

Communication Electronics

Practical File

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ROLL NO. : 206054

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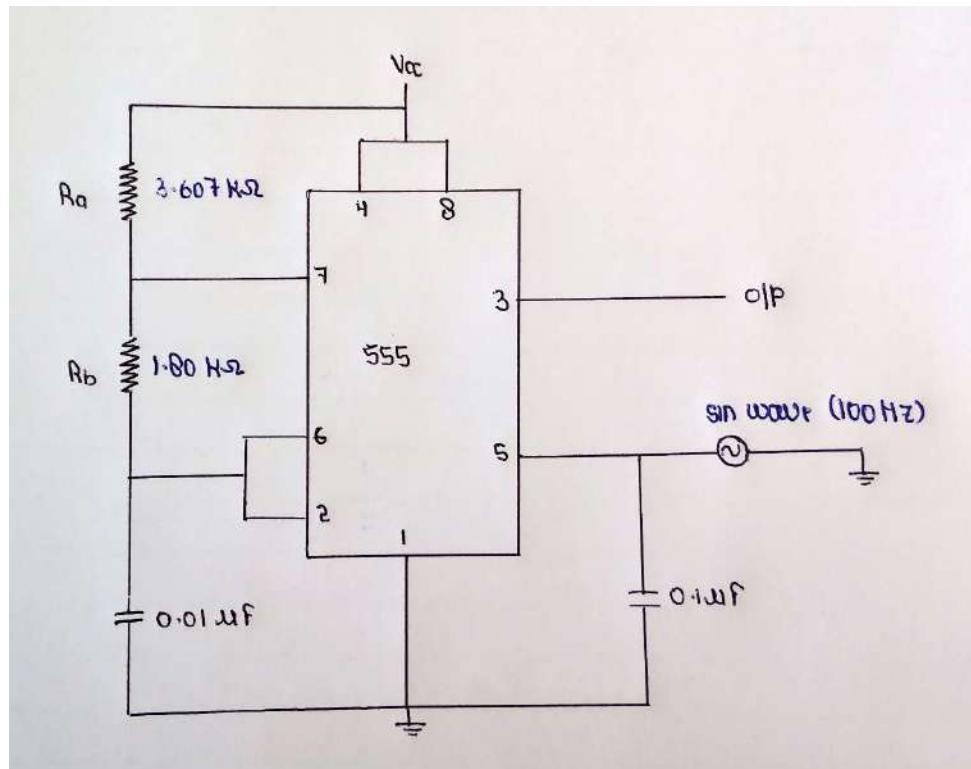
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EXPERIMENT: 1

AIM: To generate FM using 555 timer.

Apparatus: Breadboard, 555 timer, resistors, function generator, CRO/DSO.

Circuit Diagram:



Calculation:

$$\frac{1}{T} = \frac{1}{0.693(R_a + 2R_b)C}$$

$$T = 0.05 \text{ ms}$$

$$0.693(R_a + 2R_b)C = 0.05 \text{ ms} \quad \text{--- (1)}$$

for 75% duty cycle

$$0.75 = \frac{R_a + R_b}{R_a + 2R_b} \quad \text{--- (2)}$$

Now from Eqn (1)

$$\text{L} \ L C = 0.01 \text{ mF}$$

$$R_a + 2R_b = \frac{0.05 \times 10^{-3}}{0.693 \times 0.01 \times 10^{-6}}$$

$$R_a + 2R_b = \frac{0.05 \times 10^{-3}}{0.693}$$

$$R_a + 2R_b = 7.215 \times 10^3 \Omega \quad \text{--- (3)}$$

Now from (2)

