Data Tables

In all the data tables, write the input combinations in ascending order.

SL	$V_D(V)$	$V_C(V)$	$V_B(V)$	$V_A(V)$	$V_Y(V)$
0	0	0	0	0	0
1	0	0	0	4.97	−0.49
2	0	0	4.97	0	−1.00
3	0	0	4.97	4.97	−1.06
4	0	4.97	0	0	−1.5
5	0	4.97	0	4.97	−2.3
6	0	4.97	4.97	0	−2.8
7	0	4.97	4.97	4.97	−3.3
8	4.97	0	0	0	−4.0
9	4.97	0	0	4.97	−4.5
10	4.97	0	4.97	0	−5.1
11	4.97	0	4.97	4.97	−5.4
12	4.97	4.97	0	0	−5.9
13	4.97	4.97	0	4.97	−6.3
14	4.97	4.97	4.97	0	−6.9
15	4.97	4.97	4.97	4.97	−7.4

Table 1: Table for binary-weighted D/A converter

−8.07 V

+7.97 V

SL	$V_D(V)$	$V_C(V)$	$V_B(V)$	$V_A(V)$	$V_Y(V)$
0	0	0	0	0	0
1	0	0	0	4.97	−0.67
2	0	0	4.97	0	−1.29
3	0	0	4.97	4.97	−1.98
4	0	4.97	0	0	−2.54
5	0	4.97	0	4.97	−3.22
6	0	4.97	4.97	0	−3.86
7	0	4.97	4.97	4.97	−4.53
8	4.97	0	0	0	−4.97
9	4.97	0	0	4.97	−5.64
10	4.97	0	4.97	0	−5.91
11	4.97	0	4.97	4.97	−6.5
12	4.97	4.97	0	0	−7.16
13	4.97	4.97	0	4.97	−7.43
14	4.97	4.97	4.97	0	−7.90
15	4.97	4.97	4.97	4.97	−8.25

Table 2: Table for R/2R ladder D/A converter

+7.96 V

Signature

−8.02 V

Report

Please answer the following questions briefly in the given space.

1. Find the resolution of both D/A converters.

Ans.

2. For any one of the converters, change the value of R_F (feedback resistance) to $0.5\times R_F$ and then to $2\times R_F$. For each case, measure output voltage for any two consecutive input combinations and calculate the step sizes. Does the effect on step size match with the theory?

Ans.

RF		Vy
468 Ω	0001	−0.21 V
	0010	−0.46 V
2.1 kΩ	0001	−1.07 V
	0010	−2.27 V

signal spends 7 sec… We can … wave in
a duty cycle of 70%. We can
figure 2 by the expressions:

$$\text{Triangular Wave,}\ D_T = \left(\frac{W_1}{W_1 + W_2}\right) \times 100\% \tag{2}$$

$$\text{Square Wave,}\ D_S = \left(\frac{W_2}{W_1 + W_2}\right) \times 100\% \tag{3}$$

Procedure:

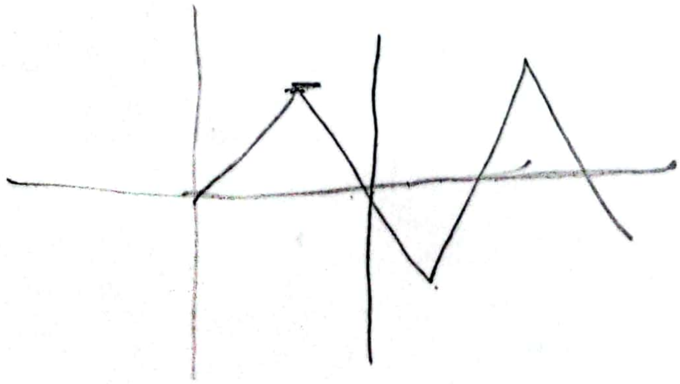
1. Construct the circuit as shown in figure 1.
2. Connect the outputs of the op-amp 1 (A) and op-amp 2 (B) with the two channels of the oscilloscope.
3. Observe the wave shapes and collect the plots from the oscilloscope. Measure the frequency F and time period T of the waves on the oscilloscope.

Data Tables

Fill up the table for the Triangular Wave.

Theoretical Frequency	Experimental Time Period, T (ms)	Experimental Frequency, F (Hz)	HIGH Time (ms)	LOW Time (ms)
138	7.86	127.5	3.96	4

Table 1: Data Table for Triangular Wave Generator



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Report

Please answer the following questions briefly in the given space.

1. Draw the output wave shapes at point A and B in the given graph paper. Keep the time in the horizontal axis and the voltage in the vertical axis.

2. Measure the HIGH and LOW times of the two waves and calculate the duty cycles. Explain if there is any relation between the two values.

Ans.

Sqruare wave ch 1

HIGH - 3·76 ms

LOW - 4·06 ms

Triangular wave

HIGH - 3·96 ms

LOW - 4 ms

ch-1

H - 3·76 ms

L - 4·01 ms

ch-2

H - 3·96

L - 4 ms

3. Suppose, we need a square wave which is HIGH when The Triangular wave is rising and is LOW otherwise. Could we feed our observed square wave as input to one of the circuits from our previous experiments for this?

Ans.

5. Can it be possible to use the above circuit to create a variable frequency wave generator? Justify your answer.

Ans.

6. Change the value of R_1 to $22K\Omega$ and measure the frequency of the output waves. Does the effect on frequency match with the theory?

Ans.

59.14 Hz.

T = 16.9 ms