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10EE46

Fourth Semester B.E. Degree Examination, Aug./Sept. 2020
Transformers and Induction Machines

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. With a neat sketch, explain the construction and working principle of core type and shell type of transformer. **(06 Marks)**

b. Draw the phasor diagram of single phase transformer for Inductive and Capacitive load. **(08 Marks)**

c. A single phase transformer has a term ratio of 144/432 and operates at a maximum flux of 7.5×10^{-3} wb at 50 Hz when on no load the transformer takes 0.24 KVA at a 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. Find (i) The magnetizing current (ii) Primary current (iii) Primary power factor. **(06 Marks)**

2 a. Develop the Exact equivalent circuit of single phase transformer. From this derive approximate and simplified equivalent circuits of the transformer. **(10 Marks)**

b. A 20 KVA, 2200/220V, 50 Hz single phase transformer gave the following readings:

OC Test:	220V	4.2 A	148 W	(LV side open)
SC Test:	86V	10.5A	360 W	(LV side shorted)

Determine :

(i) The equivalent resistance and reactance referred to the secondary.
(ii) The voltage regulation on full load, 0.8 pF lagging.
(iii) The efficiency at full load and half the full load at 0.8 pF lagging. **(10 Marks)**

3 a. Discuss the need and condition for parallel operation of 2, 1ϕ transformer. **(08 Marks)**

b. Derive the expression for copper saving in an autotransformer. **(06 Marks)**

c. Write a note on constant current transformer with diagram. **(06 Marks)**

4 a. Explain with necessary diagram, the Scott connection of transformer. **(06 Marks)**

b. A 3 phase 1000 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 ohm and secondary resistance per phase is 0.025 ohm. Determine the efficiency on full load at (i) Unity PF (ii) 0.8 pF lagging if the iron loss is 15 kW. **(10 Marks)**

c. Discuss the essential and desirable conditions to be fulfilled for operating two three phase transformers in parallel. **(04 Marks)**

PART – B

5 a. Explain the concept of rotating magnetic field and hence explain the principle of operation of 3-phase induction motor. **(10 Marks)**

b. Explain with neat sketches the construction of squirrel cage and slip ring induction motor. Mention the advantages and disadvantages of each type. **(10 Marks)**

6 a. Develop the equivalent circuit for a 3-phase induction motor. Explain how the mechanical power developed is taken care of in the equivalent circuit. **(10 Marks)**

b. A 4 pole, 50 Hz, 3 phase induction motor develops a maximum torque of 110 Nm at 1360 rpm. The resistance of the star connected rotor is 0.25 ohm/phase. Calculate the value of resistance that must be inserted in series, with each rotor phase, to produce starting torque equal to half of the maximum torque. **(10 Marks)**

7 a. Describe the working principle of double cage induction motor and sketch torque and current characteristics of a double cage induction motor. **(10 Marks)**

b. What is induction generator? Explain the principle of operation. **(10 Marks)**

8 a. Write a note on shaded pole motor. **(05 Marks)**

b. Why induction motor is not self starting? Explain the double revolving field theory. **(05 Marks)**

c. What is the necessity of starter for 3-phase IM? Explain the ($Y-\Delta$) starter. **(07 Marks)**

d. Explain any one method of speed control of 3ϕ IM. **(03 Marks)**

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