$$0.75(R_a + 2R_b) = R_a + R_b$$

$$R_a + R_b = 5.411 \text{ k}\Omega \quad \text{--- (4)}$$

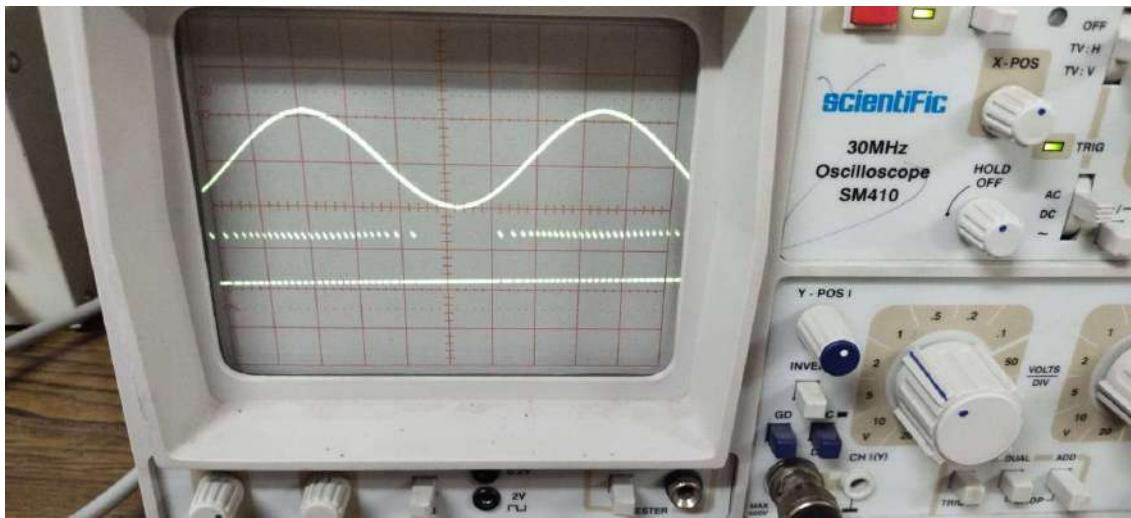
Subtracting (4) from (3)

$$R_b = 1.804 \text{ k}\Omega$$

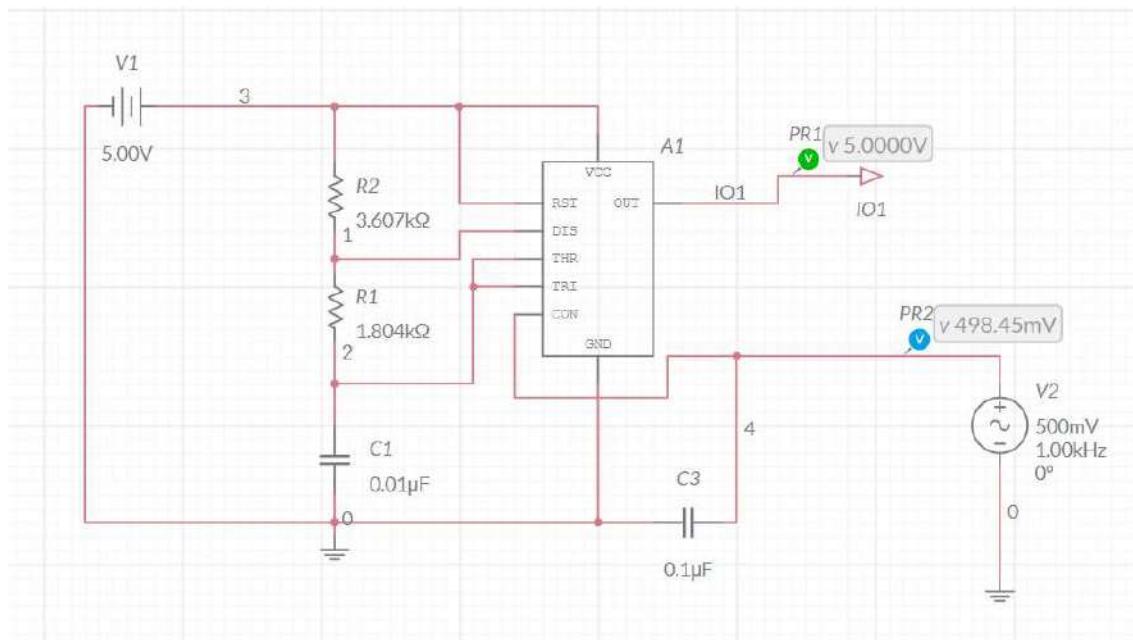
from (4)

