

Total No. of Questions : 8]

SEAT No. :

PE-2543

[Total No. of Pages : 3

[6583]-70

T.E. (Electrical Engineering)
ELECTRICAL MACHINES - II
(2019 Pattern) (Semester - V) (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 and Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Use of Calculator is allowed.
- 5) Assume suitable if necessary.

- Q1)** a) Draw the schematic diagram of 3-ph synchronous motor & label it. [4]
b) Why 3-ph, synchronous motor is not self-starting? explain with diagrams. [6]
c) A 3-phase, 3300 V, 50Hz, delta connected synchronous motor has synchronous reactance $X_s = 18 \Omega$ /phase and negligible resistance. It draws 600 kW while working at pf = 0.8 leading. Calculate the excitation emf & power angle. [8]

OR

- Q2)** a) State the methods of starting 3-ph synchronous motor. Which method makes motor self-starting? [4]
b) Sketch & explain the "V" curves for the synchronous motor for [6]
i) Full load
ii) Half load and
iii) No load condition.
c) A 2300-V, 3-phase star connected synchronous motor has a resistance of 0.3 ohm per phase and a synchronous reactance of 3.3 ohm per phase. The motor is operating at 0.8 power factor lagging with a line current of 180 amp. Determine the value of e.m.f. generated per phase and the angle of retardation. [8]

P.T.O.

- Q3)** a) What is energy efficient three phase induction motor? [3]
b) Sketch the schematic Construction diagram of Brushless D.C. motor & explain its working. [6]
c) Explain the Construction, principle of working of superconducting alternator. [8]

OR

- Q4)** a) State the various methods of speed control of 3-ph induction motor on stator and rotor side. [3]
b) Compare 3-phase synchronous motor with 3-phase induction motor. [6]
c) Draw the neat construction diagram and explain the working of variable reluctance stepper motor. Show the truth table. How to reverse the direction of rotation. [8]
- Q5)** a) What are the modifications necessary in construction of dc series motor to operate it on ac supply? [4]
b) Draw the approximate phasor diagram of AC series motor & explain. [6]
c) A universal series motor when operating on 240 Volt D.C. supply, draws 10 amp and runs at 1400 r.p.m. Find the new speed and power factor, when connected to 240 V, 25 Hz a.c. supply the motor current & voltage remaining the same for both the conditions. The motor has total resistance of 3Ω and inductance of 0.1 H . [8]

OR

- Q6)** a) Draw the torque - armature current characteristics of AC and DC series motor on common X & Y-axis & comment on armature current & torque. [4]
b) Explain inductively compensated AC series motor, with suitable diagram. [6]
c) What do you mean by universal motor? Draw its speed vs torque characteristics on AC and DC operation. State applications of universal motor. [8]
- Q7)** a) How to make 1-ph induction motor self-starting? [3]
b) Compare single phase induction motor with 3 phase induction motor. [6]
c) Sketch the torque-slip characteristics of 1-ph Induction motor based on double field revolving theory. Prove, how the 1-ph induction motor is not self-starting by mathematically & graphically. [8]

OR

- Q8) a) How to reverse the direction of rotation of a single phase induction motor? Show by circuit diagrams. [3]
- b) 500W, 240 V, 50 Hz, single phase, capacitor start induction motor has following constants Main winding: $Z_m = 4.5 + j2.7 \Omega$ & Auxiliary winding: $Z_a = 7.5 + j2.5 \Omega$. Determine value of starting Capacitor which will develop maximum starting torque. [6]
- c) Draw the circuit diagram, observation table and write the procedure to conduct open circuit & Blocked rotor test on capacitor start single phase induction motor. Write the formulae used to find equivalent circuit parameters. [8]

