

- l) What is cycloconverter? Explain the working of a single phase centre-tap cycloconverter with a simple diagram. Draw the input wave of frequency f and output wave of frequency $f/4$ for a resistive load.

Part-III

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

- Q3 a) Draw and explain the dynamic characteristic of thyristor during turn on and turn-off process. Draw the relevant circuit for this characteristic. (10)
- b) Find the protective elements of snubber circuit for protection of $\frac{di}{dt}$ and $\frac{dv}{dt}$. (6)
- Q4 a) Explain the operation with associated waveforms of a three-phase half wave controlled rectifier for a highly inductive load. Derive the expression for average and rms output voltage. (10)
- b) A three phase half wave controlled converter is operated from a three-phase Y-connected 208V, 60Hz supply and the load resistance is $R = 10 \text{ ohm}$. If it is required to obtain an average output voltage of 50% of the maximum possible output voltage, Calculate : (i) the delay angle α (ii) the rectification efficiency. (6)
- Q5 a) Draw and explain for three phase voltage source bridge type of inverter operating under 180° mode. (10)
- b) A first-quadrant dc-to-dc chopper feeds an inductive load of 10Ω resistance, 50mH inductance, and back emf of 55V dc, from a 340V dc source. If the chopper is operated at 200Hz with a 25% on-state duty cycle, determine, with and without (rotor standstill, $E = 0$) the back emf :
- i) the load average and rms voltages;
 - ii) the rms ripple voltage, hence ripple factor;
 - iii) the maximum and minimum output current, hence the peak-to-peak output ripple in the current;
 - iv) the average load output current.
- Q6 a) Draw the circuit diagram at different mode of operation for the single phase parallel inverter and explain the working with output voltage waveform. (10)
- b) Discuss the working function of a SMPS with block diagram. (6)