

Electrical Domestic Appliances (EDA)

Paper-I

Theory – 40
Practical - 60

Unit. I : Current Electricity:

Electricity as a source of energy, definition of resistance, voltage, current, power, energy and their units, Relation between electrical, mechanical and thermal units, Factors effecting resistance of a conductor, Temperature coefficient of resistance, Difference between AC and DC voltage and current

DC Circuits:

Ohm's Law, Series and parallel resistance circuit and their equivalent resistance, Kirchhoff's Laws and their applications.

Heating and lighting effects of currents:

Joule's laws of electric heating and its domestic applications, Heating efficiency, Lighting effect of electric current, Filaments used in lamps, Different types of filament lamps and gaseous discharge lamps, their working and applications.

Capacitors:

Capacitors and its capacity, types of capacitors and their use in circuits, series and parallel connection of capacitors, energy stored in a capacitor

Electromagnetic Effects:

Permanent magnet and Electromagnets, their construction and use, Polarities of an electromagnet and rules of finding them. Faraday's Laws of Electromagnetic Induction, Dynamically induced emf, its magnitude and direction; Static induction, Self-induced emf, its magnitude and direction, Inductance and its units, Mutually induced emf, its magnitude and direction; energy stored in an inductance. Force acting on a current carrying conductor in a magnetic field, its magnitude and direction; Torque produced on a current carrying coil in a magnetic field; Principle and construction of Dynamo

Unit.II AC Circuits:

Generation of AC voltage, its generation and wave shape; Cycle, Frequency, Peak value (Maximum value), Average value, Instantaneous value, R.m.s. value, Form factor, crest factor, Phase difference, Power & Power factor (leading and lagging), Identification of phase, neutral and earthing.

AC Circuit with : (i) Resistance and inductance; (ii) Resistance and capacitance & (iii) Resistance, inductance and capacitance in series.

Polyphase Circuits:

Generation of three-phase voltages, phase sequence; Numbering of phases; Interconnection of phases; Star and Delta connection; Voltages and currents in star and delta connection; Comparison of star and delta connection. Power in three phase system.

Construction and working principle of moving iron and moving coil voltmeters and ammeters, Dynamometer type Wattmeter, Ohm meter, Megger, Earth Tester and Induction type energy meter – their circuit connection and application for measurement of electrical quantities.

Unit.III Electrical Wiring:

Types of wiring – Cleat wiring, Casing and Capping, C.T.S./T.R.S. wiring, Metal sheath wiring, Conduit wiring and concealed wiring- their procedure of installation.

Factor for selection of a particular wiring system; Importance of switch, fuse and earthing of wiring system; Types of faults, their causes and remedies.

Methods of finding numbers of circuits and circuit distribution by distribution board system, Loop in system of wiring connections; IE Rules related to wiring.

Single phase wiring from three phase supply system. Three phase wiring in power circuits such as heaters and motors from three phase supply system.

Electric Iron:

Type of Electric Iron – Ordinary type and automatic/Thermostat Control type/steam iron, Construction and working principle of electric irons; common defects, testing and repairs

Electric Stove:

Types of Electric Stoves- Coiled type, covered type, Hot Plate, Grill/Oven, Cooking Range- Construction and working principle of electric stoves, common defects, testing and repairs; Induction heater; OTG and Microwave oven; Three phase heater, star and Delta connections.

Electric Toasters:

Types of Toaster - Ordinary and Automatic; Construction and working principles of electric toaster; common defects, testing and repairs.

Table Lamp and Tube Light:

Construction, working principles and use of Table Lamp, Night Lamp and Tube Light; Common faults, their causes, testing and repair, LED Table lamp

Unit-IV Electric Fan:

Type of Fans – ceiling fan, Pedestal fan, Bracket Fan, Exhaust Fan; Construction working principles, special characteristics and applications of Electric fans; Common faults, their causes, testing and repairs; Installation of Bracket Fan and Exhaust Fan.

Electric Mixer, Grinder and Blender:

Construction, working principles, special characteristics and applications of Electric Mixer, Grinder and Blender; Common Faults, their causes, testing and repairs; Servicing maintenance and overhauling of Electric Mixer, Grinder and Blender.

Electric Washing Machine:

Constructions, working principles special features and applications of Washing Machine; common faults, their causes, testing and repairs; Servicing and overhauling of Washing Machine.

