Model Question Paper-1 with effect from 2019-20 (CBCS Scheme)

USN

Fourth Semester B.E. Degree Examination
Electric Motors

TIME: 03 Hours   Max. Marks: 100

Note: 01. Answer any **FIVE** full questions, choosing at least **ONE** question from each **MODULE**.

Module -1

Q.01   a   What is meant by back EMF.? Explain the significance of Back EMF.   (06 Marks)

b   State the applications of various types of DC motor   (06 Marks)

c   A DC shunt motor runs at 1000 rpm on 200V supply its armature resistance is   (08 Marks)
0.8 Ω and the armature current drawn is 40 amps. What resistance must be
connected in series with the armature to reduce the speed to 600 rpm, the
armature current remaining same ? Neglect armature reaction

OR

Q.02   a   Derive the torque equation of a D.C. Motor   (04 Marks)

b   What is the necessity of a starter for a D.C. Motor? Explain, with a neat
sketch, the working of a 3- point D.C. Shunt motor starter, bringing out the   (09 Marks)
protective features incorporated in it.

c   A 220 V shunt motor with an armature resistance of 0.5 ohm is excited to give   (07 Marks)
constant main field. At full load the motor runs at 500rpm and takes an
armature current of 30A. If a resistance of 1.0 ohm is placed in the armature
circuit, find the speed at (a) full-load torque (b) double full-load torque.

Module-2

Q. 03   a   With a neat circuit diagram, explain the importance and procedure of   (10 Marks)
conducting Swinburn test on DC motor. List the advantages of this test. Show
how the efficiency as

i. Motor
ii. Generator can be predetermined

b   Two identical dc machine, when tested by Hopkinson's method gave the   (10 Marks)
following data:

i. Line voltage:230V & Line current excluding the field current:30 A

ii. Motor armature current:230A

iii. Field current 5A and 4A. The armature resistance of each machine is
0.025Ω calculate the efficiency of both the machines.

Module-2

Q. 04   a   Derive the torque equation for a three phase IM and obtain

$$i. \frac{T_{st}}{T_m}$$
$$ii. \frac{T_{F.L}}{T_m}$$
(10 Marks)

b.   A 3-phase, 50 Hz, 400 V inductions motor has 4 poles star connected stator winding. Rotor resistance & reactance per phase are 0.15 Ω & 1Ω respectively. Full load slip is 5%. Calculate (i) total torque developed (ii) maximum torque (iii) speed at maximum torque. Assume stator to rotor torque ratio 2:1.   (10 Marks)

Module-3

Q. 05   a   In a 3 phase IM, show that rotor input: rotor cu loss: mechanical power developed is 1:s:1-s.   (07 Marks)

b.   Draw and explain the phasor diagram of 3 phase IM. Write the steps involved in drawing it.   (06 Marks)

c.   Explain the grid connected operation of induction Generator   (07 Marks)

OR

Q. 06   a.   Draw the circle diagram from no load and short circuit test of a 50 KW, 6 pole, 50 Hz, 450 V 3- phase slip ring induction motor furnished the following test data.   (10 Marks)

     No load: 450V, 20A, 0.15 p.f
     S.C test: 200V, 150 A, 0.3 p.f

b.   Explain the phenomenon of cogging and crawling in a 3 phase IM.   (05 Marks)

c.   Explain the construction and working of deep bar rotor type of Induction Motor.   (05 Marks)

Module-4

Q. 07   a.   Justify the necessity of starter for 3 phase induction motor. Explain star delta starter with neat sketch   (08 Marks)

b.   Explain any three methods of speed control of 3 phase induction motor   (12 Marks)

OR

Q. 08   a.   Explain double field revolving theory as applied to a single-phase induction motor and prove that it cannot produce any starting torque.   (10 Marks)

b.   Explain construction and working principle of a shaded pole motors.   (10 Marks)

Module-5

Q. 09   a   List the different methods of starting synchronous motor. Explain any one in detail.   (08 Marks)

b.   Describe a phenomenon of hunting in synchronous machine, what are the methods to overcome this.   (06 Marks)

c.   What is synchronous condenser? What is its application.   (06 Marks)

OR

Q. 10   a.   Explain the construction and working principle of universal motor.   (10 Marks)

b.   With a neat diagram explain the operation of two phase Ac servo motor.   (10 Marks)