Minor-II: ELL302

Max. Marks: 25 ***Time: 60 minutes***

Note: (i) Draw neat waveforms to scale (if needed)

1. Waveforms of a 3-phase rectifier feeding an R-L load (R=0.1 Ω, L=1.0 H) are shown in Fig. 1. Identify t waveforms with proper justification. (7)

2. A single-phase full-wave controlled bridge rectifier is feeding an inductive load (I_0). Through mathemati analysis determine the (a) magnitude of the predominant harmonic present in the ac source current wavefor (b) the per unit value of seventh harmonic. (8)
(Assume rms value of input source current as base value)

3. A 48 to 12 V, 18 W, 100 kHz step-down converter (feeding a 12 V battery load) inductor current waveforn shown in Fig. 2. Determine the switching frequency of the device, if the load on converter is reduced to 6 W a switch duty ratio of 40%. Assume switch and diode conducts for equal durations. (10)

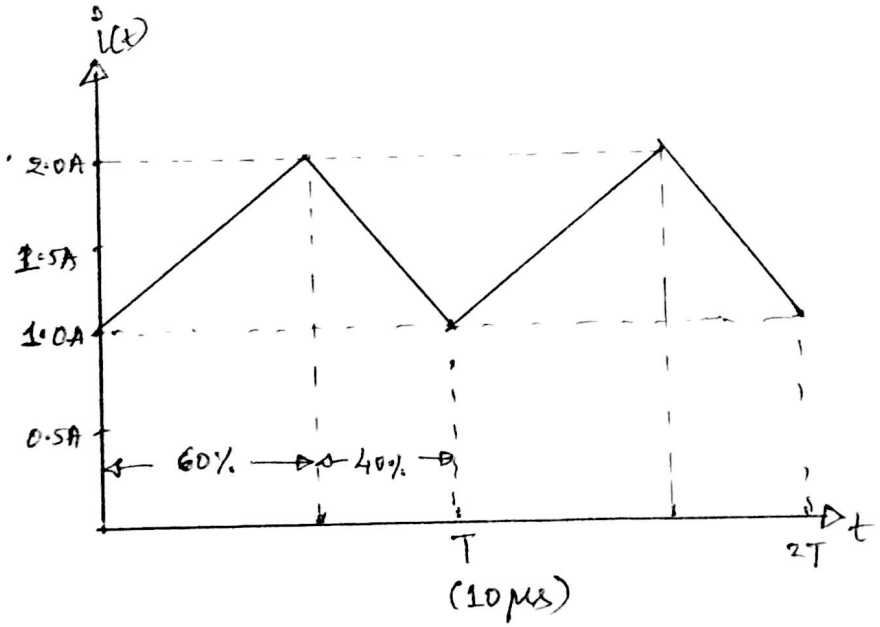
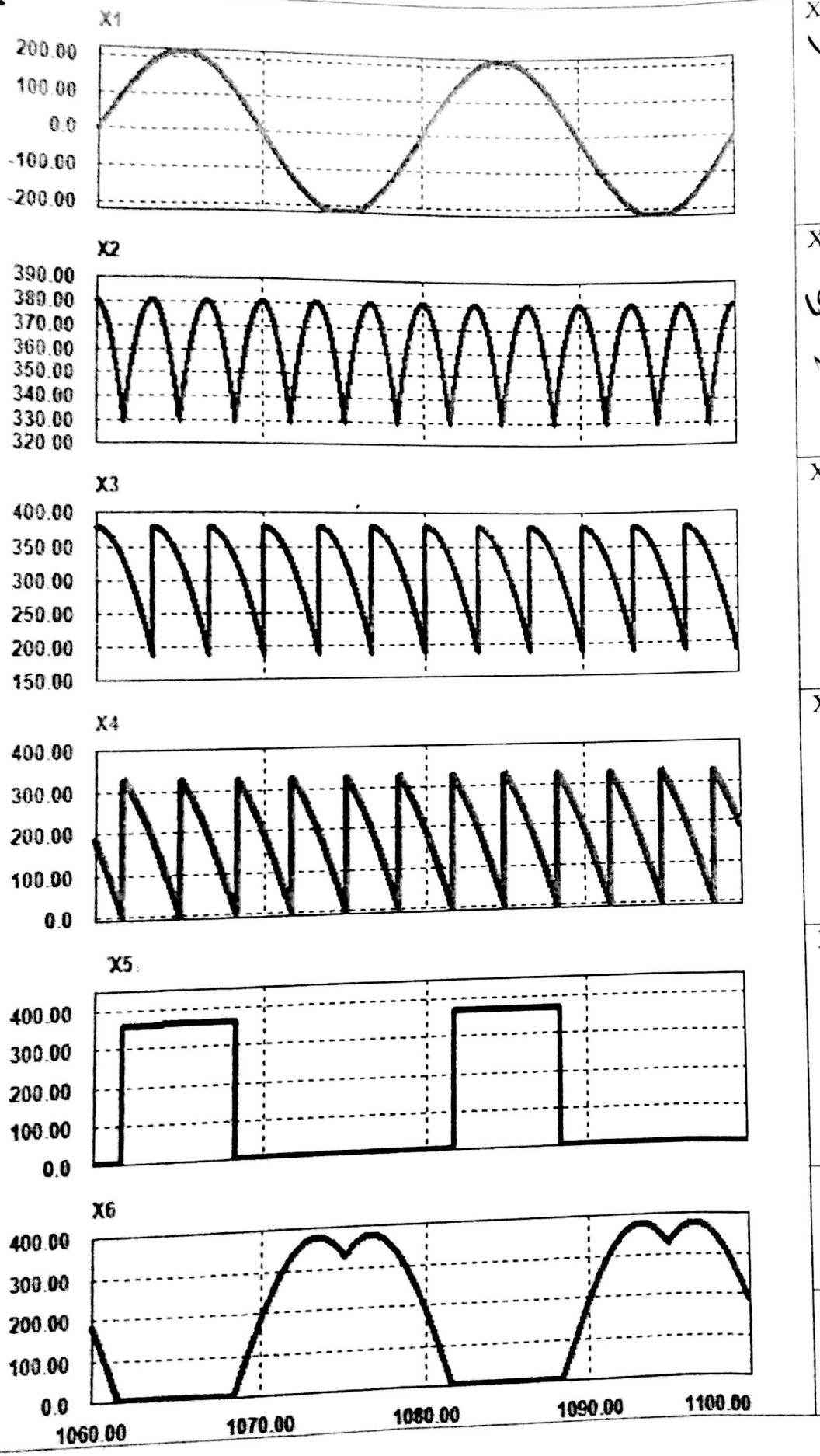


Fig. 2

Fig. 1



X1: V_{source}

$V_{phase} = V_m \sin(\omega t)$

$V_m = 220V$. (1)

X2:

$\theta = \sqrt{3} V_m \sin(\omega t + \frac{\pi}{6})$

$V_m = 220V$. (1)

3-phase, 6pulse rectifi

$\omega t \in (2n\pi - \frac{\pi}{6}, 2n\pi +$

X3:

$\alpha = 30°$. (1)

X4:

$\alpha = 60°$ (1)

X5:

Current waveform

0.5

X6:

3-phase, half wave rectifier (0)

Devices conducting sequence:

61, 12, 23, 34, 45, 56 (1)

P.T.