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Question Paper Code : 91037

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

Fourth Semester

Electrical and Electronics Engineering

EE 3405 — ELECTRICAL MACHINES – II

(Regulations 2021)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. What are advantages of ZPF method to find the voltage regulation of an alternator?
2. What do you mean by synchronous impedance?
3. How do you prevent hunting in a synchronous motor?
4. What is the use of damper winding in synchronous motor?
5. What is meant by cogging?
6. State the principle behind the operation of an Induction motors.
7. Mention the speed control methods of a 3 phase induction motor.
8. What is meant by V/f control in IM?
9. Draw the equivalent circuit of a single phase induction motor.
10. Mention the types of stepper motor.

PART B — ($5 \times 13 = 65$ marks)

11. (a) Explain the EMF and MMF method of finding out the voltage regulation of an Alternator.

Or

- (b) Discuss the parallel operation of Alternator with neat diagram.

12. (a) Explain the working principle, construction and operation of Synchronous motor.

Or

- (b) Explain how a synchronous motor can be operated in lagging, unity and leading power factors.
13. (a) Derive the expression for starting torque and running torque of a three phase induction motor. Also, obtain the condition for maximum torque for starting and running conditions.

Or

- (b) Explain the no load and blocked rotor test in three phase Induction motor.
14. (a) Explain the auto transformer and star-delta methods of starting of 3 phase induction motor.

Or

- (b) Briefly discuss the different types of braking in three phase induction motor.
15. (a) Discuss the working principle, construction and operation of single phase induction motor.

Or

- (b) Discuss the operation of shaded pole induction motor and Hysteresis motor with neat sketch.

PART C — (1 × 15 = 15 marks)

16. (a) A 400 V, 50Hz, 4 – pole, star connected induction motor takes a line current of 10 A with 0.86 p.f. lagging. Its total stator losses are 5% of the input. Rotor copper losses are 4% of the input to the rotor and mechanical losses are 3% of the input of the rotor. Calculate
- (i) Slip and rotor speed (5)
 - (ii) Torque developed in the rotor (5)
 - (iii) Shaft torque. (5)

Or

(b) A 220 V, three phase, 4 – pole, 50 Hz, star connected induction motor is rated 3.73 kW. The equivalent circuit parameters are $R_1 = 0.45 \, \Omega$, $X_1 = 0.8 \, \Omega$, $R_2' = 0.4 \, \Omega$, $X_2' = 0.8 \, \Omega$, $B_0 = -1/30 \, \text{mho}$. The stator core loss is 50W and rotation loss is 150 W. For a slip of 0.04, find

- (i) power factor (5)
 - (ii) air gap power and mechanical power (5)
 - (iii) electromagnetic torque and efficiency. (5)
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