Total No. of Questions : 6] SEAT No. :

P490

[Total No. of Pages : 2

TE/Insem/APR - 17
T.E. (Electrical)
DESIGN OF ELECTRICAL MACHINES
(2012 Pattern) (Semester - II)

Time : 1 Hour] *[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 wherever 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) What are different modes of heat dissipation? Define heating time constant and cooling time constant and state thier units. **[5]**

b) Derive the expressions for heating time constant $\left\{\text{Th} = \frac{Gh}{S\lambda}\right\}$. **[5]**

OR

Q2) a) The temperature rise of transformer is 25°C after 1 Hr & 37.5°C after 2 Hrs of starting from cold conditions. Calculate its final steady state temperature rise & heating time constant. **[4]**

b) Explain with diagram the use of tap changer and conservator. **[6]**

Q3) a) Derive the output equation for three phase transformer with usual notations. **[5]**

b) A 200 kVA, 50 Hz, 1 phase, core type transformer has following data-

Maximum flux density : 1.3 Tesla; Current Density : 2.5 A/mm^2, Window space factor : 0.3; Assume cruciform core, voltage per turn to be 14V and distance between the adjacent limbs is 1.4 times that of width of largest stamping. Calculate overall dimensions of transformer. **[5]**

OR

P.T.O.

Q4) a) Derive the expression for leakage reactance for three phase core type of transformer referred to primary. **[5]**

b) The full load efficiency of a 200 kVA transformer is 97% at unity power factor. Find the number of cooling tubes required if allowed temperature rise is 35°C. The tank area may be assumed to be 5 m^2. Assume diameter of cooling tube as 5 cm and average length of tube is 100 cm. Heat dissipation of tank surface is 12.5 W/m^2 and heat dissipation of tubes 8.8 W/m^2 °C. **[5]**

Q5) a) Explain the procedure to calculate working/loss component of no load current for there phase tranformer. **[4]**

b) Calculate the percentage regulation at full laod 0.8 pf lag for a 300 kVA, 6600/440 V, delta - star, 3 phase, 50 Hz, core type transformer having cylindrical coils of equal length with the following data. Height of coils = 4.7 cm, thickness of HV coil = 1.6 cm, thickness of LV coil = 2.5 cm, insulation between LV & HV coils = 1.4 cm, Mean diameter of the coils = 27 cm, volt/turns = 7.9 V, full load copper loss = 3.75 Kw. **[6]**

OR

Q6) a) Derive the expression for Axial Force for core type of transformer. **[6]**

b) Draw generalised flow chart for design of transformer. **[4]**

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