Name: _____

Entry No: _____

Group No: _____

Major Examination: ELL302

Time: 2 Hours **Max. Marks: 40**

Note: *(i) Answer all the questions*
(ii) Draw neat waveforms to scale, if needed
(ii) Assume suitable data, if required.
(iii) In case of design problems justify the converter topology selection and assumptions made in the design process, etc.

1. Waveforms of a rectifier circuit (1-phase or 3-phase) feeding an R-L load (R=0.1 Ω, L=1.0 H) are shown in Fig. 1. Identify various waveforms and also give proper justification. (10)

2. The ac supply voltage and load circuit parameters of the circuit (shown in Fig. 2) are: $v_g(t) = 100\sin(\omega t)$, f_s=50 Hz, R=100 Ω. Draw all possible waveforms and compute RMS and average load voltages (v_o: load voltage) for the following cases: (a) the SCR (T_1) is fired only in the positive half cycle of input ac voltage with a firing angle of 90°, (b) the SCR (T_1) is fired both in positive and negative half cycle of input ac voltage with a firing angle of 90°. (Mention assumptions, if any) (10)

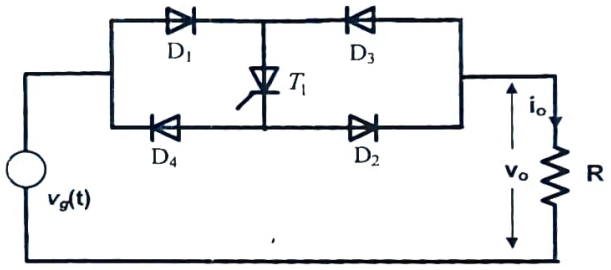


Fig. 2

3. All possible switching states of the basic single-phase inverter (output voltage frequency is 50 Hz) are listed in Table-1. The dc input voltage (V_g) to the single-phase inverter is 200 V and ac-load is of R-L (R=40 Ω, L=100 mH) nature. The ac voltage at the ac load terminals is generated by using the switching states given in Table-1 and their sequence in one cycle of output voltage waveform is: State-1-> State-3. If the State-1 and State-3 durations are identical then (a) compute the load voltage fundamental and harmonic components (up to 9th harmonic), (b) compute the load current fundamental and harmonic components (up to 9th harmonic), (c) THD in the load voltage and (d) power supplied to the load. (10)

Table- 1

State	S_1	S_2	Load voltage
1	+	-	V_g
2	-	-	0
3	-	+	$-V_g$
4	+	+	0

4. Establish the time-domain analysis for the converter circuit shown in Fig. 3 and then obtain expressions for (a) ideal voltage gain of the converter, (b) steady-state inductor currents, capacitor voltages, (c) inductor ripple currents, minimum and maximum currents in L_1 and L_2. (10)

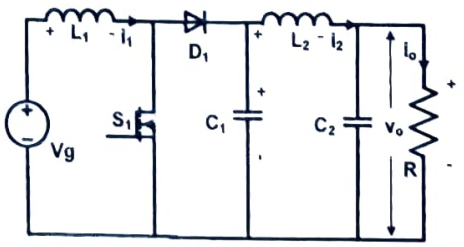
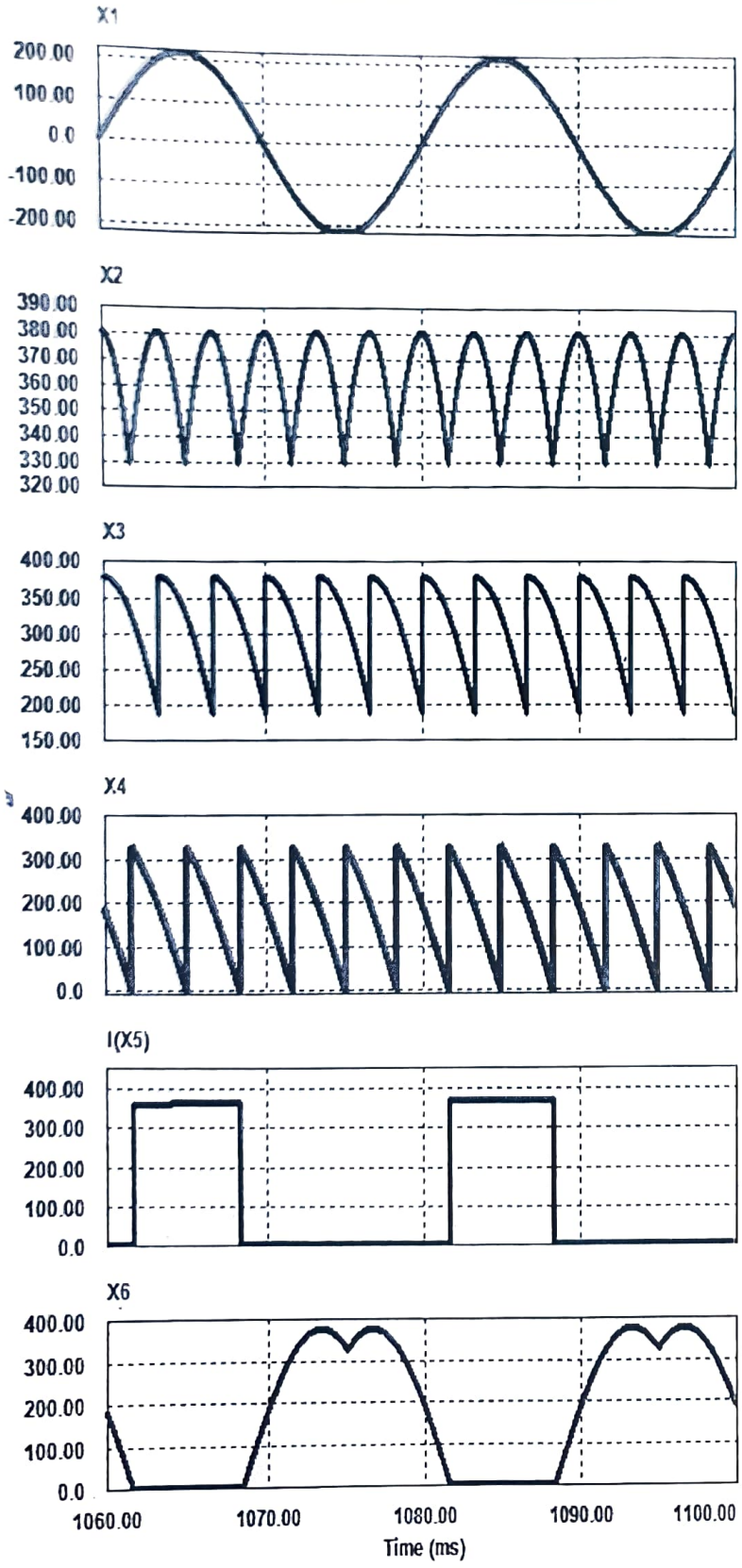


Fig. 3

(P. T. O)

Fig. 1 (Refer question No:1)



X1:

X2:

X3:

X4:

X5:

X6:

Devices conducting sequence: