

B.E. / B.Tech. Instrumentation Engineering (Model Curriculum) Semester-V
IN503M - Industrial Drive Control

P. Pages : 2

Time : Three Hours



GUG/W/24/14023

Max. Marks : 80

- Notes :
1. All questions carry equal marks.
 2. Due credit will be given to neatness and adequate dimensions.
 3. Assume suitable data wherever necessary.
 4. Illustrate your answers wherever necessary with the help of neat sketches.

1. a) Find out the number of thyristors, each with a rating of 1000V and 200A, need to be connected in each branch of series-parallel combination for a circuit with a total voltage of 10kV and 1000A current. Assume a derating factor of 15%. Also determine the values of static equalizing resistance and dynamic equalizing capacitance for the string if maximum off state blocking current is 10mA and the maximum difference in their reverse recovery charge $\Delta Q = 20$ micro-coulombs. 8

- b) Discuss turn ON and turn OFF characteristics of SCR with neat waveforms. 8

OR

2. a) Elaborate the operation of TRIAC with its static VI characteristics. 8

- b) What is Commutation? Classify the commutation and discuss class C commutation methods in brief. 8

3. a) The single phase half bridge inverter has a resistive load of 10Ω and the center tap dc input voltage is 96V compute a) RMS value of the output voltage, b) Fundamental component of the output voltage waveform, c) Fundamental power consumed by the load, d) RMS power consumed by the load. 8

- b) Elaborate with neat circuit diagram & waveforms the single phase half wave fully controlled rectifier operation with R load and derive the average value of output voltage and ripple factor. 8

OR

4. a) Describe the working of Type-C two quadrant choppers. 8

- b) Elaborate the operation of series inverter with circuit diagram and waveforms. 8

5. a) Elaborate the working principle & operation of Synchronous motor. 8

- b) Elaborate working principle of Position Servo Motor. 8

OR

6. a) Discuss the single phase induction motor in details. 8
- b) The field rheostat is adjusted so that the field resistance is 150Ω , find the new operating speed if the torque and the armature current remain constant. 8
7. a) What are the advantages and disadvantages of Field Control (or) Flux control method? 8
- b) A one quadrant chopper is used for rheostatic braking of a separately excited dc motor. $R_a = 0.1 \text{ ohm}$, braking resistance = 7.5 ohm , voltage constant 1.4V/A-rad/sec , armature current 120A and field current is 1.6A . The duty cycle of chopper is 0.35 . Find a) average voltage across chopper, b) power dissipated in braking resistance, c) motor speed 8

OR

8. a) Describe with neat circuit diagram the transistorized H-Bridge. 8
- b) What are the different driving modes of stepper motor? Elaborate it with neat diagrams. 8
9. a) Examine different techniques of Closed Loop Control of Induction motor. 8
- b) A 400V 4 pole 50Hz 3 phase star connected induction motor has the following parameters: number of stator turns/phase is twice the number of rotor turns/phase. $r_1 = 0.64\Omega$, $x_1 = 1.1\Omega$, $r_2 = 0.8\Omega$, $x_2 = 0.12\Omega$. The load torque is proportional to square of speed and is 40N-m at 1440 rpm . If the motor speed is 1300 rpm , find a) load torque b) rotor current c) stator applied voltage. Neglect no load current. 8

OR

10. a) Elaborate with neat block diagram & circuit diagram of Variable Frequency Drives. 8
- b) Elaborate the control system of a. c. motor using Firing Angle Control method. 8