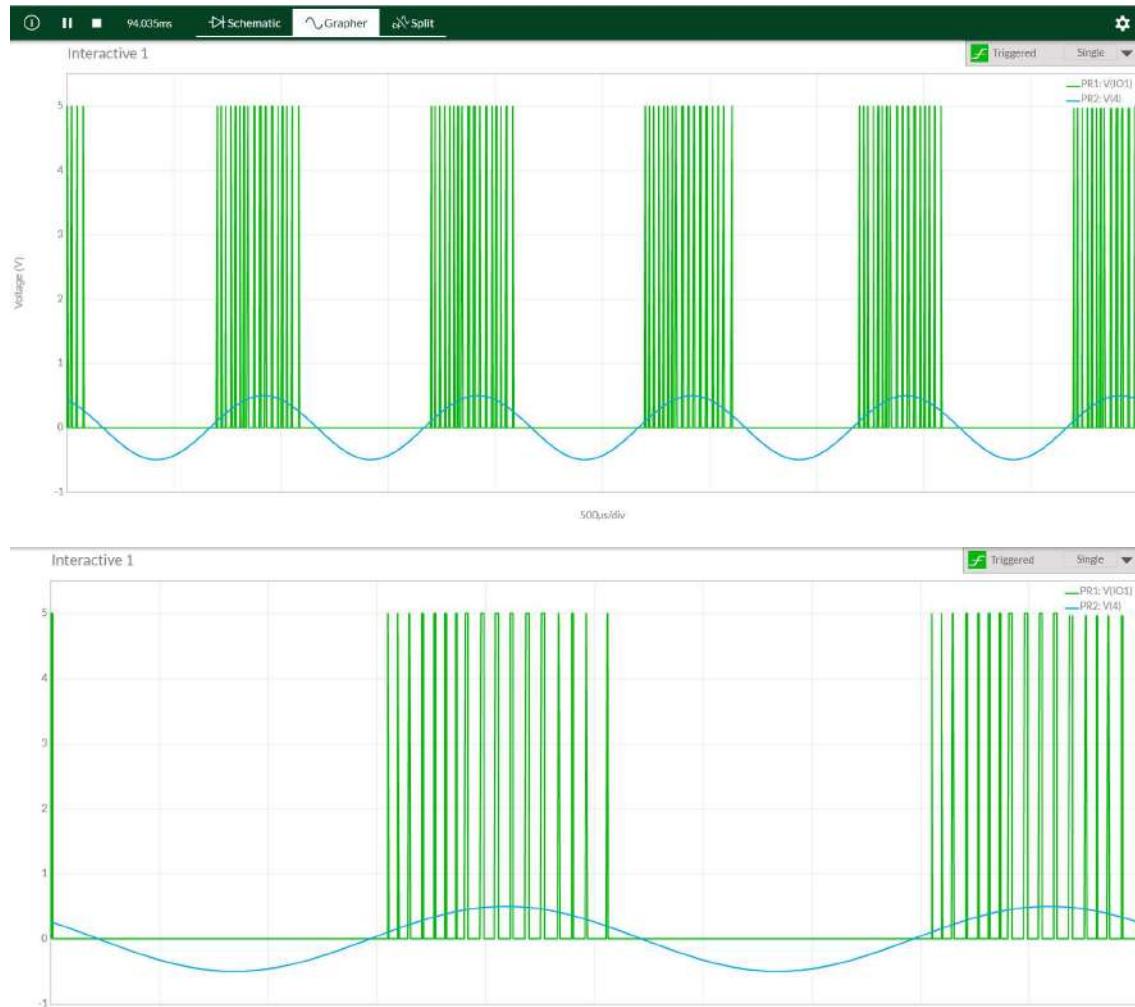
$$R_a = 3.607 \text{ k}\Omega$$

Observations:



Multisim Observations:





Result:

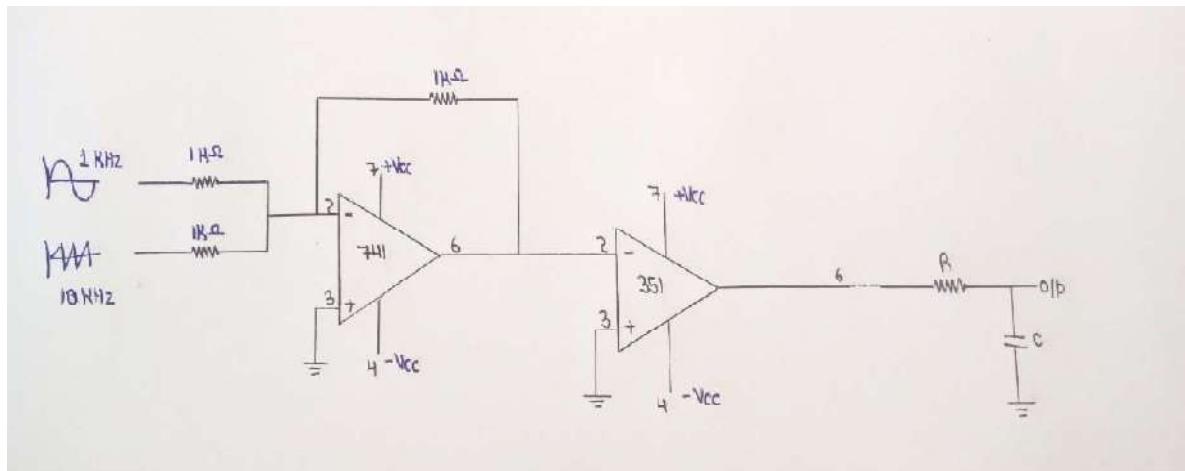
We have successfully completed Frequency Modulation using 555 timer.

