

Total No. of Questions : 6]

SEAT No. :

P3634

[Total No. of Pages : 2

APR-15/ENGG.-119

T.E. (Electrical) (In Sem - Semester - II)

DESIGN OF ELECTRICAL MACHINES

(2012 Pattern)

Time : 1 Hour]

[Max. Marks : 30

Instructions to the candidates:

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of logarithmic table, slide rule, Mollier chart, electronic pocket calculator and steam table is allowed.*
- 5) *Assume suitable data, if necessary.*

- Q1)** a) What are the various specifications of transformer as per IS 2026? [4]
b) An induction motor has a final steady temperature rise of 40° C when running at its rated output. Calculate its half hour rating for the same temperature rise if the copper losses at rated output are 1.25 times its constant losses. The heating time constant is 90 minutes. [6]

OR

- Q2)** a) Write the functions of tap changer, pressure release valve, conservator and breather? [4]
b) A 100 kVA transformer has an efficiency of 98 percent at full load and 0.8 power factor. For the purpose of cooling, the transformer may be considered to be 1200 kg of homogeneous material having a specific heat of 700 J/kg-°C and a surface area of 10 m², the surface emitting heat at 12 W/m²-°C. Find the thermal time constant and the full load temperature rise. [6]

- Q3)** a) Derive output equation of 3-phase transformer with usual notations. [4]
b) The tank of a 1250 kVA natural oil cooled transformer has the dimensions length, width and height as 1.55 m × 0.65 m × 1.85 m respectively. The full load loss is 13.1 kW. Find the number of cooling tubes for this transformer assuming: W/m²-°C due to radiation = 6; W/m²-°C due to convection = 6.5; improvement in convection due to provision of tubes = 40 percent; temperature rise = 40°C; length of each tube = 1 m; diameter of tubes = 50 mm. Neglect the top and bottom surfaces of the tank as regards cooling. [6]

P.T.O.

OR

- Q4)** a) List the assumptions made while deriving the equation for leakage reactance of three phase core type transformer. [4]
- b) Determine the dimensions for core and yoke for a 5kVA, 50 Hz, single phase core type transformer. A rectangular core is used with long side twice as long as short side. The window height is 3 times the width. Voltage per turn = 1.8 V; space factor = 0.2; current density = 1.8 A/mm²; flux density = 1 Wb/m²; stacking factor = 0.9. [6]
- Q5)** a) Derive the expression of average radial force produced in case core type transformer. [4]
- b) A 220/110 V, 1 kVA, 50 Hz single phase transformer has a core with a uniform cross sectional area of 2500 mm², an effective magnetic core length of 0.4 m and a core weight of 8 kg. If the core is worked at a maximum flux density of 1.2 Wb/m², the corresponding magnetizing force is 200 A/m and the specific core loss is 1.0 W/kg, determine the transformer no load current when the h.v. is fed at 220 V. [6]

OR

- Q6)** a) Derive the expression for calculation of no load current of three phase core type transformer. [5]
- b) Write a generalized flow chart for design of electrical machines. [5]

