b)Electric kettle 1000 watt 230V c)Electric iron 1200 watt 230 With temperature control d)Immersion beater 750/1000/1500W-230V e) Geyser 25 litre 240 V(storage type)	
93.	Flux meter	2 nos.
94.	Laboratory type induction coil 6 volt to 800-10,000 volt	1 nos.
95.	3-point D.C. starters	1 no.
96.	4-point D.C. starters	1 no.
97.	Cut out, reverse current, over load, under voltage relays.	1 each
98.	Starters for 3-phase,400 V,50 cycles,2 to 5 H.P. A.C. motors a) Direct on line starter b) Star delta starter with manual, semi-auto and automatic c) Auto transformer type starter	
99.	Electrical machine trainer:- suitable for demonstrating the construction and functioning of different types three of DC machines and AC machines(single phase and three phase) should be completed with fri8ction brake dynamo meter, instrument panel and power supply units.	1 per institute
100.	Motor generator (ACtoDC) consisting of: cycles, 3-phase with star delta starter and switch directly couple to DC shunt generator 5KW 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 no.

101.	Motor generator (DC to AC) 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, 0.8 PF 50cycles with exciter and I switch board mounted with regulator, circuit breaker, ammeter, voltmeter frequency meter, knife blade switch bolts, foundation bolts and flexible coupling.	1 no
102.	Used DC generator-series, shunt and compound type for overhauling practice	1 each
103.	D.C shunt generator, 2.5 KW, 220 V with control panel	1 no.
104.	D.C compound generator, 2.5 K.W> 250 V, with control panel including filed rheostat, Voltmeter, ammeter and circuit breaker	1 no.
105.	Diesel generator set, 5 KVA, 44 volt, AC 3 phase with change over switch, over current circuit breaker and water-cooled with armature, star-delta connections.	1 no.
106.	Motor series DC, 220 Volt, 0.5 to 2 HP, coupled with mechanical load.	1 no.
107.	Motor shunt DC 220 volt, 2 to 3 HP	2 nos.
108.	Motor DC compound wound 220 volt 2 to 3 :HP with starter and switch	2 nos.
109.	Motor AC squirrel cage, 3-phase 400 volt, 50 cycles, 2 to 3 HP with star delta starter and triple pole iron clad switch fuse.	1 no
110.	Motor AC phase-wound slip ring type 5 HP 400 volts, 3-phase, 50 cycles with starter and switch.	1 no.
111.	Motor A.C. series type 230V, 50 cycles, ¼ HP with mechanical load	1 no.
112.	Motor AC single phase 230 volt 50 cycles 1 HP capacitor type with starter switch 1 HP	1 no.
113.	Motor universal 230 volt, 50 cycles ¼ HP with starter/switch	1 no.
114.	Stepper motor with digital controller	1 no.
115.	Fan A..C. 230 volt 1200 mm	2 nos.
116.	Transformer single phase, 1 K.V.A., 230/115-50-24-12 Volts, 50 cycles	3 nos.

	core type, air cooled.,	
117.	Transformer three phase, 5 K….V…A., 440/230 volts, 50 cycles, delta/ star, shell type oil cooled.	2 nos.
118.	Variable auto transformer 0-250 V, 8 amps.	2 nos.
119.	Oscilloscope –Dual Trace, 30 MHZ Function Generator	1 no.
120.		1 no.
121.	Discrete component trainer	1 no.
122.	Linear I.C.Trainer	1 no.
123.	Digital I.C.Trainer	1 no.
124.	Bath impregnate	1 no.
125.	Oven stoving	2 nos.
126.	Oil testing Kit	1 no.
127.	Battery charger with variable output 1 KW	1 no.
128.	Hydrometer	1 no.
129.	A.C.B. 5 KVA	1 no.
130.	M.C.B. 16 amp.	1 no.
131.	Thyristor /IGBT controlled D.C. motor drive 1 HP with techo-generator feedback arrangement.	1 no.
132.	Thyristor/IGBT controlled A.C. motor drive with VVVF control, 3 phase 2 HP	1 no.
133.	Lockers with 2 drawers (standred size)	2 nos.
134.	Bench working 2.5 * 1.20 * 0.5 meters	4 nos.
135.	Almirah 2.5 * 1.20 * 0.5 meter	1 no.
136.	Instructor’s table	1 no.
137.	Instructor’s chair	2 nos.
138.	Fire extinguisher	2 nos.
139.	Fire buckets	4 nos.
140.	Metal rack 100*150*45 cm	4 nos.

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