



CBCS SCHEME

18EE44

Fourth Semester B.E. Degree Examination, Jan./Feb. 2021 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 the torque equation of a D.C. Motor. (06 Marks)
b. Explain with circuit diagrams, the speed control methods for D.C. shunt motor. (08 Marks)
c. A 4 pole DC shunt motor takes 24A from 220 V supply. The armature and shunt field resistances are 0.5Ω and 110Ω respectively. The armature is wave connected with 300 conductors, if the flux per pole is 30 milliweber. Calculate the speed and the torque developed. (06 Marks)

OR

- 2 a. Derive the condition for maximum efficiency in a D.C. motor. (07 Marks)
b. Explain the operation of a three point starter with a neat sketch. (07 Marks)
c. A 240 V, DC shunt motor runs at 1000 rpm and takes armature current 60 A. Find resistance to be added to the field circuit to increase speed from 1000 rpm to 1200 rpm at an armature current of 80 A. Assume flux proportional to field current. Consider armature resistance and field resistance are 0.15Ω and 200Ω respectively. (06 Marks)

Module-2

- 3 a. Explain the procedure of conducting Swinburne test on D.C. motor with a neat circuit diagram? Also, show how the efficiency of motor can be predetermined. (06 Marks)
b. Draw and explain the torque-slip characteristics of 3-phase induction motor. (06 Marks)
c. Two shunt machines gave the following results at full load for Hopkinson's test:
Line voltage = 230 V, Armature currents of motor and generator are 38 A and 32 A respectively. Field currents of motor and generator are 0.80 A and 0.75 A respectively. Calculate the efficiency of the motor and generator. Assume resistance of each machine for the armature as 0.3Ω . (08 Marks)

OR

- 4 a. Derive the torque equation for a three phase induction motor. (06 Marks)
b. Describe the field test procedure on DC motor with neat circuit diagram. (08 Marks)
c. Derive an expression for condition for maximum running torque of an induction motor. (06 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)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg. $42+8=50$, will be treated as malpractice.

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. Why starters are required? With a neat diagram, explain the operation of DOL starter. (07 Marks)
- b. Mention methods and speed control of three phase induction motor. Explain any two methods. (06 Marks)
- c. Describe the construction and working of shaded pole motors? Mention its applications. (07 Marks)

OR

- 8 a. Explain the double field revolving theory as applied to a single phase induction motor. (08 Marks)
- b. With a neat circuit diagram, explain the operation of a star-delta starter. (06 Marks)
- c. Explain the operation of capacitor-start induction motor with a neat circuit diagram. Also, mention its applications. (06 Marks)

Module-5

- 9 a. Describe the operation of a synchronous motor under constant excitation with varying load. (07 Marks)
- b. Explain any two methods of starting of synchronous motor. (06 Marks)
- c. Explain hunting and damping in synchronous motor. How do you overcome hunting? (07 Marks)

OR

- 10 a. What is stepper motor? Explain the construction and working principle of variable reluctance stepper motor with a neat sketch. (08 Marks)
- b. Describe the construction and working principle of universal motor. Mention its applications. (07 Marks)
- c. With neat sketches, explain the construction and operation of linear induction motor. (05 Marks)
