Total No. of Questions : 6]

SEAT No. :

P529

[Total No. of Pages : 2

TE/Insem/APR-117
T.E. (Electrical) (Semester - II)
Design of Electrical Machines
(2015 Pattern)

Time :1 Hour] *[Max. Marks : 30*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4 and 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 with neat sketch. **[6]**

b) Write short note on IS 2026 (Part I) of transformer. **[4]**

OR

Q2) a) The temperature rise of a 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) Write short note on auxiliaries of transformer such as tap changer, breather, pressure release valve and conservator. **[6]**

Q3) a) Derive the output equation for single phase core type of transformer with usual notations. **[5]**

b) A 200 kVA, 50 Hz, 1 phase, core type transformer has following data- Max.Flux Density : 1.3 tesla; Current Density : 2.5A/Sq.mm; 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 stampings. Calculate overall dimensions of transformer. **[5]**

OR

Q4) a) Derive the expression for leakage reactance for 1 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 $5m^2$. Assume diameter of cooling tube as 5cm and average length of tube is 100cm. Heat dissipation of tank surface is 12.5 W/m^2 and heat dissipation of tubes 8.8 $W/m^{2\circ}C$. **[5]**

Q5) a) Derive the expression for No Load current for 3 phase transformer. **[5]**

b) A 500 kVA, 6600/440V, 50 Hz, 3 phase, delta-star, core type transformer has 600 turns on HV winding. The height of HV and LV windings is 0.5m and length of mean turn is 1.2m. Calculate the radial force at full load and also the instantaneous radial force on HV winding under short circuit, if leakage impedance is 5% Take the doubling effect of multiplier as 1.6. **[5]**

OR

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

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