PART – A

Answer all questions. Each question carries 2 marks.

1. Define RMS and Average value.

2. Derive the relation between phase and line voltages of a 3-phase balanced star connected system.

3. Give the principle of operation of single phase energy meter.

4. List out the methods of improving power factor.

5. Explain about core losses in a DC machine.

6. Draw the phasor diagram of an ideal transformer.

7. Is a single phase induction motor self starting? If not, why?

8. Compare the performance of mercury vapour with sodium vapour lamps.

9. Mention the different types of LT and HT consumers.

10. Name the main parts of Hydroelectric power plants.
PART – B

Answer any one full question from each Module. Each question carries 20 marks.

Module – I

11. a) A coil having a resistance of 8Ω and an inductance of 0.05H is connected across a 230 V, 50 Hz supply. Calculate
   a) current,
   b) phase angle between the current and supply voltage,
   c) apparent power,
   d) active power,
   e) reactive power.

10

b) For the circuit shown in Fig. 1, find the current flowing in all the branches.

10

\[\text{Figure 1}\]

OR

12. a) Define the following terms:
   i) Magnetic circuit
   ii) Magnetic field strength
   iii) Magneto Motive Force (M M F)
   iv) Reluctance.

10
b) A mild steel ring has a mean diameter of 20 cm and cross sectional area of 400 mm². Calculate:
   i) The reluctance of the ring
   ii) m.m.f. to produce a flux of 500 micro-Weber's
   iii) Magnetic field strength. Assume the relative permeability of mild steel as 1080.

Module – II

13. a) Explain how 3-phase power can be measured with the help of three wattmeters in a 3-phase 4 wire circuit.

b) A wattmeter has a current coil of 0.1 Ω resistance and a pressure coil of 6500 Ω resistance. Calculate the percentage errors, due to resistance only with each of the two methods of connection of wattmeter when reading the input to an apparatus which takes (i) 12 A at 250 V with unity power factor and (ii) 12 A at 250 V and 0.4 power factor.

OR

14. a) Explain different types of distribution systems with the help of neat sketches.

b) A three phase ring main PQRS fed at P of 11 kV, supplies balanced loads of 50 A at 0.8 p.f. lagging at Q, 120 A at unity p.f. at R and 70 A at 0.866 lagging at S, the resistances being referred to the various sections are: Section PQ = (1 + j0.6) ohm; section QR = (1.2 + j0.9) ohm; Section RS = (0.8 + j0.5) ohm; Section SP = (3 + j2) ohm. Determine the currents in various sections and station bus-bar voltages at Q, R and S.

Module – III

15. a) Obtain the equivalent circuit of a single-phase transformer. Explain how to evaluate the equivalent circuit of a transformer from open circuit and short circuit tests.

b) A 5 kVA, 220/110 volts, 1-phase transformer has a maximum efficiency of 96.97% at 0.8 p.f. lagging. It has a core loss of 50 watts and the full load regulation at 0.8 p.f. lagging is 5%. Find the efficiency and regulation at full load 0.9 p.f. lagging.

OR
16. a) Explain the terms: Maximum torque, Full load torque, Starting torque and No-load torque of a 3-phase Induction Motor.

b) An 8-pole, 50 Hz, 3 phase slip ring IM has effective resistance of 0.08/phase. The speed correspond to maximum torque is 650 rpm. What is the value of resistance to be inserted in rotor circuit to obtain maximum torque at starting? 10

Module – IV

17. a) What is high voltage fuse? Mention the different types of fuses. 10

b) Describe the principle of operation of MCB with a neat sketch. 10

OR

18. a) List out the different types of lead acid batteries and explain about their characteristics. 10

b) What is the need to avoid overcharging? 10