

CBCS Scheme

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15EE44

Fourth Semester B.E. Degree Examination, Dec.2017/Jan.2018 Electric Motors

Time: 3 hrs.

Max. Marks: 80

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

Module-1

- 1 a. What is back emf? Derive the armature torque equation of a DC motor. (06 Marks)
- b. List the applications of DC motors. (04 Marks)
- c. A 200V shunt motor with constant main field drives a load, the torque of which varies at the square of the speed. When running at 600 rpm, it takes 30A. Find the speed at which it will run and the current it will draw, if a 20Ω resistor is connected in series with the armature. Neglect the motor losses. (06 Marks)

OR

- 2 a. Draw the power flow diagram of a DC motor and derive the condition for minimum efficiency. (06 Marks)
- b. Explain the characteristics of a DC shunt motor. (05 Marks)
- c. Explain with circuit diagram, the armature control methods of DC series motors. (05 Marks)

Module-2

- 3 a. With neat diagram, explain the Swinburne's test on a DC motor. Mention the demerits of this test. (05 Marks)
- b. Explain the test on a DC motor which determines the rotational losses (05 Marks)
- c. Hopkinson's test on two machines gave the following results for full-load : line voltage = 230V, Line current excluding field current = 50A, motor armature current = 380A, field currents 5A and 4.2A. The armature resistance of each machine is 0.02Ω . Calculate the efficiency of each machine. (06 Marks)

OR

- 4 a. What is slip? Derive the maximum running torque equation of an induction motor. (06 Marks)
- b. Draw and explain the torque-slip characteristics covering motoring, generating and braking regions of operation. (06 Marks)
- c. Explain the effect of rotor resistance on maximum torque and slip of an induction motor. (04 Marks)

Module-3

- 5 a. Derive the approximate equivalent circuit referred to stator of an induction motor. (06 Marks)
- b. Explain with neat diagram the blocked rotor test on an induction motor. (05 Marks)
- c. The power input to the rotor of a 440V, 50Hz, 6-pole, 3-phase induction motor is 80kW. The rotor emf is observed to make 100 complete alternations per minute. Calculate the slip, the rotor speed and the mechanical power developed. (05 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.

OR

- 6 a. Write the procedure of drawing the circle diagram. What information can be obtained from the circle diagram? (06 Marks)
- b. With neat diagram, explain the construction of rotor of a double cage induction motor. (05 Marks)
- c. Explain the stand alone operation of the induction generator. (05 Marks)

Module-4

- 7 a. Why starter is necessary for an induction motor? With neat diagram, explain the operation of a start – Delta starter. (06 Marks)
- b. Explain the stator voltage control of a three phase induction motor. (05 Marks)
- c. A squirrel cage induction motor has a full-load slip of 4% and blocked rotor current of 6 times the full-load current. Find the percentage of tapping of the auto-transformer starter to give full-load torque on starting and the line current as a percentage of full-load current. (05 Marks)

OR

- 8 a. Explain with double –revolving field theory why the single phase induction motor is not self starting with phasor diagram. (08 Marks)
- b. Explain with neat diagram, the working principle of capacitor start single phase induction motor. (08 Marks)

Module-5

- 9 a. Explain the operation of a synchronous motor under constant excitation and varying load. (06 Marks)
- b. What is a synchronous condenser? What is its application? (04 Marks)
- c. List the causes of hunting and effects of hunting in a synchronous motor. (06 Marks)

OR

- 10 a. With a neat diagram, explain the operation of a two-phase AC servomotor. (08 Marks)
- b. What is a linear induction motor? Explain its principle of operation and draw the torque speed characteristic. (08 Marks)

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