Total No. of Questions : 8]

SEAT No. :

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[Total No. of Pages : 3

[6403]-63

T.E.

ELECTRICAL ENGINEERING

Electrical Machines - II

(2019 Pattern) (Semester-V) (303143)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates :

1) ***Solve Q1 or Q2; Q3 or Q4; Q5 or Q6; Q7or Q8***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be draw,, wherever necessary.***
4) ***Assume suitable additional data, if necessary.***
5) ***Use of non-programmable calculator is allowed.***

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

b) Explain the following terms related to loading of 3 phase synchronous motor **[6]**

i) load angle or torque angle

ii) Internal angle

iii) power factor angle. Show these angles by drawing relevant phasor diagram at lagging power factor.

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

OR

Q2) a) Draw constructional details of 3 phase synchronous motor and label it. **[4]**

P.T.O.

b) Compare three phase synchronous motor with three phase induction motor. (any six points). **[6]**

c) A 3 phase 36.775 kW , 410 V 50 Hz star connected synchronous motor has full load efficiency of 85 % . The synchronous impedance of the motor is 0.2 + j 2 ohms per phase. If the excitation of the motor is adjusted to give a leading pf of 0.85. **[8]**

Calculate

i) full load induced emf and

ii) mechanical power developed.

Q3) a) State different methods of speed control of three phase induction motor. **[3]**

b) Explain with neat block diagram Cascade control method to control speed of three phase induction motor. **[6]**

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

OR

Q4) a) What is energy efficient Induction Motor? State its any two features. **[3]**

b) Explain with suitable diagram construction and working of Permanent Magnet Stepper motor. **[6]**

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

Q5) a) Draw and explain phasor diagram of Non compensated A C series motor. **[4]**

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) What are the drawbacks of a DC series motor when it is operated on AC supply? **[4]**

b) What do you mean by universal motor? Draw its torque vs speed characteristics on A C and DC operation. State applications of universal motor. **[6]**

c) A 350 watts single phase 50 Hz 220 V universal motor runs at 2000 rpm and takes a current of 1 Amp when supplied from 220 V DC Supply . If the motor is connected to 220 Volts A C Supply, it takes 1 Amp current. Calculate the speed torque and power factor when operated on A C supply. Assume resistance of motor (Rm) = 20 ohms and inductance of motor (Lm) = 0.4 H. **[8]**

Q7) a) Draw phasor diagram of single phase capacitor start induction motor. **[3]**

b) With neat diagram explain working of Permanent capacitor induction motor. State any two applications of this motor. **[6]**

c) A 220 V single phase induction motor gave following test results-
Blocked rotor test: 120 V 9.6 A 460W
No load test :220 V 4.6 A 125 W
The stator winding resistance is 1.5 ohm. During the blocked rotor test the starting winding is open. Determine the equivalent circuit parameters. Also find the core friction and windage losses. **[8]**

OR

Q8) a) Draw Torque Vs Speed characteristics of single phase induction motor on the basis of double revolving field theory. What is net torque at starting? **[3]**

b) With suitable diagram explain blocked rotor test performed on single phase capacitor start induction motor. Draw its equivalent circuit under blocked rotor conditions. **[6]**

c) A 230 V I kW 4 pole 50 Hz single phase induction motor has the following parameters: R1 = 2.2 ohm, XI = 3 ohm, R'2 = 3.8 ohm, X'2 = 2.1 ohm, the total magnetizing reactance Xm = 86 ohm. Calculate - Current, power factor, input power, and efficiency at slip s = 0.06. **[8]**