Total No. of Questions : 8]

SEAT No. :

P3518

[Total No. of Pages : 2

[5560]-168
T.E. (Electrical)
DESIGN OF ELECTRICAL MACHINES
(2012 Course) (Semester-II)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6.***
2) ***Assume suitable data wherever necessary.***
3) ***Figures to the right in bold indicate maximum marks.***
4) ***Use of non-programmable scientific calculator is permitted.***
5) ***Neat diagrams must be drawn wherever necessary.***

Q1) a) Develop the output equation of single phase shell type transformer. **[6]**

b) Discuss electrical steel sheets used for stampings of magnetic core of transformers and three phase induction motors. Explain with neat sketch the basic directional properties of cold rolled grain oriented transformer steel. **[6]**

c) A 200 kVA, 6600/440 V, 50 Hz, delta star, core type transformer has maximum flux density of 1.3 Wb/m^2, current density of 2.5 A/mm^2 and window space factor of 0.3. The overall height is equal to overall width and window area is 1.25 times the core area. Determine the overall core dimensions. Assume three stepped core. **[8]**

OR

Q2) a) How total resistance of a designed three phase transformer is calculated without carrying out any tests on it. **[6]**

b) Draw neat sketches of mitred joints used for cores of cold rolled oriented steel : **[6]**

i) 45^o mitre joint.

ii) $35^o/55^o$ mitre joint.

c) Write down in detail the steps to calculate the no load current of three phase transformer. **[8]**

Q3) a) What are various types of the stator slots? Draw any three types of slots and indicate the dimensions of the slots. **[8]**

b) Develop mush winding for 4 pole, 36 slots three phase induction motor. Draw winding diagram for anyone phase. **[10]**

OR

P.T.O.

Q4) a) Develop the output equation of three phase induction motor write down the nomenclatures used with their respective units. **[9]**

b) Determine the main dimensions of 3.7 KW, 400 V, 4 pole, 50 Hz three phase squirrel cage induction motor. The specific electric and magnetic loadings are 0.45 Wb/m^2 and 23000 A/m respectively. The full load efficiency is 0.85 and power factor is 0.84. Design the motor for cheapness assuming winding factor of 0.955. **[9]**

Q5) a) Which factors should be considered when estimating the length of the airgap of induction motor? Explain the effect of larger air gap on any two. **[8]**

b) How to calculate the dimensions of rotor bars for three phase squirrel cage induction motor? **[8]**

OR

Q6) a) What are different methods to improve starting torque of three phase squirrel cage induction motor? Explain any one in detail. **[8]**

b) A 6 pole, three phase squirrel cage induction motor has 72 slots with 15 conductors in each slot. There are 55 rotor slots. The coil span is 11 slots and the phase spread is 60º. Determine the current in rotor bars and end rings if the stator current is 24.1A & power factor is 0.83. **[8]**

Q7) a) Write detail procedure to calculate copper loss of a designed three phase induction motor (Without performing any test). **[8]**

b) Describe the significance of B_{60} in three phase induction motor. A 75 kW, 8 pole 3300V, 50 Hz., star connected induction motor has a magnetizing current which is 35% of full load current. Calculate the number of stator winding turns per phase if the mmf required for flux density at 60º from the inter polar axis is 500 a. Assume winding factor of 0.95, full load efficiency of 0.94 and full load power factor of 0.86. **[8]**

OR

Q8) a) How stator and rotor resistances are calculated in three phase squirrel cage induction motor. **[8]**

b) Why does skewing lowers the power factor and overload capacity. **[8]**