

Duration – 3 Hours

Total Marks - 80

N.B.:- (1) Question No.1 is compulsory.

(2) **Attempt** any **three** questions out of remaining **five** questions.

(3) Assume suitable data if necessary and justify the same.

- Q 1. Answer the following questions. **20**
- a) Write a short note on types of magnetic materials.
 - b) Mention the types of cooling methods used in transformer and explain anyone.
 - c) Explain the working of BLDC motor.
 - d) Explain the need for CAD analysis.
- Q 2 a) Derive the output equation of 3 phase induction motor. **10**
- Q 2 b) Explain the effect of choice of electrical loading and magnetic loading on the design of electrical machine. **10**
- Q 3 a) Explain the design of damper winding in synchronous machines. **10**
- Q 3 b) Explain the estimation of full load mmf in synchronous machines. **10**
- Q 4 a) Find the main dimensions of 100 MVA, 11 KV, 50 Hz, 40 pole salient pole generator assuming air gap flux density as 0.65 Wb/m^2 and ampere conductors as 40000 per metre. The peripheral speed should not exceed 60 m per second. **10**
- Q 4 b) Find the main dimensions of a 15 kW, 3 phase, 400 V, 50 Hz, 2810 r.p.m. squirrel cage induction motor having an efficiency of 0.88 and a full load power factor of 0.9. Assume specific magnetic loading = 0.5 Wb/m^2 ; specific electric loading 25000 A/m. Take the rotor peripheral speed as approximately 20 m/s at synchronous speed. **10**
- Q 5 a) A 250 kVA, 6600/400 V, 3 phase core type transformer has a total loss of 4800 W at full load. The transformer tank is 1.25 m in height and $1 \text{ m} \times 0.5 \text{ m}$ in plan. Design a suitable scheme for tubes if the average temperature rise is to be limited to 35°C . The diameter of tubes is 50 mm and are spaced 75 mm from each other. The average height of tubes is 1.05 m. Specific heat dissipation due to radiation and convection is respectively 6 and $6.5 \text{ W/m}^2 \text{ }^\circ\text{C}$. Assume that convection is improved by 35 per cent due to provision of tubes. **10**
- Q 5 b) Explain sizing of electric motors for electric vehicle? **10**
- Q 6 a) Explain types of insulating materials in detail. **10**
- Q 6 b) i) Draw and explain flowchart of Hybrid method in Computer aided designs. **05**
- ii) Write a short note on window space factor. **05**
