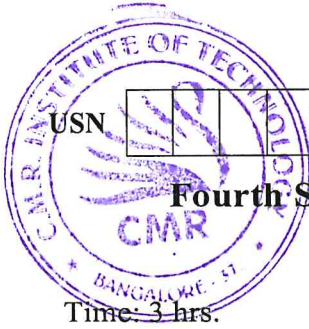


CBCS SCHEME



17EE44

Fourth Semester B.E. Degree Examination, July/August 2022

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. What is back E.M.F.? Explain its significance. (06 Marks)
- b. Draw and explain the characteristics of D.C. Shunt Motor. (06 Marks)
- c. A 10 kW, 250 V, d.c shunt motor with an armature resistance of 0.8Ω and a field resistance of 275Ω takes 3.91A, when running at rated voltage and rated speed. Calculate the machine efficiency as a generator when delivering an output of 10 kW at rated voltage and speed and as a motor drawing an input of 10 kW. (08 Marks)

OR

- 2 a. Derive an expression for the armature torque of D.C. Motor. (06 Marks)
- b. Briefly explain the various losses that occur in D.C Machine. Derive the condition for maximum efficiency of D.C. Motor. (08 Marks)
- c. With a neat sketch describe the working of 3 point starter. (06 Marks)

Module-2

- 3 a. Derive torque equation of a 3ϕ induction motor and obtain the condition for maximum torque. (06 Marks)
- b. Discuss in detail the Swinburn's test conducted on D.C. Machine. (06 Marks)
- c. A retardation test is carried out on a 1000 rpm d.c. machine. The time taken for the speed to fall from 1030 rpm to 970 rpm is (i) 40 seconds with no excitation (ii) 20 seconds with full excitation (iii) 9 seconds with full excitation and the armature supplying an extra load of 10 A at 225 V. Calculate the moment of inertia of the armature in kg-m^2 , Iron losses and the mechanical losses at the mean speed of 1000 rpm. (08 Marks)

OR

- 4 a. Explain Hopkinson's Test for two identical D.C Machine and calculate the efficiency of machine as generator and motor. (10 Marks)
- b. A 440 V, 30ϕ , 50Hz, 5 pole, star connected induction motor has a full load speed of 1425 rpm. The rotor has an impedance of $(0.4+j4)\Omega$ per phase and rotor / stator turn ratio of 0.8. Calculate (i) Full load torque (ii) Full load copper loss (iii) Maximum torque and the speed at which it occurs (iv) Starting current. (10 Marks)

Module-3

- 5 a. Explain no load test and blocked rotor test in a 3ϕ Induction motor. How are the parameters of equivalent circuit determined from test results? (10 Marks)
- b. A 6 pole, 3-phase induction motor develops 30 HP including mechanical losses, total 2 HP at a speed of 950 rpm on 550 V, 50 Hz mains. The power factor is 0.58. Calculate for this load, i) Slip, ii) Rotor copper loss, iii) Total input if the stator losses are 2000 W. iv) Efficiency v) The line current vi) The number of complete cycles of the rotor emf per minute. (10 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. Explain step-by-step procedure draw circle diagram. (06 Marks)
 b. Explain Cogging and Crawling. (06 Marks)
 c. A 15HP, 400V, 50Hz, 3 phase, 4 pole delta connected induction motor gave following test results:
 No load test : 400V, 8A, 1000 Watt ; blocked rotor test: 100V, 25A, 1750 Watt.
 Construct the circle diagram estimate
 (i) Full load current and power factor (ii) Maximum possible power output
 (iii) Best possible operating power factor. (08 Marks)

Module-4

- 7 a. Discuss with a neat sketch the working of DOL starter. (06 Marks)
 b. Explain with a neat sketch the construction and working principle of split phase induction motor with applications. (06 Marks)
 c. Mention the different methods of speed control of 3 ϕ induction motor. Describe any two. (08 Marks)

OR

- 8 a. What is the necessity of starter for 3 ϕ induction motor. Explain star delta starter with neat sketch. (10 Marks)
 b. Explain double field revolving theory. (10 Marks)

Module-5

- 9 a. Write a brief note on V and inverted V curves of synchronous motor. (08 Marks)
 b. Explain with neat diagram, the construction and operation of linear induction motor and state its application. (12 Marks)

OR

- 10 a. Explain the construction and working principle of universal motor. (08 Marks)
 b. Describe the phenomenon of hunting in synchronous machine. (06 Marks)
 c. Describe the different methods of starting synchronous motor. (06 Marks)

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