Total No. of Questions : 8]

SEAT No. :

PC-1746

[Total No. of Pages : 3

[6353] - 63
T.E. (Electrical Engineering)
ELECTRICAL MACHINES - II
(2019 Pattern) (Semester - I) (303143)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Solve Q1 or Q2, Q3 or Q4, QS or Q6, Q7 or Q8.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data if necessary.***
5) ***Use of non-programmable calculator is allowed.***

Q1) a) Draw V curve of synchronous motor. Show under excited, overexcited and critical excitation regions on it. **[4]**

b) State different methods to start 3 phase synchronous motor. Explain damper winding method with neat diagram. **[6]**

c) Explain with relevant phasor diagrams the operation of synchronous motor at constant load and variable excitation condition. **[8]**

OR

Q2) a) Draw and explain torque angle characteristics of 3 phase synchronous motor. **[4]**

b) Explain the following terms related to loading of 3 phase synchronous motor - i) load angle or torque angle ii) Internal angle iii) power factor angle. Show these angles by drawing relevant phasor diagram for leading power factor. **[6]**

c) The input to an 11000V, 3 phase, star connected synchronous motor is 60 A. The effective resistance and synchronous reactance per phase are respectively 1 ohm and 30 ohms. Calculate the power supplied to motor at 0.8 pf lagging and induced emf for a power factor of 0.8 leading. Determine the angle of retardation at 0.8 pf leading. **[8]**

P.T.O.

Q3) a) Draw speed vs torque characteristics of 3 phase induction motor for three frequencies such that f1>f2>f3. **[3]**

b) Calculate the stepping angle for a 3 phase 24 pole PM stepper motor. If its stepping frequency is 300 steps per second, calculate the motor speed. **[6]**

c) Explain operation three phase induction motor as an induction generator. State its advantages and applications. **[8]**

OR

Q4) a) State important features of energy efficient induction motor. **[3]**

b) Explain with suitable diagram speed control of three phase induction motor by cascade control. **[6]**

c) Describe with suitable diagram construction & working of permanent magnet DC motor. State its advantages and applications. **[8]**

Q5) a) What do you mean by universal motor? Draw its torque vs speed characteristics on A C and D C operation. **[3]**

b) With suitable diagram, explain conductively compensated A C series motor. **[6]**

c) Discuss the modifications necessary in design and construction of D C series motor so that it can work satisfactorily on A C supply as a universal motor. **[8]**

OR

Q6) a) How unidirectional torque is produced when a D C series motor is operated on A C supply? **[3]**

b) Compare compensated A C series motor with non-compensated A C series motor. **[6]**

c) A universal motor having resistance of 30 ohms and inductance of 0.5 H. When connected to 250 V D C supply, it takes 0.8 A and runs at 2200 rpm. Determine its speed, torque and power factor when connected to a 250 V, 50 Hz A C supply and taking same current of 0.8 A. **[8]**

Q7) a) If S_f is forward slip and S_b is the backward slip, then prove that $S_f+S_b = 2$ **[4]**

b) With suitable diagram explain blocked rotor test performed on single phase capacitor start induction motor. **[6]**

c) A 2 pole 230 V 50 Hz single phase induction motor has the following constants referred to the stator :

R1 = 2.2 ohms; X1 = 3 ohms ; R'2 = 3.8 ohm ; X'2 = 2.1 ohms; Xm = 86 ohms Calculate the stator current, power factor and input power, when the motor is operating at a full load of 2820 rpm. **[8]**

OR

Q8) a) A 0.25 HP 110 V split phase single phase induction motor takes a current of 4 A lagging the supply voltage by 15 degrees for the starting winding and a current of 6 A lagging the voltage by 40 degrees for its main winding. Calculate **[4]**

i) the total current and

ii) the power factor

b) Explain double field revolving theory for single phase induction motor with suitable phasor diagrams. **[6]**

c) With neat diagram explain construction and working of capacitor start capacitor run induction motor. State applications of this motor. **[8]**