Total No. of Questions : 5] [Total No. of Printed Pages : 4

Roll No. .....

EE/EX–404(GS)

B. E. (Fourth Semester) EXAMINATION, June, 2012

(Grading System)

(Common for EE & EX Engg. Branch)

ELECTRICAL MACHINE – I

Time : Three Hours

Maximum Marks : 70

Minimum Pass Marks : 22 (D Grade)

Note : Attempt all the *five* questions. All questions carry equal marks. Assume any missing data.

Unit – I

1. (a) Draw the phasor diagram of an transformer for lagging power factor, and explain how the flux in the transformer core remains constant from no-load to full load. 7

(b) Obtain the equivalent circuit of a 200/400 V, 50 Hz, single phase transformer from the following test data :

O. C. test : 200 V , 0·7 A, 70 W on L. V. side

S. C. test : 20 V , 11 A, 85 W on H. V. side

Calculate the secondary voltage when delivering 5 kW at 0·8 p.f. lagging, the primary voltage being 200 V. 7

P. T. O.

Or

(a) Describe a back to back (Sumpner's test) for separation of losses in two identical transformers with lab diagrams. 7

(b) Find "all-day" efficiency of a transformer having maximum efficiency of 98% at 15 kVA at unity power factor and loaded as follows : 7

12 hours – 2 kW at 0·6 p. f. lag.

6 hours – 10 kW at 0·7 p. f. lag.

6 hours – at no load

Unit – II

2. (a) Discuss briefly the essential and desirable conditions to full filled for operating two three-phase transformer in parallel with connection diagrams. 7

(b) For a scott connection, calculate the values of line currents on the three phase side if the loads on the two-phase side are 300 kW and 600 kW both at 100 volt and 0·707 pf (lag) and the 3-phase line voltage is 3300 volts. The 300 kW load is on the leading phase on the 2 phase side. Neglect transformer losses. 7

Or

(a) Explain the operation of no-load and on-load ,tap changing transformers. Why are the tap changing transformers required ? 7

(b) Explain the construction, operating principle and applications of pulse and high frequency transformers. Also draw its characteristics. 7

Unit – III

3. Discuss the construction of the circuit diagram of three phase induction motor. What are the tests needed in the lab to obtain the data to draw the same ? 14

Or

(a) Draw the explain the power flow diagram of the three-phase induction motor. 7

(b) Draw the torque-speed characteristics of the three-phase induction motor in three mode operation and label it properly. 7

Unit – IV

4. (a) Discuss induction generation in all respect. How is it differ from the motor ? 7

(b) Explain cogging and crawling phenomenon occurs in the three-phase induction motor. 7

Or

(a) Explain double cage and deep bar induction motor, and compare it with the slip ring induction motor. 7

(b) Determine the starting torque of an induction motor in terms of full load torque when started by means of :

(i) a star-delta starter

(ii) an autotransformer with 70·7% tappings

The short-circuit current of the motor at normal voltage is 6 times the full load current and the full-load slip is 4%. Neglect the magnetising current. 7

Unit – V

5. (a) Discuss the construction, working principle and various types of LIM (Linear Induction Motor). Also, derive the expression of tractive force. 7

(b) Explain the single phase induction motor performance using double revolving field theory and draw the torque-speed characteristics for the same. 7

Or

(a) Explain the single phase A. C. series motor in detail with performance characteristics. 7

(b) The following data relates to tests on a 110 volts, 150 watts 50 Hz, 6-pole single-phase induction motor :

No load test : 110 volts, 63 watts, 2·7 amp.

Blocked rotor test : 55 volts, 212 watts, 5·5 amps.

The stator winding is 2·2 ohms and during the blocked rotor test the starting winding is open. Determine the equivalent circuit parameters. Also find the core, friction and windage losses. 7