EXPERIMENT : 2

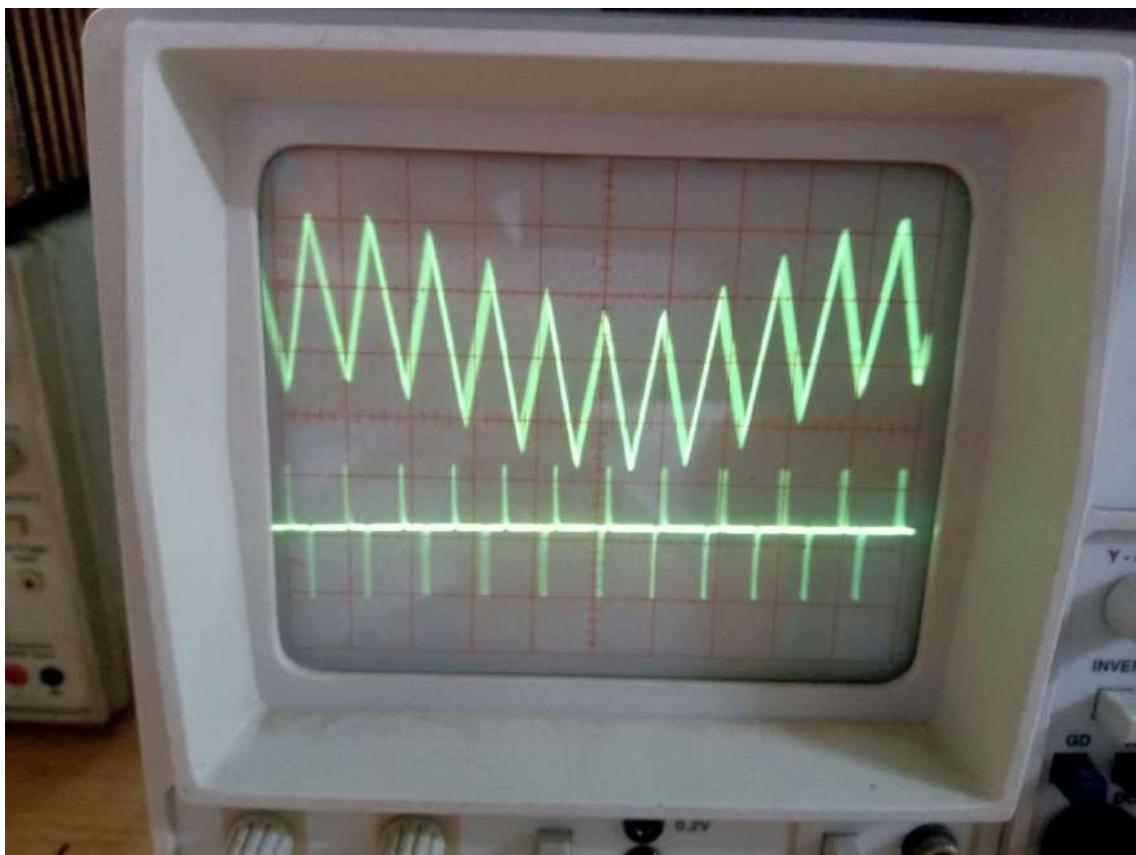
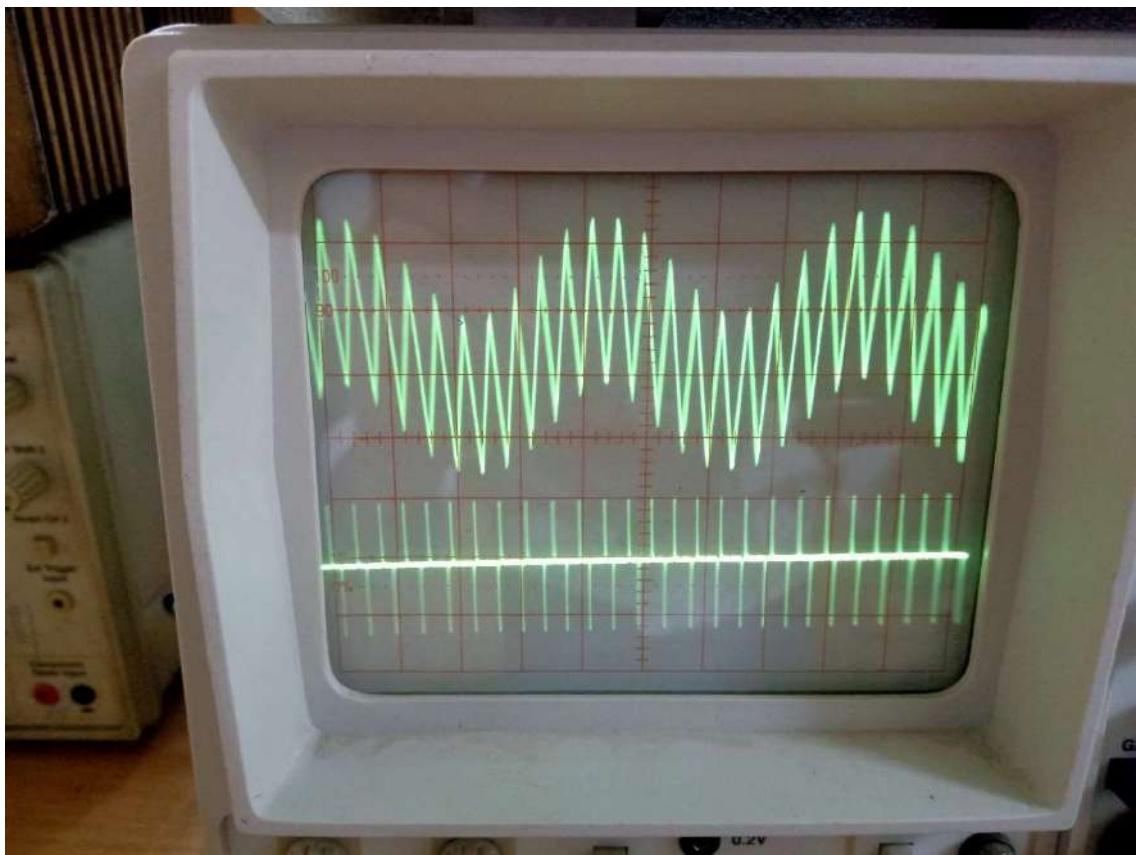
AIM: To generate PWM wave.

