ELECTRICAL TECHNOLOGY

CLASS–XII
ELECTIVE
ELECTRICAL MACHINES (787)

THEORY

Time: 2 Hours ***Marks: 40***

1. Single-Phase Transformer **8**

Types of transformer - step-up and step-down transformer, voltage and current transformer, auto-transformer. Construction, working principles and applications of different types of transformers, rewinding of transformers, cooling of transformers.

2. D.C. Motors **12**

Types of motor - series, shunt, compound and universal, construction, working principles, characteristics, winding details and applications of different types of motors including fractional horse power, starting and starters for D.C. motors. Installation of D.C. motor and testing, speed reversal and speed control of D.C. motors, common faults, their causes, testing and repairs.

3. Three Phase Induction Motors: Principle, working & starting of three phase induction motor. **4**

4. Single Phase A.C. Motor **12**

Types of A.C. Motors – induction motor (Split phase and repulsion start), capacitor motor, shaded pole motor, universal motor, construction, working principles, special characteristics, winding details and applications of different types of fractional horse power motors. Starting and starters for different motors. Speed reversal and speed control of A.C. Motors, installation of A.C. motor and testing, common faults, their causes, testing and repairs, rewinding of fractional h.p. motors.

5. Electrical Solders: Types of Solders, flux and methods, techniques of soldering. **4**

PRACTICAL

Time: 3 Hours ***Marks: 60***

1. To test and repair a defective cycle dynamo.
2. Dismantling, study and reassembling of a D.C. motor.
3. Measurement of resistance of series, shunt field and armature of a given D.C. motor and identification of terminals by multimeter.
4. Measurement of insulation resistance of armature and field.
5. Testing, fault finding and repair of a D.C. motor.
6. Overhauling of a D.C. motor.
7. Dismantling, study and reassembling of a D.C. motor starter.
8. To study D.C. series motor, its running, speed control and reversing rotation and measurement of current, voltage and speed.
9. To study D.C. shunt motor, its running, speed control and reversing rotation and measurement of current, voltage and speed.
10. To study D.C. compound motor, its running, speed control and reversing rotation and measurement of current, voltage and speed.

11. To study D.C. universal motor, its running, speed control and reversing rotation and measurement of current, voltage and speed.
12. Identification of semi-conductor devices.
13. To draw forward & reverse characteristics of given semiconductor diode.
14. Study of transistor circuits: (i) Common Base, (ii) Common Emitter, and (iii) Common Collector.
15. Study of a half-wave rectifier circuit with and without filter.
16. Study of a full-wave rectifier circuit with centre tap transformer with and without filter.
17. Study of bridge rectifier circuit with and without filter.
18. Study of transistor amplifier circuits: (i) Common Base, (ii) Common Emitter and (iii) Common Collector.
19. Study of (i) Voltage Transformer, (ii) Current Transformer and (iii) Auto-Transformer.
20. To rewind the given 230/12 v transformer.
21. Dismantling, study and reassembling of an A.C. motor.
22. Overhauling of an A.C. motor.
23. Dismantling, study and reassembling of an A.C. motor starter.
24. Testing, fault finding and repair of an A.C. motor starter.
25. Connecting, starting, running and reversing of a three phase squirrel cage induction motor.
26. Connecting, starting, running of a shaded pole motor.
27. Connecting, starting, running and reversing of a capacitor start/run motor.
28. Connecting, starting, running and reversing of an A.C. Universal motor.
29. Installation of D.C. motor.
30. Installation of A.C. motor.
31. Study of DOL starter for starting three phase induction motor.

MARKING SCHEME

Marks: 60

Note:

1. The marks for sessional work will be awarded by the teacher concerned and included in the final award.
2. Students may be asked to perform any one of the experiments listed above.

DISTRIBUTION OF MARKS

1. Sessional Work **10**

(a) All listed practical performed.

(b) Maintenance of proper records pertaining to sessional and On-Job-Training.

2. Experiment(s) **40**

(a) List of material/tools/equipment.

(b) Circuit/connection diagram (wherever diagram is not applicable then these marks should be clubbed with performance of experiments).

(c) Performance of experiment(s).

3. Viva Vioce 10

(a) Question related to the experiment assigned.

(b) Question related to the remaining experiments.

CLASS–XII
ELECTIVE
ELECTRICAL APPLIANCES (788)
THEORY

Time: 2 Hours ***Marks: 40***

1. Electric Room Heater: 2

Construction and working principle of reflector type room heater, common defects, testing and repairs.

2. Electric Iron 2

Types of electric iron – ordinary type and automatic / thermostat control type – construction and working principles of electric irons. Common defects testing and repairs.

3. Electric Stove 3

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 & microwave oven.

4. Electric Toaster 3

Types of toasters – ordinary and automatic. Construction and working principle of electric toasters. Common defects, testing and repairs.

5. Immersion Heater and Geyser 2

Construction, working principle and use of immersion heater. Common faults – their causes, testing and repairs. Construction, working principles and use of geyser and thermostat, common defects, their causes, testing and repairs. Testing and installation of geyser. Precautions in using immersion heater and geyser.

