

Total No. of Questions : 8]

SEAT No. :

P284

[Total No. of Pages : 3

[6003]-363

T.E. Electrical Engineering
ELECTRICAL MACHINES-II
(2019 Pattern) (Semester-I) (303143)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Figures to the right indicate full marks.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Assume suitable additional data, if necessary.
- 5) Use of non-programmable calculator is allowed.

Q1) a) Draw the power flow (power stages) diagram of 3 phase synchronous motor. **[4]**

b) Draw the phasor diagram of 3 phase synchronous motor for leading power factor. & show

i) Load angle

ii) Internal angle

iii) Power factor angle on it.

(iv) Write the formula for back emf from phasor diagram. **[6]**

c) A 415 V three phase star connected synchronous motor has armature resistance of 0.2 ohm/ph. and synchronous reactance of 2 ohm/ph. While delivering certain load, it takes 25A from supply. Calculate back EMF induced in the motor if it is working with.

i) 0.8p.f. lag

ii) 0.8 p.f. lead. **[8]**

OR

Q2) a) Sketch V and inverted V curves of synchronous motor and comments on armature current. **[4]**

b) State the methods of starting the synchronous motor. Explain the starting by using damper winding. **[6]**

P.T.O.

- c) A three phase star connected 50 Hz, synchronous motor is rated 75 kW, 440 V with synchronous reactance 2.5 ohm/phase operates at 0.8 leading power factor. The motor efficiency is 95 %. Calculate.
- armature current
 - back emf and
 - power angle.

[8]

- Q3)** a) What is induction generator? Draw the torque - speed characteristics of 3 phase Induction motor and induction generator. [3]
- b) Draw the block diagram & explain the V/f method of speed control of 3phase induction motor. [6]
- c) With the neat construction diagram and explain the working of permanent magnet stepper motor. Show the truth table. how to reverse the direction of rotation. [8]

OR

- Q4)** a) Calculate step angle & resolution of 3-ph stepper motor with 08 stator poles & 06 rotor poles. [3]
- b) What is Energy Efficient Induction Motor? Explain, how to improve the EE? [6]
- c) With the neat diagram describe the construction and working of PM D.C. motor. State its applications & Drawbacks. [8]

- Q5)** a) Draw the torque speed characteristics of AC and DC series motor & explain how unidirectional torque is produced when DC series motor is connected to AC supply? [4]
- b) Compare conductively compensated and inductively compensated series motor. [6]
- c) A series motor having resistance 40 Ω & inductance 0.3 H When connected to 240 V DC supply draws a current of 1 A and run at 2000 rpm. If it is supplied by 240 V , 50 Hz AC supply with same loading; Calculate
- speed
 - power factor
 - Gross power developed and
 - torque.

[8]

OR

- Q6)** a) What are the modifications necessary in construction of DC series motor to operate it on ac supply? [4]
- b) What is universal motor? State its construction types. With neat diagram, explain its working and state its applications. [6]
- c) What are the various methods of improving commutation in series motor? Explain the use of compoles in detail. [8]

- Q7)** a) Sketch the torque-slip characteristics of 1-ph Induction motor based on double field revolving theory. What is the net torque at starting? [3]
- b) Compare single phase motor with 3 phase motor. [6]
- c) 250 W, 230 V, 50 Hz , single phase capacitor start induction motor has following constants.

Main winding: $Z_m = 4.5 + j 3.7 \Omega$ & Auxiliary winding; $Z_a = 9.5 + j 3.5 \Omega$. Determine value of C which will make develop maximum torque. [8]

OR

- Q8)** a) How to reverse the direction of rotation of 1-ph induction motor, explain by connection diagram. [3]
- b) Draw the connection diagram and observation tables to conduct no load and blocked rotor test on single phase induction motor. Also draw the equivalent circuit of motor under these test conditions. [6]
- c) Explain construction and working of capacitor start induction run motor. Draw its torque-speed characteristics. State its two applications. [8]