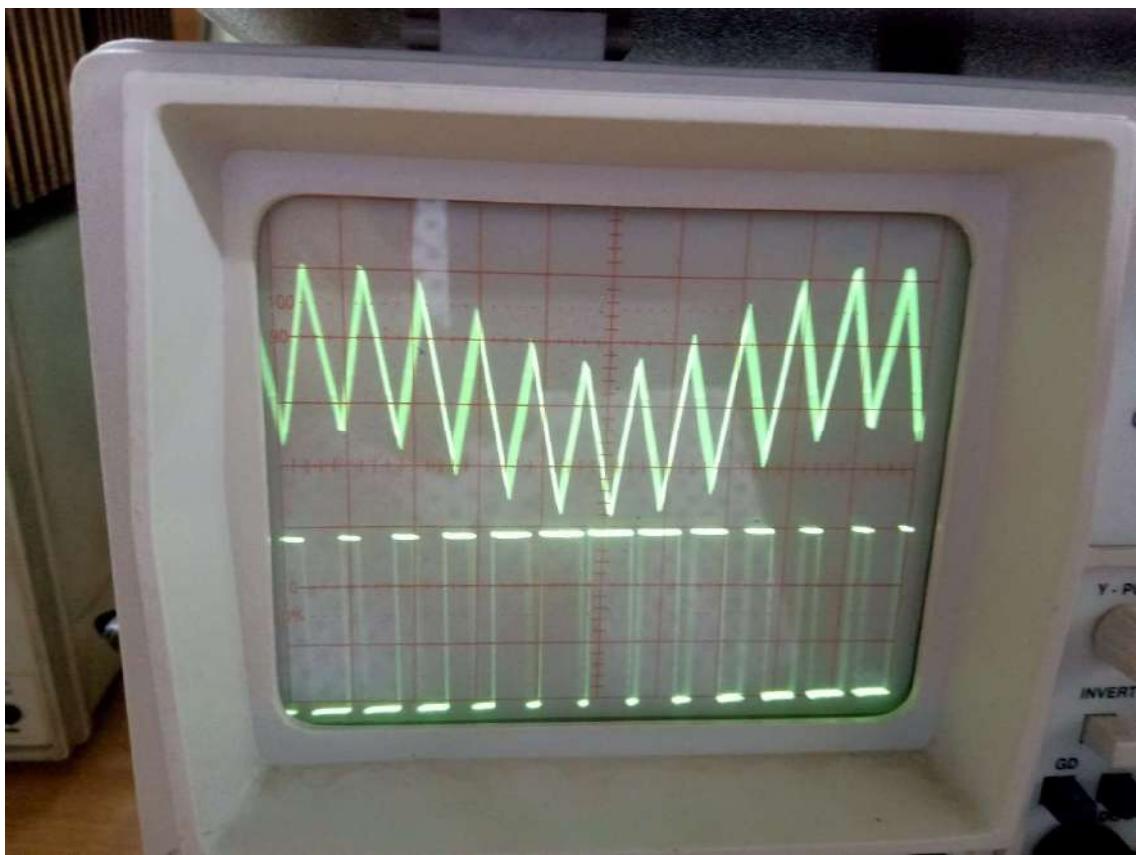
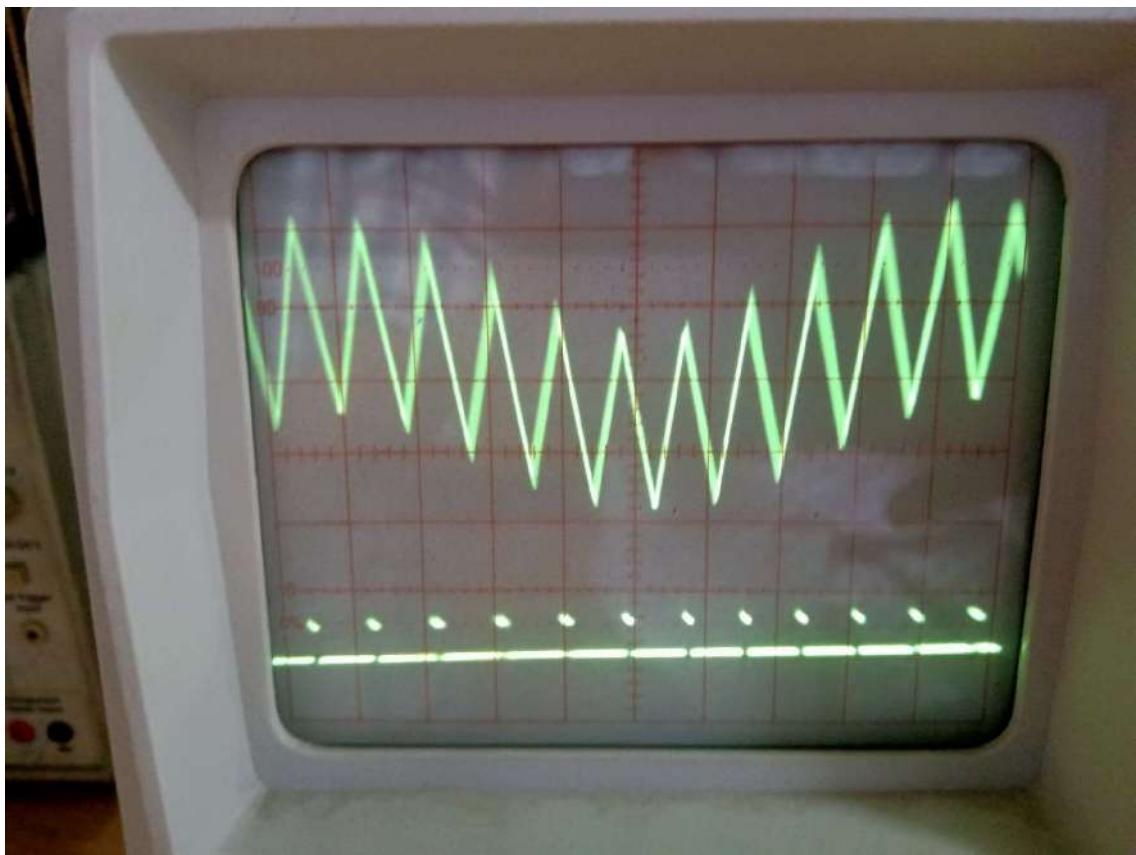
Apparatus: Breadboard, resistors, 741 Adder, 351 Comparator, function generator, CRO/DSO.

