Major: EEL209

Max. Marks: 40   *Time: 120 minutes*
Note: Draw neat waveforms if necessary

1. A single-phase half-wave uncontrolled rectifier supplies a resistive load of 2.0 Ω and its ac source voltage is 1.5 kV, 3 kHz. The diode reverse recovery charge is Q_{RR} = 15 μC and the softness factor (S) is 0.6. Find (a) the reverse recovery time t_{rr} of the diode and (b) the peak reverse current I_{RR}. (Assume di/dt variation is 9 A/μsec)   (8)

2. A three-phase semi converter charges A dc battery having an emf of 160 V and its internal resistance is 0.7 Ω. The semi-converter is fed from a 230 V, 50 Hz three-phase ac supply. Determine the firing angle of the converter (a) when the battery is drawing a charging current of 30 A, (b) when the battery feeding the power into the ac source at a battery current of 30 A. Assume lossless converter.   (8)

3. A class C chopper is supplying a DC motor at a current of 10 A. The motor has large inductance and an armature resistance of 0.6 Ω. The chopper source voltage is 120 V. In the motoring mode the duty ratio of the switch, which allows current flow from dc source to load side, is 0.8. Determine the amount of power absorbed by the motor load. If the motor is to be operated in regenerating mode at a current of 10 A what should be the duty ratio's of the switching devices?
      (8)

4. A three phase voltage source bridge inverter delivers power to a balanced three-phase balanced resistive load (10 Ω/phase) on continuous basis. The inverter dc voltage is derived from a diode bridge rectifier and its input ac voltage is 500 V, 50 Hz. Determine (a) rms value of load current, (b) rms value of switch/thyristor current.   (8)

5. A single-phase ac voltage controller is feeding power to an R-L load. Show that the power supplied to the load is function of firing angle, load circuit parameters and input supply voltage.   (8)