B.E. / B. Tech.(Full Time) DEGREE END SEMESTER EXAMINATIONS APRIL/MAY 2013

ELECTRICAL AND ELECTRONICS ENGINEERING BRANCH

FIFTH SEMESTER

**EE – 9304 ELECTRICAL MACHINES II**

(REGULATIONS 2008)

Time: 3 hr  Max. Mark : 100

Answer all Questions

PART – A (10 x 2 = 20 Mark)

1. Draw the single phase equivalent circuit of a three phase induction motor.
2. State the advantages of double cage rotor.
3. Distinguish the terms cogging and crawling
4. How do we increase the starting torque of an Induction motor? Explain.
5. Can the synchronous motors self start? Explain.
6. Where do we use cylindrical and salient pole machines? Explain.
7. How do we use a synchronous machine for the supply of reactive power? Explain.
8. What are the factors that pull a synchronous machine out of synchronism?
9. Distinguish the use of capacitor start and run machines.
10. Is stepper motor an asynchronous motor or a synchronous motor? Explain.

PART – B ( 5 x 16 = 80 Mark)

11. (i) Draw the typical torque-speed curves of an Induction machine for the following cases (i) with variable voltage, (ii) with variable frequency and (iii) with variable rotor resistance. (10)

(ii) Explain how the equivalent circuit parameters of an Induction machine be determined by no-load and blocked rotor tests. (6)

12. a. Illustrate with the help of neat phasor-diagram, the occurrence of V and inverted V curves of synchronous machine either when operated as a motor or a generator. (16)

(OR)

12.b. (i) Two synchronous machines are connected in parallel to supply the loads. Explain in detail the influencing factors that affect the sharing of real and reactive power loads by the two machines. (10)

(ii) What is the significance of determining the direct and quadrature axis reactance? Explain. (6)

13. a. Illustrate the phenomenon of hunting and possibility of damping in synchronous machines with necessary equations.

(OR)

13.b. A 220 V, 50 Hz, 6pole star connected alternator with Ohmic resistance of 0.06 Ohm per phase, gave the following data. Determine the percentage voltage regulation by any two methods at full load current of 40 A and power factor of 0.8 lag.

| Field current | 0.2 | 0.4 | 0.6 | 0.8 | 1 | 1.2 | 1.4 | 1.8 | 2.2 |
|---|---|---|---|---|---|---|---|---|---|
| OC | 29 | 58 | 87 | 116 | 146 | 172 | 194 | 232 | 261.5 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| voltage | | | | | | | | | |
| Short circuit current | 6.6 | 13.2 | 20 | 26.5 | 32.4 | 40 | 46.3 | 59 | - |
| Zero pf voltage | - | - | - | - | - | 0 | 29 | 88 | 140 |

14. a. Consider a 3 phase, 4 pole, 1440 rpm, 50 Hz induction motor, which has star connected rotor winding having a resistance of 0.2 Ohms per phase and leakage reactance of 1 Ohm per phase. Rotor induced emf, at standstill, with supply voltage and frequency kept at rated value, is 120V/phase. Determine the rotor current, rotor power factor and torque at starting and full load. Compare these results.

(OR)

14.b.(i) Draw the circle diagram and explain how it is useful in predetermining the performance of an Induction machine. (8)

14.b.(ii) Illustrate two methods for speed control of Induction motors. (8)

15. a. (i) Illustrate the forward and reverse revolving field theory of single phase induction motor (6)

15.a. (ii) Draw the equivalent circuit and derive an expression for the developed forward and reverse torques (10)

(OR)

15.b. Write short notes on the following

(i) Universal machines and their application (8)

(ii) Theory of armature reaction and compensation (8)