Circuit Diagram:



Observation:





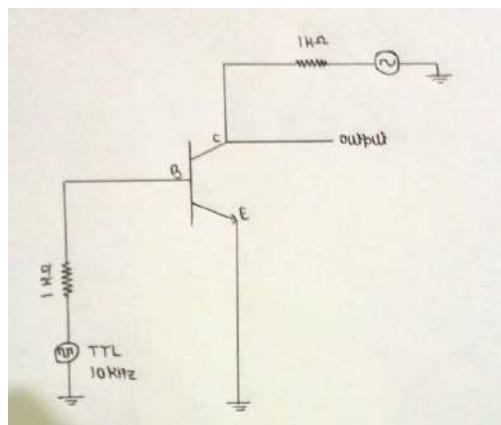
Result: We have successfully generated PWM wave.

EXPERIMENT: 3

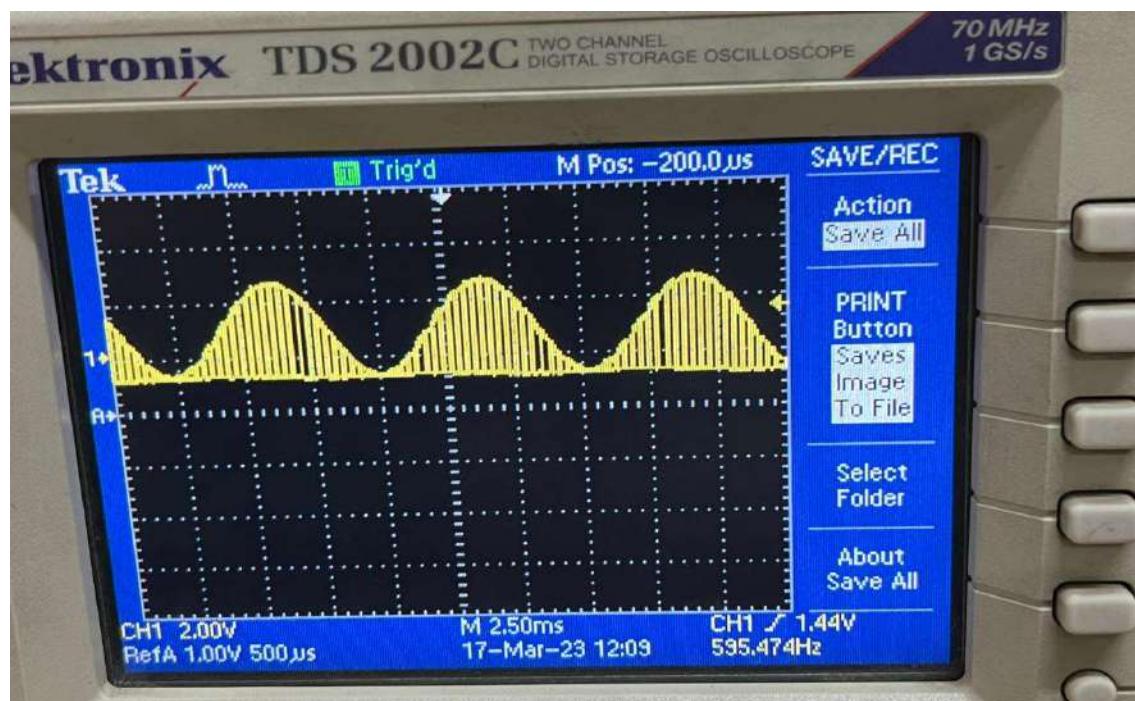
AIM: To generate PAM wave.

Apparatus: Breadboard, resistors, Transistor, function generator, CRO/DSO.

