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Question Paper Code : 10575

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2025.

Fourth Semester

Electrical and Electronics Engineering

EE 8401 – ELECTRICAL MACHINES – II

(Regulations 2017)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. Define chording factor.
2. What are capability curves?
3. How the synchronous motor can be used as synchronous condenser?
4. Draw the torque-angle characteristics of a synchronous machine.
5. Write the phenomenon about cogging and how is it prevented.
6. What is induction generator?
7. Why is rotor rheostat starter not suitable for a squirrel cage motor?
8. What is meant by frequency control of three phase induction motor?
9. List the applications of single phase induction motor.
10. Define resolution in a stepper motor.

PART B — ($5 \times 13 = 65$ marks)

11. (a) (i) Derive the emf equation of a three phase alternator. (7)
(ii) A 4 pole, three phase, 50 Hz star connected alternator has 60 slots with 4 conductors per slot. Coils are short pitched by 3 slots. If the phase spread is 60 degree, find the line voltage induced for a flux per pole of 0.943 Wb distributed sinusoidally in space. All the turns per phase are in series. (6)

Or

- (b) (i) Explain briefly about the impact of load power factor on the voltage regulation of a three phase alternator and explain any one method to predetermine the voltage regulation. (7)
- (ii) For a salient synchronous machine, derive the expression for power developed as a function of load angle. (6)
12. (a) With neat sketches, explain the construction, operating principle and starting methods of a three phase synchronous motor.

Or

- (b) (i) Draw and explain V and inverted V curves of three phase synchronous motor. (7)
- (ii) The input to a 1100 V, three phase star connected synchronous motor is 60 A. The effective resistance and synchronous reactance per phase are respectively 1 ohm and 30 ohm. Find the power supplied to the motor and the induced emf for power factor of 0.8 leading. (6)
13. (a) (i) Describe the construction and working principle of three phase induction motor. (7)
- (ii) Draw the equivalent circuit of three phase induction motor and explain how parameters are obtained. (6)

Or

- (b) (i) Explain the construction and operating principle of double cage induction motor. (7)
- (ii) The power input to a three phase induction motor is 60 kW. The stator losses are 1 kW. Find the mechanical power developed and rotor copper loss per phase if the motor is running with a slip of 3%. (6)
14. (a) Enumerate the various methods of starting the three phase induction motor and explain any one method used for three phase squirrel cage induction motor. Obtain the relation between starting torque and full load torque.

Or

- (b) With neat diagram explain how the speed of three phase slip ring motor is controlled with slip power recovery scheme. Also mention the merits and demerits of this scheme.

15. (a) (i) Using double field revolving theory, explain why a single phase induction motor is not self-starting. (7)
- (ii) Describe the construction and working principle of single phase induction motor. (6)

Or

- (b) (i) Develop equivalent circuit of a single phase induction motor neglecting core losses. (7)
- (ii) Explain the principle of operation of AC series motor with neat sketches. (6)

PART C — ($1 \times 15 = 15$ marks)

16. (a) (i) Derive the torque expression for a three phase induction motor and explain the various operating region in speed-torque characteristics. (9)
- (ii) A three phase 50 Hz, 6 pole induction motor has rotor resistance of 0.1 ohm and reactance of 0.92 ohm. Neglect the voltage drop in stator and assume that the rotor resistance is constant. Given that the full load slip is 3%, calculate the ratio of maximum torque to full load torque. (6)

Or

- (b) (i) Describe how the direct and quadrature axis reactance of a salient pole synchronous machine can be estimated by slip test. (9)
- (ii) A 12 MVA, 5000V, three phase, 4 pole, 50 Hz alternator is connected to infinite bus bar. The short circuit current is 4 times the normal full load current and the moment of inertia of the rotating system is 22000 kg-m². Determine the normal period of oscillation. (6)

