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Fourth Semester B.E. Degree Examination, Dec.2013/Jan.2014
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 the vector diagram, explain operation of practical transformer under no-load and load. **(08 Marks)**

   b. Write a note on 1-ϕ core type transformer. **(05 Marks)**

   c. A 50 KVA, 1-ϕ transformer has 500 – turns on the primary and 100-turns on the secondary. The primary is connected to 250volts, 50Hz supply. Calculate the following neglecting losses:
   i) The secondary voltage on open circuit.
   ii) Currents flowing through the windings.
   iii) Maximum value of flux.
   iv) If the transformer 50A to a load, what is its impedance. **(07 Marks)**

2. a. Derive the condition for maximum efficiency of a transformer. **(05 Marks)**

   b. Explain the sumpner's test for testing two 1-ϕ transformer. Also explain why this is beneficial for finding efficiency of transformer. **(08 Marks)**

   c. Find the all day efficiency of 500KVA distribution transformer whose copper loss and iron loss at full load are 4.5 kW and 3.5 kW respectively. During a day, it is loaded as under.

Number of hours	6	10	4	4
Loading in kW	400	300	100	0
Power factor	0.8	0.75	0.8	-

   (07 Marks)

3. a. Deduce expression for the load shared by two transformers in parallel when no-load voltages of these transformers are equal. **(06 Marks)**

   b. Explain the working principles and construction of constant current transformer. **(07 Marks)**

   c. Derive an expression for the saving of copper in autotransformer as compared to an equivalent two winding transformer. **(07 Marks)**

4. a. With the help of connection diagram and phasor diagram, explain how a two phase supply can be obtained from a three-phase supply. **(08 Marks)**

   b. Discuss the conditions that must be satisfied to operate two 3-phase transformer in parallel. **(06 Marks)**

   c. A balanced 3-ϕ load of 30 KVA, at a p.f. of 0.866 lagging is connected to two transformers connected in open-delta to a five 230V, three-phase system. Find the power delivered by each transformer. **(06 Marks)**

PART – B

5. a. What are the advantages of skewed slots in the rotor of squirrel cage induction motor? **(04 Marks)**

   b. Show that a rotating magnetic field can be produced by the use of 3-ϕ currents of equal magnitude. **(08 Marks)**

   c. Draw the complete torque-sip characteristics of a 3-ϕ I.M. indicating all the regions and explain. **(08 Marks)**

6 a. Explain the phenomenon of cogging and crowling in a 3-φ induction motor. (08 Marks)

b. A 415 volts, 40HP, 50Hz, Δ-connected motor gave the following test data:

| No-load test | 415V, 21A, 1250 Watt |
| Locked rotor test | 100V, 45A, 2730 Watt |

Construct the circle diagram and determine:
  i) The line current and power factor for rated output.
  ii) The maximum torque.
  Assume stator and rotor copper losses are equal at stand still. (12 Marks)

7 a. With a neat sketch, explain the working of a double-cage induction motor. Draw its equivalent circuit. (10 Marks)

b. Explain the working operation of induction generator, with a neat sketch. (10 Marks)

8 a. What is the necessity of starter for a 3-φ I.M? Explain the star-delta (Y-Δ) starter. (07 Marks)

b. Why 1-φ I.M is not self starting? Explain the working operation of 1-φ capacitor start and run induction motor. (07 Marks)

c. Explain any two methods of speed control of three-phase cage type motors. (06 Marks)

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