KUMARAGURU college of technology
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Register Number: ……..

B.E DEGREE EXAMINATIONS: MAY 2015

(Regulation 2009)

Fourth Semester

ELECTRICAL AND ELECTRONICS ENGINEERING

EEE105**:** Electrical Machines-II

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. In a synchronous generator operating at zero power factor lagging, the effect of armature reaction is
   a) magnetizing b) demagnetizing
   c) Cross-magnetizing d) Both magnetizing and Cross-magnetizing
2. Slip test is performed to determine
   a) slip b) Direct-axis and quadrature-axis reactance
   c) Positive sequence reactance d) Sub-transient reactance
3. Damper winding is provided in a three phase synchronous motor in order to
   a) Dampen out the noise of the machine b) Prevent hunting
   c) Provide starting torque d) Provide a cylindrical structure to reduce wind friction
4. While starting a three phase synchronous motor, its field winding should be
   a) Kept open b) Short circuited
   c) Connected to DC source d) None of those
5. In a three phase slip ring induction motor, three phase balanced supply is given to the rotor and stator winding is short circuited. The rotor would
   a) Not run b) Run in the direction of rotating field
   c) Run against the direction of rotating field d) Run at half the synchronous speed
6. Induction generator deliver power at
   a) Unity power factor b) Zero power factor lagging
   c) Leading power factor d) Lagging power factor

7. A star-delta starter is equivalent to an auto-transformer starter with a tapping of
   a) 86.6% b) 57.73%
   c) 57% d) 58%
8. A 6-pole three phase induction motor from a 50 Hz supply is cumulatively cascaded to a 4-pole motor. Speed of the 4-pole motor would be----------rpm
   a) 1500 b) 1000
   c) 600 d) 3000
9. The direction of rotation of a single phase induction motor can be reversed by
   a) Reversing connections of both windings b) Reversing connections of starting winding
   c) Using a reversing switch d) Reversing supply connections
10. Compensating winding is employed in a AC series motor in order to
   a) Compensate for decrease in field flux b) Increase the total torque
   c) Reduce the sparking at brushes d) Reduce the effects of armature reaction

PART B (10 x 2 = 20 Marks)

11. What are the causes of harmonics in the EMF waveforms of synchronous generators?
12. Define the voltage regulation of an alternator.
13. Write the different methods of starting for a synchronous motor.
14. Draw the V and inverted V curves of synchronous motor.
15. How do you define slip of an induction motor?
16. Write the condition for maximum torque under running conditions in a three phase induction motor?
17. Under what conditions is the direct on line starting of three phase cage induction motors preferred?
18. List out the advantages of slip power recovery scheme?
19. Why single phase induction motor is not self-starting?
20. Name the three types of stepper motor.

PART C (5 x 14 = 70 Marks)

21. a) A 100 kVA, 3000 V, 50 Hz 3-phase star-connected alternator has effective armature resistance of 0.2 Ω. The field current of 40 A produces short-circuit current of 200 A and an open-circuit EMF of 1040 V. Calculate the full-load voltage regulation at 0.8 p.f. lagging and 0.707 p.f. leading. Use EMF method.

(OR)

b) Explain the two reaction theory as applied to salient pole synchronous machines. Describe a method of determining direct and quadrature axis reactance of salient pole alternator.

22. a) (i) Explain from physical considerations, how synchronous motor can be made to operate at leading or lagging power factors with suitable phasor diagrams. (6)

(ii) Derive an expression for power developed in a cylindrical-rotor synchronous motor in terms of load angle and synchronous impedance. (8)

(OR)

b) (i) Develop the excitation circles for cylindrical rotor synchronous motor. How are these circles helpful in studying the steady state behavior of synchronous motors? (10)

(ii) A salient pole synchronous motor is connected to infinite bus. If its field current is reduced to zero, will it stop or continue running? Justify the answer. (4)

23. a) Describe the principle of operation of a three phase induction motor. Explain why the rotor is forced to rotate in the direction of rotating magnetic field.

(OR)

b) A 20 kW, 400 V, 50 Hz, three phase star connected induction motor has the following test data:

No-load test	400 V	9 A	power factor=0.2
Blocked rotor test	200 V	50 A	power factor=0.4

Draw a circle diagram and determine (a) line current (b) power factor (c) slip and (d) efficiency at full load. The stator and rotor copper losses are divided equally in the blocked rotor test.

24. a) A three phase squirrel cage induction motor has maximum torque equal to twice the full load torque. Determine the ratio of motor starting torque to its full load torque, if it is started by

(i) direct on line starter

(ii) star-delta starter

(iii) Auto transformer starter with 70% tapping.

The per phase rotor resistance and per phase standstill reactance referred to stator are 0.2Ω and 2Ω respectively. Neglect stator impedance.

(OR)

b) (i) How is the speed of a three phase induction motor controlled by its stator voltage control? (6)

(ii) Explain cascade arrangement for controlling speed of three phase induction motors. (8)

25. a) (i) Using double revolving field theory explain the torque-slip characteristics of a single phase induction motor and prove that it cannot produce any starting torque. (7)

(ii) Draw the equivalent circuit of a single phase induction motor and discuss the experimental procedure to obtain its parameters. (7)

(OR)

b) Write short notes on

(i) Repulsion Motor

(ii) Hysteresis Motor

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