Part-III

Long Answer Type Questions (Answer Any Two out of Four)

Q3 a) Derive the output voltage of the single phase full wave converter with source inductance connected with R-L load. Draw the relevant output voltage and current waveform. (10)

b) The boost regulator has an input voltage of V_s =6V. The average output voltage is V_a= 15V and the average load current is 0.5 A. The switching frequency is 20 kHz. If L=250 μ H and C=440 μ F, determine (a) the duty cycle (b) the ripple current of the inductor (c) the peak current of the inductor (d) the ripple voltage of the filter capacitor (d) the critical value of L and C. (6)

Q4 a) What are different types of SCR triggering? Explain detail the operation of UJT triggering with neat circuit diagram and show how it is differs from others triggering. (10)

b) A string of thyristors is connected in series to withstand a dc voltage of V_s=15 kV. The maximum leakage current and recovery charge differences of thyristors are 10 mA and 150 μ C respectively. A derating factor of 20% is applied for the steady state and transient voltage strings of thyristors. If the maximum steady-state voltage sharing is 1000V, determine (a) the steady-state voltage-sharing resistance R for each thyristor, and (b) the transient voltage capacitance for each thyristor. (6)

Q5 a) Explain the operation of 3-phase bridge inverter for 180 degree mode of operation with aid of relevant phase and line voltage waveforms. (10)

b) The single phase half bridge inverter has a resistive load of R = 2.4 ohm and the dc input voltage is V_s = 48 V. Determine (i) the rms output voltage at the fundamental frequency (ii) the output power (iii) the total harmonic distortion (THD) (6)

Q6 a) What are the different control strategies of AC voltage controller? Explain briefly with circuit diagram and waveforms. (10)

b) An R-L load, energized from single phase, 230V, 50Hz source through a single thyristor, has R=20 onm and L=0.08 henry. If it is triggered in every positive half cycle at α=75^0, find current expression as function of time. (6)