Code: 13A02404 **R13**

B.Tech II Year II Semester (R13) Supplementary Examinations May/June 2017

ELECTRICAL MACHINES – II

(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

*****

1 Answer the following: (10 X 02 = 20 Marks)

(a) What is meant by magnetizing current?

(b) What is the phase relationship between the primary and secondary voltages of a transformer?

(c) A 500 KVA, 3-phase transformer has iron losses of 300 W and full load copper loss of 600 W. Find the percentage of load at which the transformer is expected to have maximum efficiency.

(d) How the core flux of a practical transformer varies with a resistive load?

(e) The rotor of a three phase, 5 kW, 400 V, 50 Hz slip ring induction rotor is wound for 6 poles while its stator is wound for 4 poles. What is the approximate average no load steady state speed when this motor is connected to 400 V, 50 Hz supply.

(f) For an induction motor, operating at slips, write the ratio of gross power output to air gap power.

(g) Two transformers of the same type, using the same grade of iron and conductor materials are designed to work at the same flux and current densities. But the linear dimensions of one are two times those of the other in all respects. What is the ratio of KVA of the two transformers?

(h) When a bank of two single-phase transformers are connected in an open delta arrangement to supply a 3-phase load, do they supply their rated output?

(i) When the supply voltage to an induction motor is reduced by 10%, the maximum torque will decrease by ------- % approximately.

(j) A 400/100 V, 10 kVA two winding transformer is reconnected as an auto-transformed across a suitable voltage source. What is the maximum rating of such an arrangement?

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2 (a) What are the different losses occurring in a transformer on load? How can these losses be determined experimentally?

(b) The no-load current of transformer is 5 A at 0.2 p.f when supplied at 240 V, 50 Hz. The number of turns on the primary winding is 250. Determine: (i) The maximum value of flux in the core. (ii) The core loss. (iii) Magnetizing current.

OR

3 (a) Discuss the different methods of cooling of transformers. What is the function of oil in transformer?

(b) Calculate the regulation of a transformer in which the ohmic loss is 1% of the output and the reactance drop 5% of voltage, when the power factor is: (i) 0.8 lagging. (ii) 0.8 leading.

UNIT – II

4 (a) In back to back test, show that one transformer may have slightly less temperature rise than the other.

(b) Two similar 40 kVA, single-phase transformers gave the following results when tested by the back to back method:
W_1 in the supply line – 800 watts.
W_2 in the secondary series circuit at rated current – 1000 W.
Calculate the efficiency of each transformer at unity p.f.

OR

5 (a) Why is it preferable to install two or more transformers in parallel than one large unit?

(b) Two single-phase transformers in parallel supply a load of 500 A at 0.8 p.f lagging and at 400 V. Their equivalent impedances referred to secondary windings are (2 + j3)Ω and (2.5 + j5)Ω. Compute the current and kVA supplied by each transformer.

 Contd. in page 2

UNIT – III

6 (a) What are Vee and Tee-connections of transformer? Where are they used?

(b) A transformer has a Δ-connected primary and a star-connected secondary working at 50 Hz supply. The line voltages of primary and secondary being 6.6 kV and 400 V respectively. The line current of the primary side is 8 A and the secondary side has a balanced load of 0.6 p.f lagging. Determine: (i) The output of the transformer. (ii) The line current on the secondary side.

OR

7 (a) Discuss the similarities between transformer and an induction machine. Explain why an induction machine is called a generalized transformer.

(b) The stator of a 3-phase, 4-pole wound rotor induction motor is connected to 50 Hz source, but its rotor is energized from 20 Hz source. Determine two possible no-load speeds of the motor. Neglect all losses.

UNIT – IV

8 (a) Explain how the equipment circuit parameters of a poly-phase induction can be determined from no-load and blocked-rotor tests and per phase stator winding dc resistance.

(b) A delta connected induction motor operating from a balanced 3-phase, 400 V, 50 Hz supply takes a line current of 50 A at 0.76 p.f lag. Calculate per phase value of the capacitance and total kVA rating of the 3-phase delta connected capacitor bank, which when connected to the motor terminals would improve the line power factor to 0.9 lag.

OR

9 A 4 kW, 400 V, 50 Hz, 3-phase, 4-pole delta connected slip-ring induction motor has stator resistance of 0.36 Ω/ph, rotor resistance of 0.06 Ω/ph and per phase stator to rotor turns ratio of 2. The tests data is given below:

No-load: 400V, 3.3 A, $\cos\theta_0 = 0.174$

Locked rotor: 210 V, 16 A, $\cos\theta_{sc} = 0.45$

Draw the circle diagram and compute:

(a) Line current, power factor, slip, torque and efficiency at full load.

(b) Best operating p.f, maximum power output, maximum torque in Nm and slip at maximum torque.

UNIT – V

10 (a) Explain the phenomenon of crawling and cogging.

(b) A 3-phae, 4-pole, 50 Hz induction motor during the short-circuit test, took 100 A and 30 kW. In case of stator resistance is equal to equivalent stand still rotor resistance, compute the starting torque.

OR

11 (a) Why is it necessary to employ special starting arrangements for induction motors?

(b) Calculate the relative values of starting currents and starting torques of 3-phase squired-cage induction motor, when it is started by: (i) Star-delta starter. (ii) Auto-transformer starter with 60% tapping.

*****