Reg. No. : .....

Name : .....

Sixth Semester B.Tech. Degree Examination, May 2013
(2008 Scheme)
Branch : Electrical and Electronics
08.601 : ELECTRICAL MACHINES – III (E)

Time : 3 Hours Max. Marks : 100

Instruction : *Answer* ***all*** *questions from Part – **A** and* ***one*** *question from* ***each*** *Module of Part – **B**.*

PART – A **(10×4=40 Marks)**

1. Explain why an induction motor never runs at synchronous speed. Also define slip.
2. What is meant by cogging ? How this can be eliminated ?
3. The power input to the rotor of a 3-phase; 50 Hz 6-pole induction motor running at 960 rpm is 50 kW. Calculate rotor copper loss and mechanical power developed.
4. Derive an expression for the torque developed in an induction motor and obtain the condition for maximum torque.
5. Explain why a starter is needed for a 3-phase induction motor. Obtain a relation between starting torque and full load torque.
6. Explain the principle of speed control of 3-phase induction motor by slip-power recovery scheme.
7. Compare an induction generator with a synchronous generator.
8. Explain the principle of operation of a synchronous induction motor.
9. Briefly explain magnetic levitation.
10. Explain why a single phase induction motor is not self starting.

PART – B

Module – I

11. a) Explain the production of rotating magnetic field in a 3-phase induction motor. 6

b) A 18 kW, 415 V, 4-pole, 50 Hz, delta connected 3-phase induction motor gave the following test results.

No load test :	415 V,	10 A,	1500 W
Blocked rotor test :	105 V,	28A,	2040 W

Draw the circle diagram and find

i) Power factor, slip and efficiency for a line current of 35 A.

ii) Ratio of maximum torque to full load torque.

iii) Starting torque if started using star-delta starter. 14

OR

12. a) Derive an expression for the mechanical power developed in an induction motor and obtain the relation between the power input to the rotor, mechanical power developed and rotor copper loss. 10

b) A 400 V, 1450 rpm, 50 Hz, star connected wound rotor induction motor has stator impedance (0.8 + j1.6) ohm/phase and equivalent rotor impedance of (0.6 + j1.6) ohm/phase. The no load current is (0.8 – j5) A. Determine :

i) stator line current

ii) power factor

iii) torque developed and

iv) gross efficiency. Use approximate equivalent circuit. 10

Module – II

13. a) What are the different methods of braking a 3-phase induction motors ? Explain any one method. 6

b) Design the five sections of a six stud rotor resistance starter for a 3-phase wound rotor induction motor. The slip at full load is 0.02 and starting current is 1.5 times the full load current. The resistance of the rotor is 0.02 ohm/phase. Derive the formulae used. 14

OR

14. a) Explain with relevant diagrams, the speed control of 3-phase induction motor by V/f control. What are the drawbacks of controlling speed either by controlling voltage or by controlling frequency alone. 10

b) Explain the construction and working of a double cage induction motor. Also draw its torque-slip characteristic. 10

Module – III

15. a) Explain the construction and working of single phase.

i) Split phase induction motor

ii) Shaded pole motor. 14

b) A 250 W, 230 V, 50 Hz capacitor start single phase induction motor has the following impedance of standstill.

Main winding : (7 + j5) ohm

Auxiliary winding : (11.5 + j5) ohm

Find the value of capacitor to be connected in series with auxiliary winding for maximum starting torque. 6

OR

16. a) What is a Universal motor ? Explain its construction and mention its applications. 8

b) Explain the principle of operation of Linear Induction Motor with a sketch. 7

c) What are the advantages of synchronous induction motor over ordinary synchronous motor ? Show three different rotor connections for d.c. excitation. 5
