

Reg. No. :

Question Paper Code : 60570

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2026.

Fourth Semester

Electrical and Electronics Engineering

EE8401 – ELECTRICAL MACHINES – II

(Regulations 2017)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Calculate the pitch factor of the generator stator winding which has 36 stator slots, 4 poles, coil span 1 to 8.
2. Write the conditions for parallel operation of alternator.
3. Define the term hunting with respect to Synchronous machines. Mention the methods to suppress it.
4. How the synchronous motor can be used as a Synchronous condenser?
5. State the reasons for skewing of rotor bars of induction motor.
6. Write the range of slip when the induction machine is operating in motor mode, generator mode and braking mode.
7. How speed of induction motor is varied by varying frequency of supply?
8. What are the different methods of starting three phase induction motors?
9. Draw the equivalent circuit of plain single-phase induction motor at standstill condition applying double field revolving theory.
10. State the applications of magnetic levitation systems.

PART B — ($5 \times 13 = 65$ marks)

11. (a) (i) Derive the emf equation of an Alternator and brief the effect of winding factor on the induced emf. (7)
- (ii) What is Synchronization of Alternators? State the conditions and explain any one method used for synchronizing Alternators. (6)

Or

- (b) Explain the slip test to estimate direct axis reactance and quadrature axis reactance of salient pole synchronous machine.
12. (a) Explain the V and inverted V curves of a synchronous motor. Also explain how a synchronous motor can be used to control the power factor. (10+3)

Or

- (b) Draw the phasor diagrams for a Synchronous motor for different excitations and thereby explain influence of field excitation on line current and power factor, when the mechanical output is kept constant.
13. (a) (i) A 3.3 kV, 20 pole, 50 Hz, 3 phase Induction Motor has rotor resistance and standstill reactance of 0.014Ω and 0.113Ω per phase respectively. Calculate the speed at which the torque developed is maximum and the ratio of full-load to maximum torque, if the full load torque is delivered at 288 RPM. (7)
- (ii) Derive the condition for maximum torque under running condition for a three-phase induction motor. (6)

Or

- (b) Develop the equivalent circuit representation for a three phase induction motor.
14. (a) With the help of a neat sketch, describe the principle of working of a star-delta starter for an Induction motor. When can this type of starter be used? (11+2)

Or

- (b) Discuss the cascade operation of induction motors to obtain variable speed.
15. (a) With suitable circuit, describe the construction and working of
- (i) capacitor start induction motor. (6)
- (ii) shaded pole induction motor. (7)

Or

- (b) Discuss in detail the construction, operation and characteristics of the stepper motor.

PART C — (1 × 15 = 15 marks)

16. (a) A 1000 kVA, 11 kV, 3-phase, star-connected Alternator has an effective resistance of $2\ \Omega$ per phase. The OCC and ZPF lagging characteristic for full-load current are given below. Predetermine the voltage regulation for full-load condition at 0.8 pf lagging by ZPF method.

Field current (A)	20	25	55	70	90
OCC Phase Voltage (V)	3348.6	4041.5	7216.9	7938.6	8660.3
ZPF phase Voltage (V)	0	866.0	4907.5	6062.2	7216.9

Or

- (b) Estimate the line current and efficiency for full load condition for a 20 HP, 50 Hz, 3-phase, star connected induction motor with the following test results: No load test: 400 V, 9 A, 0.2 pf lagging Blocked rotor test: 200 V, 50 A, 0.4 pf lagging Stator resistance per phase: $0.56\ \Omega$

