

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR
 (AUTONOMOUS)

B.Tech. II Year II Semester Supplementary Examinations December-2025

INDUCTION AND SYNCHRONOUS MACHINES

(Electrical & Electronics Engineering)

Time: 3 Hours
Max. Marks: 70
PART-A

(Answer all the Questions 10 x 2 = 20 Marks)

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|---|---|---|-------|------|----|
| 1 | a | How does load variation affect rotor speed? | [CO1] | [L2] | 2M |
| | b | Draw the equivalent circuit of 3 phase induction motor | [CO1] | [L4] | 2M |
| | c | What is the effect of increasing rotor resistance in a slip ring motor? | [CO2] | [L2] | 2M |
| | d | How can the speed of a 3-phase induction motor be controlled? | [CO2] | [L3] | 2M |
| | e | What is the function of a capacitor in a capacitor-start motor? | [CO3] | [L2] | 2M |
| | f | What is the function of the main winding in a single-phase induction motor? | [CO3] | [L4] | 2M |
| | g | What is armature reaction in a synchronous generator? | [CO4] | [L2] | 2M |
| | h | How does load variation affect the power factor of a synchronous generator? | [CO4] | [L3] | 2M |
| | i | What is meant by over-excitation and under-excitation in a synchronous motor? | [CO5] | [L2] | 2M |
| | j | Why is a damper winding used in a synchronous motor? | [CO5] | [L4] | 2M |

PART-B

(Answer all Five Units 5 x 10 = 50 Marks)

UNIT-I

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|---|--|---|-------|------|-----|
| 2 | | Describe the constructional details of squirrel cage and slip ring rotor induction machines | [CO1] | [L2] | 10M |
|---|--|---|-------|------|-----|

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|---|---|---|-------|------|----|
| 3 | a | Define slip, rotor emf and rotor frequency of the induction motor | [CO1] | [L4] | 5M |
| | b | Compare squirrel cage induction motor and slip ring induction | [CO1] | [L2] | 5M |

UNIT-II

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|---|---|---|-------|------|----|
| 4 | a | List out the starting methods of 3 phase induction motors. | [CO2] | [L4] | 5M |
| | b | A 3-phase induction motor is driving full load torque which is independent of speed. If line voltage drops to 80% of the rated value. Find the increase in motor copper losses. | [CO2] | [L5] | 5M |

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| 5 | | Explain no Load and blocked rotor tests of 3Ø induction machine. with circuit diagram and calculations. | [CO2] | [L2] | 10M |
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UNIT-III

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| 6 | | Explain the construction and operating principle of split phase induction motor. List out the merits, demerits and applications. | [CO3] | [L2] | 10M |
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| 7 | a | List out the applications of single-phase induction motor. | [CO3] | [L2] | 5M |
| | b | A 250 W, 230V, 50Hz capacitor start motor has the following constants for the main and auxiliary windings: main winding, $Z_m = (4.5 + j3.7)$ ohm. Auxiliary winding $Z_a = (9.5 + j3.5)$ ohm. Determine the value of the starting capacitor that will place the main and auxiliary winding currents in quadrature at starting. | [CO3] | [L3] | 5M |

UNIT-IV

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|---|--|--|-------|------|-----|
| 8 | | Write short notes on
a) distributed winding b) concentrated winding c) Pitch factor
d) Distribution factor with relevant derivations
e) integral slot and fractional slot winding | [CO4] | [L2] | 10M |
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| 9 | a | List out the different types of armature windings | [CO4] | [L2] | |
| | b | Define the voltage regulation of an alternator. Explain the various factors, which may affect the regulation of an alternator | [CO4] | [L2] | |

UNIT-V

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|----|---|--|-------|------|--|
| 10 | a | Describe the merits and demerits of synchronous motor? | [CO5] | [L2] | |
| | b | A three-phase 500V star-connected synchronous motor gives a net output of 17 kW on full load operating at 0.9 lagging power factor. Its armature resistance is 0.8Ω per phase. The mechanical losses are 1300 W. Estimate the current drawn by the motor and full load efficiency. | [CO5] | [L3] | |

OR

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|----|---|---|-------|------|--|
| 11 | a | What is a synchronous condenser? What is the use of a synchronous condenser with a neat phasor diagram? | [CO5] | [L2] | |
| | b | Explain the power flow diagram of Synchronous motor | [CO5] | [L2] | |

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