

Total No. of Questions :6]

SEAT No. :

P85

APR. -16/TE/Insem. - 17

[Total No. of Pages :2

T.E.(Electrical)

DESIGN OF ELECTRICAL MACHINES

(2012 Course) (Semester - II) (303149)

Time : 1Hour]

[Max. Marks :30

Instructions to the candidates:

- 1) *Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6.*
- 2) *Neat diagrams must be drawn whenever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 5) *Assume suitable data if necessary.*

Q1) a) Derive the expressions for heating time constant $\left\{Th = \frac{Gh}{S\lambda}\right\}$ [5]

- b) A three-phase 15 H.P. squirrel cage induction motor, connected to 415V,50Hz ac supply has final steady temperature rise of 40°C when running at its rated output. Calculate its one-hour rating for the same temperature rise, if the heating time constant is 180 minute. The ratio of conductor losses to constant losses may be assumed as 1.25 and the total losses of machines at full load are 1800W. [5]

OR

Q2) a) State in details the specifications of transformer as per IS 2026(part 1) [4]

- b) The temperature rise of transformer is 25°C after one hour and 37.5°C after 2 hours of starting from cold conditions. Calculate its final steady temperature rise and heating time constant. If its temperature falls from final steady value to 40°C in 2.5 hours when disconnected, Calculate its cooling time constant. The ambient temperature is 30°C. [6]

P.T.O.

Q3) A core type, three phase delta/star, 750 kVA, 6600V, 50Hz, transformer has following data: **[10]**

Width of l.v. winding = 35mm

Width of h.v winding = 30mm

Width of duct between l.v and h.v winding = 15 mm

Height of winding = 0.45m

Length of mean turn = 1.5m

h.v.winding turns = 217

Estimate leakage reactance of transformer referred to h.v. side. Also estimate per unit regulation of transformer at full load and 0.8pf lagging if resistance per phase referred to h.v. side is 0.8Ω

OR

Q4) a) State the assumptions made while calculating leakage reactance of transformer. **[5]**

b) Explain in detail the procedure for design of transformer tank. **[5]**

Q5) a) Draw and explain flowchart for computer Aided Design of induction motor. **[5]**

b) A single phase 6000V, 50Hz transformer has a core of sheet steel. The net iron cross-sectional area is $22.336 \times 10^{-3} \text{ m}^2$. The mean length is 2.23 m, and there are four lap joints. Each lap joint takes $\frac{1}{4}$ times as much reactive mmf as is required per meter of core. If $B_m = 1.1 \text{ Wb/m}^2$, determine the number of turns on the 6600V winding and no load current. Assume an amplitude factor of 1.52 and that for given flux density, mmf per meter = 232A/m; specific loss = 1.76 W/kg. Specific gravity of plates = 7.5. **[5]**

OR

Q6) a) State and Explain the measures to overcome the mechanical forces under short circuit conditions. **[5]**

b) Write a note on estimation of no load current of transformer with its vector diagram. **[5]**

