

**FACULTY OF ENGINEERING****B.E. 3/4 (EEE) II – Semester (New) (Main) Examination, April / May 2013****Subject : Electrical Machinery – III****Time : 3 hours****Max. Marks : 75****Note: Answer all questions from Part-A. Answer any FIVE questions from Part-B.****PART – A (25 Marks)**

1. What is slot ripple? 2
2. Define phase spread. 2
3. What is the nature of armature reaction under short circuit for a synchronous generator? 2
4. State the necessary conditions for synchronising two alternators. 3
5. Give the phasor diagram of a synchronous motor giving maximum power output under steady state conditions. 3
6. What is synchronous condenser? 2
7. What are the subtransient, transient and steady state reactance? 3
8. What is slew range? 2
9. Evaluate the single phasing torque in an AC servomotor. 3
10. How can the linear velocity of a linear induction motor be increased? 3

**PART – B (50 Marks)**

- 11.a) Find the pitch factors for the windings given below :
  - i) 36 stator slots, 4 poles, coil span 1 to 8. 4
  - ii) 96 stator slots, 6 poles, coil span 1 to 12 4
- b) Explain from basic principles and relevant diagrams, as to how the effect of armature reaction in a synchronous machine can be represented by a reactance. 6
12. The open circuit and full load zero power characteristics of a 15,000 KVA, 11,000 V, 3 phase, 50 Hz star connected turbogenerator are given below.

Field ampereturns in thousands	10	18	24	30	40	45	50
Open circuit line emf in kilovolts	4.9	8.4	10.1	11.5	12.8	13.3	13.65
Zero power factor full load line emg in kilovolts	-	0	-	-	-	10.2	-

Find the armature reaction and the regulation at full load 0.8 pf lagging. 10

- 13.a) Explain the different starting methods of synchronous motors. 5
- b) A 1000 KVA, 11,000 V, 3 phase star connected synchronous motor has a synchronous impedance of  $3.5\Omega + j40\Omega$  per phase. Find the induced emf and angular retardation of the rotor at full load unity power factor. 5
- 14.a) Given the power-angle curve for a synchronous machine, how is the transient stability limit found. 5
- b) Describe the working of a hysteresis motor. 5
- 15.a) Explain the principle of a shaded pole motor. 5
- b) The main and auxiliary windings of a 200 KW, 120V, 50 Hz split phase motor have the following locked rotor parameters :
- |                       |                    |
|-----------------------|--------------------|
| $R_m = 2.00 \Omega$ , | $X_m = 3.46\Omega$ |
| $R_a = 9.15\Omega$ ,  | $X_a = 8.23\Omega$ |
- Find the currents in the main and auxiliary windings at starting. 5
16. Describe the working of :
- |                              |                                |    |
|------------------------------|--------------------------------|----|
| a) variable reluctance motor | b) permanent magnet step motor | 10 |
|------------------------------|--------------------------------|----|
17. Write short notes on :
- |                        |                                    |    |
|------------------------|------------------------------------|----|
| a) Two-reaction theory | b) Hunting in synchronous machines | 10 |
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