



CBCS SCHEME

21EE44

Fourth Semester B.E. Degree Examination, June/July 2024 Electric Motors

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. What is back emf? Explain its significance briefly. (06 Marks)
- b. Explain the characteristics of DC shunt motor with suitable diagrams. (06 Marks)
- c. A 4-pole lap wound Dc motor has 576 conductors and draws an armature current of 10A. If magnetic flux per pole is 0.02 wb, calculate the armature torque developed. What will the value of this torque if the motor is wave wound? (08 Marks)

OR

- 2 a. Derive the torque equation of a DC motor. (04 Marks)
- b. Explain the characteristics of a DC series motor with suitable diagrams. (06 Marks)
- c. With a neat diagram, explain the construction and operation of a 3-point starter. (10 Marks)

Module-2

- 3 a. Compare direct and indirect methods of testing DC motors. (04 Marks)
- b. Briefly explain Swinburne's test. (08 Marks)
- c. Explain why Hopkinson's test is called a Back-to-Back test. (08 Marks)

OR

- 4 a. Derive the torque equation of a 3-phase induction motor. (06 Marks)
- b. Clearly explain slip, slip speed and percentage slip. (06 Marks)
- c. A 3-phase, 50Hz induction motor runs at 1490 rpm at no load. Calculate the slip, percentage slip and slip speed. If the full load speed of this motor is 1450rpm, what are the values of slip, percentage slip and slip speed? (08 Marks)

Module-3

- 5 a. Draw and explain the equivalent circuit of the rotor of a 3-phase induction motor. How is the mechanical load on the motor is shown in this equivalent circuit? (06 Marks)
- b. With a diagram, explain the construction and operation of a double cage induction motor. (07 Marks)
- c. Explain how blocked rotor is conducted on a 3-phase induction motor. (07 Marks)

OR

- 6 a. Explain the phenomenon of cogging and crawling in a 3-phase induction motor. (06 Marks)
- b. With a neat diagram, explain how maximum output, maximum torque and maximum input are calculated by using the circle diagram of a 3-phase induction motor. (06 Marks)
- c. A 3-phase, star connected induction motor takes a stator current of 30A at a line voltage of 40 volts, with the rotor blocked. Under this condition, the power input to the motor is 500 watts and core loss is 50 watts. If the DC resistance between a pair of stator terminals is 0.12Ω and the ratio of AC to DC resistance is 1.62, find the equivalent leakage reactance/phase of the motor, per phase stator resistance and per phase rotor resistance. (08 Marks)

Module-4

- 7 a. Mention the limitations of star-delta starter. (06 Marks)
b. Explain rotor resistance starting with a neat diagram. (06 Marks)
c. Explain the speed control of a 3-phase induction motor by controlling input voltage and frequency. (08 Marks)

OR

- 8 a. Explain double field revolving theory as applicable to single phase induction motors. (10 Marks)
b. With a neat diagram, explain the construction and operation of a shaded pole induction motor. (10 Marks)

Module-5

- 9 a. Briefly explain why synchronous motor is not self starting. (06 Marks)
b. Write a note on hunting and damping in synchronous motors. (08 Marks)
c. Explain the operation of universal motor. (06 Marks)

OR

- 10 a. Explain V and inverted V curves briefly. Give suitable diagrams. (08 Marks)
b. Write a note on synchronous condenser. (06 Marks)
c. Explain the operation of linear induction motor. (06 Marks)

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