Thapar Institute of Engineering & Technology, Patiala

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Course Code: UEC 301; Course Name: Analog Electronic Circuits

B.E (ECE/ENC) (IV-Sem), "Tutorial Sheet No. - 10"

Q1. Consider the expressions for V_1 and V_1' representing two corner voltages in the response for a symmetrical square-wave applied to a high-pass RC circuit. Verify the expressions for voltages V_1 and V_1' are given by equations reproduced below:

$$V_1 = \frac{V}{1+e^{-T/2RC}}$$

$$V_1' = \frac{V}{1+e^{+T/2RC}}$$

Q2 (a) A square wave whose peak- to- peak value is 1V extends ± 0.5 V with respect to ground. The duration of the positive section is 0.1 sec and of the negative section is 0.2 sec. If this waveform is impressed upon a RC differentiating circuit (RC high-pass circuit) whose time constant is 0.2 sec, what are the steady-state maximum and minimum values of the output waveform? (b) Prove that the area under the positive section equals that under the negative section of the output waveform. What is the physical significance of this result?

Q3. A symmetrical square-wave whose peak-to-peak amplitude is 2 V and whose average value is zero is applied to an RC integrating circuit (RC low- pass circuit). The time constant equals the half period of the square-wave. Find the peak-to-peak value of the output amplitude.

Q4. Obtain the expression for the peak voltage V_2 in response for a symmetrical square-wave applied to a low-pass RC circuit.

$$V_2 = \left(\frac{V}{2}\right)\left(\frac{e^{2x}-1}{e^{2x}+1}\right) = \left(\frac{V}{2}\right)\tanh x$$

Q5. For a high pass RC circuit, obtain the output waveform for a square-wave input shown in Fig. 1. Given R = 100 K and C = 0.47μf. Given $T_1 = T_2$ = 0.05 Sec.

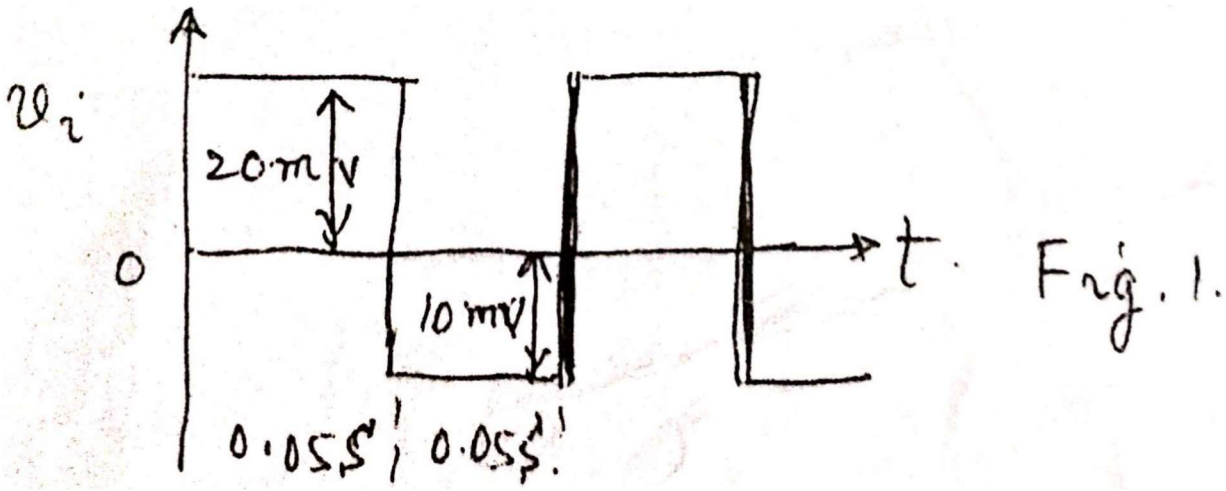

Fig. 1.

Q6. Arrive at the balanced- bridge condition $R_1C_1 = R_2C_2$ for perfect compensation by sketching the attenuator as a bridge.

Q7. Explain the working operation of the followings:

(i) Astable multivibrator

(ii) Monostable multivibrator

(iii) Bistable multivibrator