6. Electric Kettle and Coffee Percolator 2

Working principle and use of electric kettle (all types) and coffee percolator. Common faults, their causes, testing and repair.

7. Electric Room Heater 2

Construction and working principle of blower type room heater. Heat convector – common defects, their causes, testing and repair.

8. Electric Fans 2

Types of fans – ceiling fan, pedestal fan, table fan, bracket fan, exhaust fan, construction, working principles. Characteristics and applications of electric fans. Common faults, their causes testing and repairs, installation of all purpose fan and exhaust fan.

9. Electric Mixer, Grinder and Blender 3

Construction, working principles, characteristics and applications of electric mixer, grinder and blender. Common faults, their causes, testing and repairs, servicing, maintenance and over.

10. Electric Washing Machine 2

Construction, working principles, special features and applications of washing machine, Common faults, their causes, testing and repair, repairing, servicing, maintenance and overhauling of washing machine.

11. Hair Dryer/Curler — 2

Construction and working principles of hair dryer/curler, Common faults, their causes testing and repair.

12. Room Cooler — 2

Construction and working details of room cooler, desert cooler, Common cooler faults, their causes, testing and repair, Installation of room cooler/desert cooler.

13. Vacuum Cleaner — 2

Construction and working principles of vacuum cleaner, common faults, their causes, testing and repair.

14. Emergency Light and Voltage Stabilizer — 3

Construction and working principles of emergency light and voltage stabilizer (manual and automatic), Common faults – their causes, testing and repair.

15. Electric Hand Drill — 2

Construction and working principles of electric hand drill, common faults, their causes, testing and repair.

16. Electric Motor Used in Domestic Appliances — 4

Split phase, capacitor start, capacitor-run, shaded-pole motors, two speed motors, reverse motors, universal motors, components testing, trouble shooting, and servicing.

17. Basic Occupational and Safety Practices — 2

Safety signs, lighting and handling loads, moving heavy equipments, Electrical safety- safety practices- first aid, Practice safe methods- lifting and handling of heavy objects, Rescue a person from live wire, Artificial respiration- Nelson's arm and Schafer's Method.

PRACTICAL

Time: 3 Hours ***Marks: 60***

1. Dismantling reassembling of reflector type room heater.
2. Testing and repair of reflector type room heater.
3. Dismantling and reassembling of electric iron (i) ordinary type and (ii) automatic thermostat control type.
4. Testing and repair of electric iron (i) ordinary type and (ii) automatic / thermostat control type.
5. Dismantling and reassembling of electric stove (i) coiled type, (ii) covered type- (a) hot plate, (b) grill or hot case.
6. Testing and repair of electric stove (i) coiled type, (ii) covered type – (a) hot plate, (b) grill or hot case.
7. Dismantling and reassembling of cooking range/oven.
8. Testing and repair of cooking range/oven.
9. Dismantling and reassembling of electric toaster:

   (i) Ordinary, (ii) semi automatic, (iii) automatic with thermostat.
10. Testing and repair of electric toaster:

    (i) Ordinary, (ii) semi automatic, (iii) automatic.

11. Dismantling and reassembling of geyser: (i) instant, (ii) storage.
12. Testing and repair of geyser: (i) storage, (ii) instant.
13. Dismantling and reassembling of electric kettles (all types) and coffee percolator.
14. Testing and repair of: (i) electric kettle (all types) and (ii) coffee percolator.
15. Connection of fluorescent tube-lamp circuit.
16. Testing and repair of: (i) table lamp, (ii) night lamp, (iii) fluorescent tube light.
17. Testing and repair of: (i) electric bell, (ii) buzzer, and (iii) door chimes.
18. Controlling lamp from two or three place.
    (Stair case wiring and go down wiring)
19. To control one lamp with one switch on batton/conduit wiring.
20. To control one lamp and one socket with separate switches on batton/conduit wiring.
21. To prepare series/parallel testing board.
22. To connect fan regulator with a ceiling fan.
23. To fit MCB in a circuit in place of fuse.
24. Measurement of insulation resistance of wiring installation by meggar.
25. Polarity test of installation.
26. Earth testing and measurement of earth resistance.
27. Identification of faults of wiring, installation and rectification.
28. Testing, fault finding, repair and overhauling of blower type room heater and heat connector.
29. Testing, fault finding, repair and overhauling of electrical fans.
30. Testing, fault finding, repair and overhauling (i) electric mixer, (ii) grinder, and (iii) blender.
31. Testing, fault finding, repair and overhauling of washing machine.
32. Testing, fault finding, repair and overhauling of hair dryer.
33. Testing, fault finding, repair and overhauling of room cooler/desert cooler.
34. Testing, fault finding, repair and overhauling of vacuum cleaner.
35. Testing, fault finding, repair of emergency light and voltage stabilizer (manual and automatic).
36. Testing, fault finding, repair and overhauling of electric hand drill machine.
37. Testing, fault finding, repair and overhauling of motors used in domestic appliances.
38. Winding/re-winding of electrical motor used in domestic appliances.
39. To test the given fan with the help of Meggar insulation resistance tester for:
    (i) Insulation resistance between body of the fan and winding.
    (ii) Continuity of windings – starting and running.
40. To study emergency light circuit.

