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06EE46

Fourth Semester B.E. Degree Examination, June-July 2009
Transformers and Induction Machines

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Explain with neat sketch the construction of single phase core and shell type transformer. **(10 Marks)**

b. Write a note on constant current transformer. **(05 Marks)**

c. State advantages and limitations of auto transformer. **(05 Marks)**

2 a. Derive EMF equation for single phase transformer. **(05 Marks)**

b. Draw the approximate equivalent circuit of a transformer referred to the primary side and indicate how it differs from the exact equivalent circuit. **(05 Marks)**

c. A single phase transformer has turns ratio of 144/432 and operates at maximum flux of 7.5×10^{-3} wb at 50 Hz. When on no load the transformer takes 0.24 kVA at power factor of 0.26 lagging from the supply. If the transformer supplies a load of 1.2 kVA at a power factor of 0.8 lagging determine,
i) Magnetizing current ii) Primary current iii) Primary power factor. **(10 Marks)**

3 a. Explain the different losses occurring in a transformer on load. **(05 Marks)**

b. Discuss the necessary condition for the parallel operation of two transformers. **(05 Marks)**

c. Find the all day efficiency of single phase transformer having maximum efficiency of 98% at 15 kVA at UPF and loaded as follows:
12 hours – 2 kW at 0.5 power factor lagging.
6 hours – 12 kW at 0.8 power factor lagging.
6 hours – No load. **(10 Marks)**

4 a. What do you mean by open delta connection? When it is used? **(05 Marks)**

b. Write a short note on Scott connection. **(05 Marks)**

c. A 3 phase, 100 kVA, 6600/1100 V transformer is delta connected on the primary and star connected on the secondary. The primary resistance per phase is 1.8 Ω and secondary resistance per phase is 0.025Ω. Determine the efficiency when the secondary is supplying full load at 0.8 p.f. and the iron loss is 15 kW. **(10 Marks)**

PART – B

5 a. Explain how rotating magnetic field is produced in 3 phase induction motor. **(10 Marks)**

b. A 1000V, 50Hz, 3-phase induction motor has star connected stator. The ratio of stator to rotor turns is 3.6. The standstill impedance of rotor per phase is 0.01 + j0.2Ω. Calculate
i) Rotor current at start
ii) Rotor p.f. at start
iii) Rotor current at slip of 3%
iv) External resistance per phase in the rotor circuit to limit starting rotor current to 200A. **(10 Marks)**

6 a. Draw and explain the phasor diagram and equivalent circuit of a 3-phase induction motor. **(08 Marks)**

b. While delivering an useful power of 24 kW to the full load, a 3-phase, 50 Hz, 8 pole induction motor draws a line current of 57A. It runs at a speed of 720 rpm and is connected to 415 supply. The p.f. of the motor is observed to be 0.707 lagging. Stator resistance per phase is 0.1Ω. Mechanical losses are 1000 Watts. Calculate i) Shaft torque ii) gross torque developed iii) rotor copper losses iv) stator copper losses v) stator iron losses vi) overall efficiency. Assume star connected stator winding. **(12 Marks)**

7 a. Draw and explain Torque-slip characteristic of induction motor covering motoring, generating and braking regions of operation. **(05 Marks)**

b. Explain crawling and cogging of induction motors. **(05 Marks)**

c. Draw the circle diagram from no load and blocked rotor test of 3-phase, 14.92 kW, 400V, 6 pole induction motor from the following test results :
No load test : 400V, 11A, pf = 0.2
Blocked rotor test : 100V, 25A, pf = 0.4
Rotor Cu loss at stand still is half the total Cu loss from the diagram. Find line current, slip, efficiency, max torque, pf. **(10 Marks)**

8 a. Explain Star-Delta starting method of 3-phase induction motor. **(05 Marks)**

b. Describe different speed control methods of 3-phase induction motor. **(05 Marks)**

c. With a neat sketch explain the working of split phase induction motor. **(05 Marks)**

d. Write a note on open circuit test on single phase transformer. **(05 Marks)**

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