

CBCS SCHEME

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18EE44

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. Derive an expression for torque of a DC motor. (06 Marks)
- b. With neat sketch explain Ward Leonard system of speed control. (06 Marks)
- c. A 200V DC series motor runs at 800rpm, when taking a line current of 15A. The armature resistance and series field resistance are 0.6Ω and 0.4Ω respectively. Find the speed at which it will run when connected in series with a 5Ω resistance and taking the same voltage. (08 Marks)

OR

- 2 a. What is the necessity of starter? Explain with neat sketch the four point starter. (08 Marks)
- b. A DC shunt motor runs at 1000 rpm on 200V supply. Its armature resistance is 0.8Ω and the current taken is 40 amps, in addition to field current. What resistance must be connected in series with the armature, to reduce the speed to 600rpm, the armature torque remaining same? Neglect the armature reaction. (08 Marks)
- c. Enumerate the various losses in a DC machine which of these losses
 - i) constant
 - ii) proportional to current
 - iii) proportional to current square. (04 Marks)

Module-2

- 3 a. Explain with a neat diagram, field test of two DC series machines to determine the efficiency. (10 Marks)
- b. Derive the torque equation of a 3- ϕ induction motor and obtain the condition for max running torque. (10 Marks)

OR

- 4 a. Explain back to back test on two identical DC shunt machines and calculate the efficiency of machines as generator and motor. (10 Marks)
- b. Discuss the torque – slip characteristics of a three phase induction motor including motoring, generating and breaking regions. (10 Marks)

Module-3

- 5 a. Explain the procedure of conducting no load and blocked rotor tests on three phase induction motor with neat circuit diagrams. (08 Marks)
- b. Describe the phenomenon of cogging in a 3 phase induction motor. How to overcome with this explain? (05 Marks)
- c. A 8 kW, 3-phase induction motor has 6 poles 50 Hz and operates at full load slip of 4% when rated voltage and frequency applied. Determine the :
 - i) Speed of stator mmf
 - ii) full load speed
 - iii) frequency of rotor
 - iv) full load torque. (07 Marks)

OR

- 6 a. Draw an equivalent circuit of double cage induction motor and explain its performance. (07 Marks)
b. How induction motor works as induction generator? Explain with a neat sketch. (06 Marks)
c. A 6 pole 50 Hz, three phase induction motor has a full load slip of 3% and develops a torque of 150 N-m at its shaft. The total stator losses are 1500 watts and frictional and windage losses are 250 watts,
Find: i) Rotor output ii) Rotor copper loss iii) Efficiency at full load. (07 Marks)

Module-4

- 7 a. Explain with neat sketch, auto transformer method and star delta starter of 3-ph squirrel cage induction motor. (12 Marks)
b. With schematic connection diagram and phasor diagram, explain the construction and working of a capacitor start induction motor. (08 Marks)

OR

- 8 a. Describe the construction and application of shaded pole induction motor with suitable diagram. (08 Marks)
b. Explain the necessity of starter in 3-ph induction motor. (04 Marks)
c. Explain double field revolving theory as applied to single phase induction motor. (08 Marks)

Module-5

- 9 a. Explain the V and inverted V-curves of an synchronous motor. (10 Marks)
b. Explain the operation of synchronous motor at constant excitation with variable load. (10 Marks)

OR

- 10 a. Explain the construction and working principle of linear induction motor. (10 Marks)
b. Explain the construction and working principle of a universal motor. (10 Marks)

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