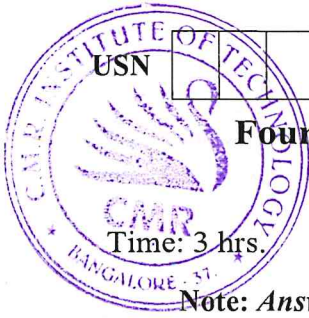


# CBCS SCHEME



17EE44

## Fourth Semester B.E. Degree Examination, Aug./Sept.2020 Electric Motors

Time: 3 hrs.

Max. Marks: 100

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

### Module-1

- Derive an expression for the armature torque of D.C. Motor. (06 Marks)
  - Draw the power flow diagram for D.C. Motor. Also, explain the various losses which occur in D.C. Motors. (07 Marks)
  - The full load current of D.C. shunt motor is 80A at 220V. The shunt field current is 12A and armature resistance  $0.055\Omega$ . Find i) Total copper losses ii) Efficiency of the motor. Consider the stray losses of 1000 watts. (07 Marks)

OR

- Draw and explain the characteristics of D.C. Shunt motor. (06 Marks)
  - With a neat circuit diagram, explain the methods of speed control for D.C. Shunt motor. Justify, which method is more significant, why? (08 Marks)
  - A 250V D.C. Series motor is running at 600 RPM by taking 60A of current. The armature resistance and series field resistance are  $0.2\Omega$  and  $0.05\Omega$  respectively. Calculate the speed when current drawn by the motor is 40A. (06 Marks)

### Module-2

- Draw and explain the torque – slip characteristics for three phase induction motor. (06 Marks)
  - The following readings are obtained from Swinburnk's test performed on D.C. Shunt motor :  $V = 220V$ ,  $R_a = 0.8\Omega$ ,  $R_{sh} = 200\Omega$ , No load current = 2A, Full load rated current = 20A. Find the efficiency at i) Full load ii) Half load. (08 Marks)
  - Derive an expression for the condition for maximum running torque of three Phase induction motor. (06 Marks)

OR

- With neat circuit diagram, explain the steps involved to carry out Field test on D.C. Series motor. Discuss merits and demerits of the same. (10 Marks)
  - The following readings are obtained from Hopkinson's test. Find Motor and Generator efficiency separately.

Motor side  $\rightarrow V = 220V$ ,  $I_a = 23A$ ,  $I_{sh} = 0.3A$   
(motor) (motor)

Generator  $\rightarrow I_a = 20A$ ,  $I_{sh} = 0.4A$   
(generator) (Generator)

Armature resistance of each machine is  $0.5\Omega$ .

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(10 Marks)

### Module-3

- Draw the phasor diagram of induction motor on no load and on load, explain in detail. (06 Marks)
  - The power input of 400V, 50Hz, 6-pole three phase squirrel cage Induction motor runs at 975 RPM is 40 kW, the stator losses are 2kW, frictional and windage losses are 1.5kW. Find i) Rotor copper loss ii) BHP iii) Efficiency. (06 Marks)

- c. With a neat circuit diagram, explain the necessity of conducting No – load and Blocked rotor tests on 3 – phase Induction motor. Also mention the mathematical relations. (08 Marks)

OR

- 6 a. Explain the Cogging and Crawling conditions in the induction motor. (08 Marks)  
 b. Write short notes on :  
 i) Double cage and deep rotor bars ii) Induction motor working as induction generator. (12 Marks)

Module-4

- 7 a. What is the necessity of starters in 3 – phase induction motors? With a neat circuit diagram, explain the operation of Star – delta starter. (08 Marks)  
 b. Explain the construction and working principle of shaded pole motor. (08 Marks)  
 c. List the various applications of single phase motors. (04 Marks)

OR

- 8 a. Describe the Double Field revolving theory and its Principle of operation. (08 Marks)  
 b. Give the construction and working principle, with a suitable sketches :  
 i) Capacitor start induction motor ii) Capacitor run motor. (12 Marks)

Module-5

- 9 Write short notes on :  
 a. Synchronous condenser.  
 b. Hunting and damping.  
 c. V and inverted V - curves.  
 d. Linear induction motor. (20 Marks)

OR

- 10 a. What is Stepper Motor? With a neat sketch, explain the construction and operation of variable reluctance type stepper motor. (08 Marks)  
 b. With a neat sketches, explain the construction and operation of universal motor. (07 Marks)  
 c. Write a note on AC servo motor. (05 Marks)

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