Emergency Light and Stabilizer:

Constructions and working principles of Emergency Light and Stabilizer; Common faults, their causes, testing and repairs.

Practical:

- Study of series resistive circuit
- Study of parallel resistive circuit
- Study of series and parallel connection of cells
- Preparation of electrolyte for Lead Acid battery and its charging and measurement of specific gravity with the help of hydrometer
- To find heat efficiency of a kettle.
- Verification of magnetic field of a solenoid with (i) iron core and (ii) air core.
- Verification of torque developed in a current carrying coil placed in a magnetic field.
- Measurement of resistance by ammeter and Voltmeter methods and Ohm meter.
- Dismantling and reassembly of dynamo
- Connecting lamps in series, parallel and series-parallel circuits
- Study of R-L series circuit and measurement of power and power factor
- Study of R-C series circuit and measurement of power and power factor
- Study of R-L-C series circuit and measurement of power and power factor
- Drawing schematic diagram to give supply to consumers for single phase and three phase.
- Practice on casing & capping wiring
- Practice on cleat, wiring.
- Practice on C.T.S./T.R.S. wiring.
- Practice on conduit wiring.
- Practice on concealed wiring.

- Controlling a lamp from two and three places (staircase and godown wiring).
- To prepare series/parallel test board.
- Measurements of insulation resistance of wiring installation by megger.
- Earth testing and measurement of earth resistance.
- Polarity test of wiring installation.
- Testing of wiring installation.
- Installation of pipe earthing for wiring installation.
- Installation of plate earthing for wiring installation.
- Testing and finding faults of wiring installation and rectification.
- Dismantling and reassemble of reflector type room Heater.
- Dismantling and reassembling of Electric Iron (i) Ordinary type (ii) Automatic/Thermostat control type
- Testing and repair of Electric Iron (i) Ordinary type (ii) Automatic/Thermostat control type
- Dismantling and reassembling of Electric Stove (i) Coiled type (ii) Covered type (a) Hot plate (b) Grill (iii) Induction Heater (iv) Microwave oven, (v) Three phase heater star and delta connection
- Testing and repairs of Electric Stove (i) Coiled type (ii) Covered Type (a) Hot plate (b) Grill (iii) Induction Heater (iv) Microwave oven, (v) Three phase heater star and delta connection
- Connection of Fluorescent tube light (FTL) circuit.
- Testing and repair of (i) Table Lamp (ii) Night Lamp and (ii) Tube Light (iv) LED table lamp
- Testing fault finding, repair and overhauling of electric fans.
- Testing fault finding, repair and overhauling of (i) electric mixer (ii) grinder (iii) blender.
- Testing fault finding, repair and overhauling of washing machine.
- Testing fault finding, repair and overhauling of emergency light
- Testing fault finding, repair and overhauling of voltage stabilizer (manual and automatic)

Paper-II

Theory – 40
Practical - 60

- Unit. I :** **DC Motors:**
Types of Motors – series, shunt, Compound and Universal; Construction, Working Principles, characteristics, winding details and applications of different types of motors (fractional horse power); Starters and starting of DC motors, Installation of DC motors and testing, Speed reversal and Speed control of DC motors; Common faults, their causes, testing and repairs.
- Single Phase AC Motor:**
Types of AC Motors – Induction Motor (Split phase and Repulsion Start), Capacitor Motor, Shaded Pole Motor, Universal Motors; Constructions, working principles, special characteristics, winding details and applications of different types of fractional horse power motor; Starting and starters for different motors; Speed reversal and speed control of single phase AC motor; Installation of AC motors and testing; Common faults, their causes, testing and repairs; Rewinding of fractional horse power motors.
- Three Phase Motors:**
General Principle, construction; Production of rotating field, working and starting of three phase induction motor, Manual and automatic star delta starter for three phase induction motor.
- Unit-II** **Conducting Materials:**
Copper and aluminum is Low Resistivity material, their electrical characteristics and applications; Eureka, Selenium and Carbon as High Resistivity material, their electrical characteristics and applications; Electric resistance materials.
- Insulating Materials:**
Distinction between conductor, Insulator and Semi-conductor; Insulation Resistance, Dielectric Strength, Breakdown Voltage, Mechanical and Physical Properties and Classification of Insulating Materials; Paper, plastic coated paper, PVC, Porcelain, Bitumen, Mica, Bakelite, Ebonite, Marble, Glass, Asbestos, Fiber Glass – their electrical characteristics and applications; Insulating Tapes; Sleeves; Insulating and impregnations with Varnishes and Paints, their uses and applications.
- Magnetic Materials:**
Classification of materials as Ferromagnetic materials; Soft and Hard Magnetic Materials; Losses in magnetic materials and procedure to reduce losses; Mild Steel, Silicon Steel, Mumetal, Premalloy, Alnico as magnetic materials; their properties and uses.
- Fuse and Soldering Materials:**
Silver, Copper, Lead , Tin and Alloys as fuse materials; their properties and application. General characteristics of soldering and brazing joints, processes and their characteristics; brief description of soldering and brazing tools, equipment; types of solders and fluxes and their uses; procedure of Soldering and Brazing; soldering defects and their remedies; advantages and disadvantages of soldering and brazing; precautionary measures while soldering and brazing. Soldering practice of electronic components on P.C.B.
- Unit-III** **Trouble Shooting of electrical power tools:**
Insulation, testing of armature, field starter, winding, noise of beaming, carbon brush changing, prevention and break down maintenance of power tools.
- Safety Precaution and Shock Treatment:**
Familiarizing the student with shop discipline; layout of Shops, Safety Precautions; Use of Firefighting equipment; First Aid Practice; Causes of Eclectic fire and shock; procedure for removal of person from contact of

