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B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2018.

Fifth Semester

Electrical and Electronics Engineering

EE 2302 – ELECTRICAL MACHINES – II

(Regulations 2008)

(Common to PTEE 2302 – Electrical Machines – II for B.E. (Part – time) Fourth Semester – EEE – Regulations 2009)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Why is the field system of an alternator made as a rotor?

2. What is synchronizing power of an alternator?

3. What is hunting?

4. Write down the significance of V and inverted V curves.

5. Why are the slots on the cage rotor of induction motor usually skewed?

6. Define slip of an induction motor.

7. What are the different methods of speed control employed in three phase cage induction motor?

8. Why is it objectionable to start large three phase induction motor by switching it directly on the line?

9. Distinguish the terms rotating and pulsating magnetic fields.

10. State the limitations of shaded pole motors.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Describe the POTIER method of determining the regulation of an alternator. (8)

(ii) A 3.3 kV alternator gave the following results :

Field current (A) :	16	25	37.5	50	70
OC voltage (kV)	1.55	2.45	3.3	3.75	4.15

A field current of 18 A is found to cause the full load current to flow through the winding during short circuit test. Predetermine the full load voltage regulation at (1) 0.8 pf lag and (2) 0.8 pf lead by MMF method. (8)

Or

(b) (i) Describe the slip test for finding X_d and X_q. (8)

(ii) Two similar, 3 phase alternators work in parallel and deliver a total real power of 1800 kW at 11 kV and at 0.85 pf lagging to the load. Each alternator initially supplied half the load power. The excitation of the first alternator is then increased such that its line current becomes 60 A lagging. Find the line current delivered by the second alternator. (8)

12. (a) (i) Why are synchronous motors not self starting? Explain. (6)

(ii) Explain the effect of variable excitation on the behaviour of the synchronous motor under constant load conditions. (10)

Or

(b) (i) Derive an expression for the maximum torque developed per phase of a synchronous motor. (8)

(ii) Explain how synchronous motor can be used as a synchronous condenser. Draw the phasor diagram. (8)

13. (a) (i) Draw the equivalent circuit and derive expressions for maximum torque and power of a three phase induction motor. (8)

(ii) A 6-pole, 50 Hz, 3-phase induction motor running on full load develops a useful torque of 160 Nm when the rotor emf makes 120 complete cycles per minute. Let, the mechanical torque lost in friction and core-loss is 10 Nm. Determine the following,

(1) shaft power output.

(2) input to the motor, and

(3) efficiency

Let the total stator loss be 800W. (8)

Or

(b) (i) Draw the torque slip characteristics of an induction motor for varying frequency. stator voltage and rotor resistance. (8)

(ii) A 400 V, 6-pole, 3-phase. 50 Hz star-connected induction motor running light at rated voltage takes 7.5A with a power input of 700W. With the rotor locked and 150 V applied to the stator, the input current is 35 A and power input is 4000W; the stator resistance/phase being 0.55 ohms under these conditions. The standstill reactances of the stator and rotor as seen on the stator side are estimated to be in the ratio of 1:0.5. Determine the parameters of the equivalent circuit. (8)

14. (a) Why are starters necessary for starting 3Φ induction motors? What are the various types of starters? Explain star-delta type starter in detail. (16)

Or

(b) With neat diagram explain the slip power recovery scheme. (16)

15. (a) Explain with suitable diagram the working principle of split-phase and capacitor start induction motor. (8+8)

Or

(b) Discuss briefly the operation and characteristics of

(i) Repulsion motor (8)

(ii) AC series motor. (8)