

2063  
B.E. (Electrical and Electronics Engineering)  
Seventh Semester  
EE-710: Power Electronic and Drives

Time allowed: 3 Hours

Max. Marks: 50

NOTE: Attempt five questions in all, including Question No. 1 which is compulsory and selecting two questions from each Part. Missing data (if any) can be assumed appropriately.

x-x-x

Q1. Explain in brief.

- a) Write the dynamic equation for motor-load combination in terms of electromagnetic torque and load torque governing any drive system. (02)
- b) What is the second order differential equations of output voltage of half-bridge inverter for RLC load for  $0 < t < T/2$  and  $T/2 < t < T$ ? (02)
- c) Write the equation for governing the speed of a DC machine. On the basis of this equation, also write the various methods of its speed control. (02)
- d) Only draw the circuit diagram for single-phase to single-phase cycloconverter with proper nomenclature. (02)
- e) Write down the rms value of output voltage equation for single-phase half-wave AC voltage controller in integral form. (02)

PART - A

- Q2. Draw the circuit-diagram for a four-stage sequence control AC voltage controller with resistive load. Draw output wave-shapes of voltage and current. Also develop the output voltage expression in rms form. (03,02, 02,03)
- Q3.A) Explain the working of a three-phase  $120^\circ$  mode voltage source inverter with a star-connected resistive load. Show the conduction of various thyristors and draw its output line and phase voltages. (07)
- B) A single phase inverter fed from a 100 V dc, is connected to load  $R=5$  ohms and  $L=0.03$  H. Determine the rms value of resultant load current up to third harmonic in case the inverter is operating at 60 Hz with a square wave output. (03)
- Q4. Write short notes on: (05)
- A) Multilevel Inverter
  - B) Working principle of AC voltage controller (05)

P.T.O.

(2)

**PART-B**

- Q5.** A 3-phase to 1-phase cycloconverter employs a 6-pulse bridge circuit. This device is fed from 400 V, 50 Hz supply through delta/star transformer whose per-phase turns ratio is 3/1. For an output frequency of 2 Hz, the load resistance is  $\omega_o L = 3\Omega$ . The load resistance is  $4\Omega$ . The commutation overlap and thyristor turn-off time limit the firing angle in the inversion mode to  $165^\circ$ . Compute (10)
- Peak value of rms output voltage.
  - Rms output current.
- Q6.A)** Draw the waveforms of output voltage equation,  $v_o$ , phase 'A' current,  $i_A$ , and thyristor current,  $i_{T1}$  for the speed control of separately-excited DC machine using three-phase semi-converter at firing angle,  $\alpha = 30$  degrees. (04)
- B)** Derive the expressions for the rms values of source and thyristor currents and the average value of SCR current (06)
- Q7.** A) Derive the expressions for electromagnetic torque at starting and at maximum condition with stator v/f control of three-phase Induction motor. (2.5x2)
- B) Explain the working of single-phase half-wave converter for speed control of DC machine. (05)

x-x-x