live wire; Treatment of Electric Shock and Burns. Lifting and handling of light and heavy equipment.

Common Tools: Familiarizing the students with common tools, safe and proper use of tools, their adjustments and applications, crimping and crimping tools.

Corrosion Protective Paints:

Components of Paints and methods of preparation; Application of Paint for corrosion protection and precaution in painting.

Transmission of Power:

Belt Drive, Shaft Drive, Gear Drive, Chain Drive, Friction Drive and their applications in Domestic appliances.

Unit-IV

Bimetallic Relay and Thermocouple:

Construction and application of Bimetallic Relays and Thermocouples for control of temperature and current.

Repair Shop:

Tools, Machines, Equipment and Instruments required for Repair shop; their working and use; planning Layout and setting of a Repair Shop; Rules and methods of repair, servicing and overhauling domestic appliances; Safety precautionary measures in Repair Shop; Up-keeping of Repair Shop.

Practicals:

- To test and repair defective cycle dynamo
- Measurement of resistance of series, shunt field and armature of a DC Motor and identification of terminals by multimeter.
- Safety practices- lifting and handling, fire fighting.
- Technique of removing persons in contact with live wire suffering from electric shock
- Artificial respiration and shock treatment
- Identification of common hand tools, make simple twist joint married joint in stranded conductors,
- Varnishing of Insulating coil winding
- Identification of different electrical symbols
- Drawing schematic diagram of electrical wiring of a house with 6 points
- Familiarization with gears and its movements
- Dismantling and reassembling pulley on motor shaft and practice on adjustment of belt tension.
- Drawing layout of (i) Repair shop and (ii) Winding Shop.
- Prepare estimate for repair, service and overhauling of domestic appliances, its costing and billing
- Single layer winding of 3-phase induction motor (squirrel cage type) (4 pole and 6 pole)
- Double layer concentric rewinding of 3-phase induction motor (4 pole & 6 pole)
- Testing, fault finding and repair of a DC motor.
- Overhauling of a DC motor
- Dismantling, study and reassembling of a DC motor starter
- To study DC series motor, its running, speed control and reversing rotation and measurement of current, voltage and speed.
- To study DC shunt motor, its running, speed control and reversing direction of rotation, measurement of voltage, current and speed.
- To study DC compound motor, its running, speed control and reversing rotation and measurement of current voltage and speed.
- Join the supplied wires by soldering
- Wind and test the field coil of a DC motor
- Identification of semi-conductor devices
- To draw forward and reverse characteristics of a semiconductor diode.
- Study of transistor circuits: (i) common base, (ii) common emitter and (iii) common collector
- Study of half wave rectifier circuit with and without filter
- Study of full-wave rectifier circuit with centre-tap transformer with and without filter
- Study of a bridge rectifier circuit with and without filter

- Study of transistor amplifier circuit (i) common base (ii) common emitter (Common collector)
- Study of an AC motor starter.
- Testing, fault finding and repair of an AC motor