

CBCS SCHEME

15EE44

USN

--	--	--	--	--	--	--	--	--	--

Fourth Semester B.E. Degree Examination, June/July 2019 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 do you mean by back emf in dc motors? Explain the significance of back emf. Also derive the condition for maximum power in dc motors. (10 Marks)
- b. A 230 V series motor is taking 50 A. Resistance of armature and series field winding is 0.2Ω and 0.1Ω respectively. Calculate:
 - i) Brush voltage
 - ii) Back emf
 - iii) Power wasted in armature and mechanical power developed (06 Marks)

OR

- 2 a. Define torque. Derive the expression for torque developed by DC motor from fundamentals. (10 Marks)
- b. A DC motor drives a 100 KW generator having an efficiency of 87%.
 - i) What should be the KW rating of the motor?
 - ii) If the overall efficiency of the motor generator set is 74%, what is the efficiency of the motor?
 - iii) Also calculate the losses in each machine. (06 Marks)

Module-2

- 3 a. With a neat circuit diagram, explain how Hopkinson's test is performed on dc shunt machines. Mention the merits and demerits of this test. (10 Marks)
- b. The Hopkinson test on two shunt machines gave the following results for full load.
Line voltage 250 V
Line current excluding field currents 50A
Motor armature current 380A
Field currents 5A and 4.2A.
Calculate the efficiency of each machine. Armature resistance of each machine is 0.02Ω (06 Marks)

OR

- 4 a. Describe Swinburne's test with the help of neat diagram to find out the efficiency of a dc machine. What are the main advantages and disadvantages of this test? (10 Marks)
- b. A 220V dc shunt motor at no load takes a current of 3A. The resistance of the armature and shunt field are 0.9Ω and 250Ω respectively. Estimate the efficiency of the motor when input current is 18 a. (06 Marks)

Module-3

- 5 a. Draw the phasor diagram of 3ϕ induction motor on no load and load condition and explain. (06 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.

- b. The following test results refer to a 3 ϕ 20HP 440V delta connected, 50Hz 4 pole induction motor.
 Running light tests : 440V, 10A (line) 1.5 KW input
 Locked rotor test: 120V, 30A (line) 2.25 KW input
 Draw the circle diagram of this induction motor and determine from the circle diagram full load current and power factor. (10 Marks)

OR

- 6 a. Develop the equivalent circuit of a double cage induction motor and obtain the approximate equivalent circuit. (06 Marks)
 b. The standstill impedance of the outer cage of a double cage induction motor is $(0.3 + j0.4)\Omega$ and that of the inner cage is $(0.1 + j1.5)\Omega$. Compare the relative currents of the two cages (i) at standstill (ii) at a slip of 5%. Neglect stator impedance. (10 Marks)

Module-4

- 7 a. With a neat diagram, explain star delta starter used for starting 3 ϕ induction motor. (06 Marks)
 b. Explain briefly the different methods of speed control of 3 ϕ induction motor. (10 Marks)

OR

- 8 a. Explain double revolving field theory with reference to single phase induction motor. (06 Marks)
 b. Explain the construction and working of shaded pole motor. (10 Marks)

Module-5

- 9 a. With a neat diagram explain the principle of operation of a 3 ϕ synchronous motor. (06 Marks)
 b. Explain the operation of a synchronous motor under (i) constant load, varying excitation (ii) constant excitation, varying load. Discuss how a synchronous motor can function as synchronous condenser. (10 Marks)

OR

- 10 a. What is a two phase servo motor? Describe its construction and working. Draw its torque speed characteristics for various control voltages. (10 Marks)
 b. Explain the principle of operations of a linear induction motor. Draw its characteristics. State its important applications. (06 Marks)