PRACTICAL GUIDELINES

Parameters	Marks
Project / Practical Activities.	15
Viva Based on Project.	10
Practical File / Report or Portfolio.	10
Demonstration of skill Competency in Lab Activities.	25
Total	**60**

CLASS–XII
GENERAL FOUNDATION COURSE (501)
(Common for Engineering & Technology Based Courses)

Time: 3 Hours ***Marks: 100***

Part–I: (Compulsory to all Vocational Courses) *Marks: 50*

A. Business Management and Entrepreneurship 30

Management of Business

Elementary treatment/exposure to basic conceptual frame work of the topic listed below:

(a) Basic Function. **6**

(b) Marketing Management. **6**

(c) Financial Management. **6**

(d) Production Management. **6**

(e) Personnel Management. **6**

B. Computational Skills 10

1. (a) Solution of linear equations and their application to problem of commercial mathematics. **5**

   (b) System of linear equations and in equation in two variables. Applications in formation of simple linear programming problems.

2. Statistics: Raw data, bar charts and Histogram; Frequency Tables; Frequency Polygon; Ogive; Menu, Median and Mode of ungrouped and grouped data; Standard Deviation; Introduction to Mortality tables; Price Index etc. Introduction to Computers. **5**

C. Environmental Education & Rural Development 10

1. **Environmental Education** **5**

   (a) Modernisation of agriculture and environment, irrigation, water logging, use of fertilisers, pesticides, soil erosion, land degradation (desertification and deforestation), silting and drying of water resources.

   (b) Rational utilisation, conservation and regeneration of environmental resources (soil, air, water, plant, energy, minerals).

2. **Rural Development** **5**

   Principles and goals of rural development, major problems/constraints in rural development in India.

Part–II: Applied Chemistry *Marks: 30*

1. Structure of Atom: Rutherford model of the structure of atom, Bohr's theory of electrons, quantum numbers and their significance, de-Broglie equation and uncertainty principle, electronic configuration of 1 to 30 elements. **3**

2. **Periodic Properties of Elements:** Periodic law, periodic table, periodicity in properties like atomic radii and volume, ionic radii, ionization energy and electron affinity. Division of elements into s.p.d. and f blocks.**3**

3. **Chemical Bonds:** Electrovalent, covalent and coordinate bond and their properties. Metallic bonding (electron cloud mode) and properties (like texture, conductance, luster, ductility and malleability). **3**

4. **Fuel and their Classification:** Definition, characteristics, classification into solid, liquid and gaseous fuel. petroleum and brief idea of refining into various factions and their characteristics and uses. Calorific value of fuel, Gaseous fuels- preparation, properties, composition and use of producer gas, water and oil gas. **3**

5. **Water:**Impurities in water, methods of their removal, hardness of water, its types, causes and removal, disadvantages of hard water in boilers, pH value and its determination by calorimetric method. **3**

6. Problems based on Gravimetric and Volumetric Analysis. **3**

7. **Metals:** Cast iron and its properties, effect of sulphur, silicon and phosphorus as impurities in cast iron. Elementary knowledge of heat treatment of steels - hardening tempering annealing, normalizing and case hardening. **3**

8. **Alloys:** Definition, classification and necessity for making alloys. Composition, properties and uses of following alloys: Brass, Bronze, Gun-metal and Duralumin. Effect of carbon, nickel, chromium, manganese on steel. **3**

9. **Corrosion:**Its meaning, theory of corrosion, prevention of corrosion by various methods using metallic and non-metallic coatings. **3**

10. **Plastic and Polymers:**Plastic-thermo-plastic and thermo-setting. Introduction of Polythene. P.V.C. Nylon, synthetic rubber and phenol-formal-dehyde resin, their application in industry. **3**

PRACTICAL

Time: 1 Hour ***Marks: 20***

1. To find the strength in grams per litre of the given solution of sodium hydroxide with the help of standard oxalic acid solution.
2. Find the strength in grams per litre of given sodium hydroxide solution with the help of standard sodium-carbonate solution and intermediate solution of an acid.
3. Determine the strength of oxalic acid solution in grams per litre using standard oxalic acid and intermediate solution of potassium permanganate.
4. Determine the total alkalinity in ppm in the given sample of water using standard sulphuric acid.
5. To find the amount of chloride ions present in water using silver nitrate solution (potassium chromate as indicator).
6. Estimate the amount of copper in the given sample of copper sulphate or copper alloy solution using a standard solution of sodium thiosulphate.
7. Estimate the amount of ash in the given sample or coal or coke or charcoal.
8. Estimate the amount of moisture in the given sample coal or coke.
9. Study the reaction of dilute and concentrated acid with any two metals (irons, copper, zinic, magnesium).

10. To arrange Mg, Zn, Fe, Fb, Sn, Cu according to their activity by studding the interaction of these metals with their salt solutions.
11. To determine the pH value of water.