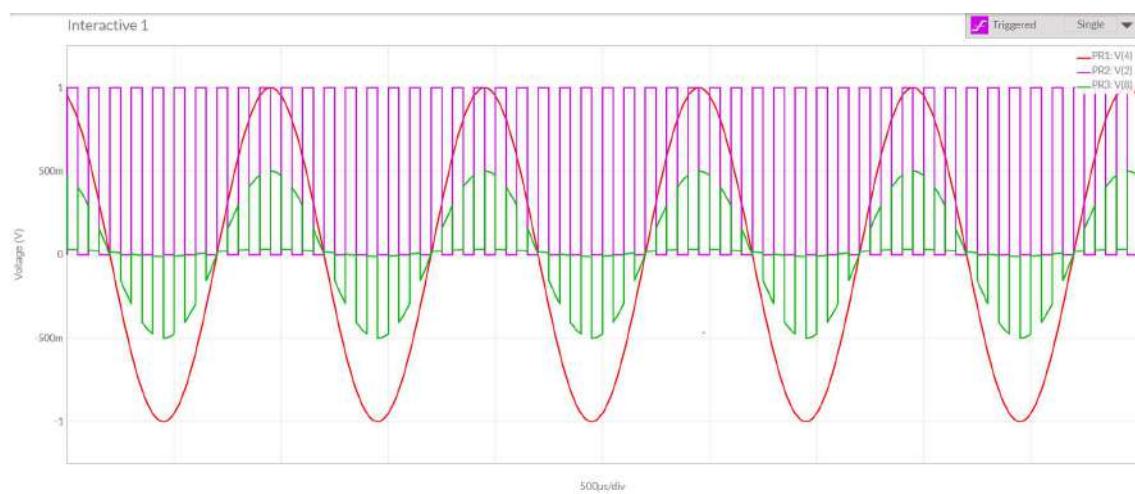
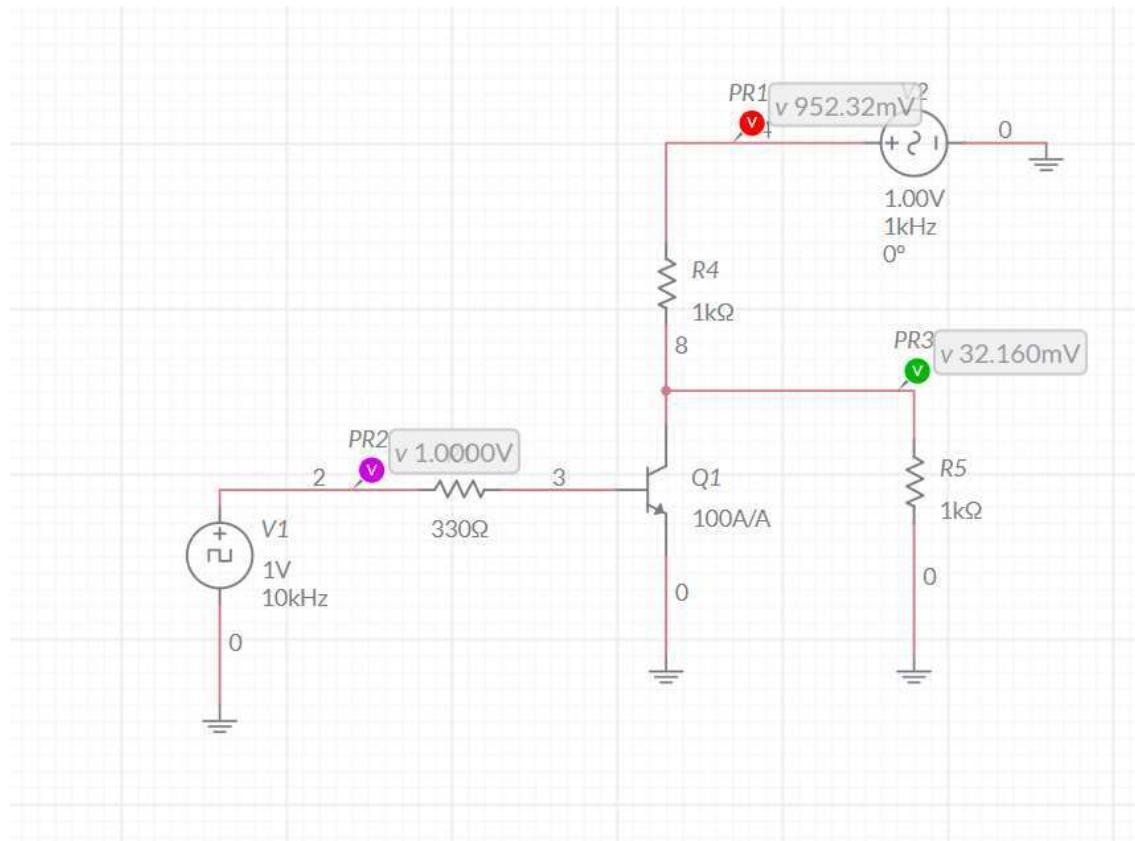
Circuit Diagram:

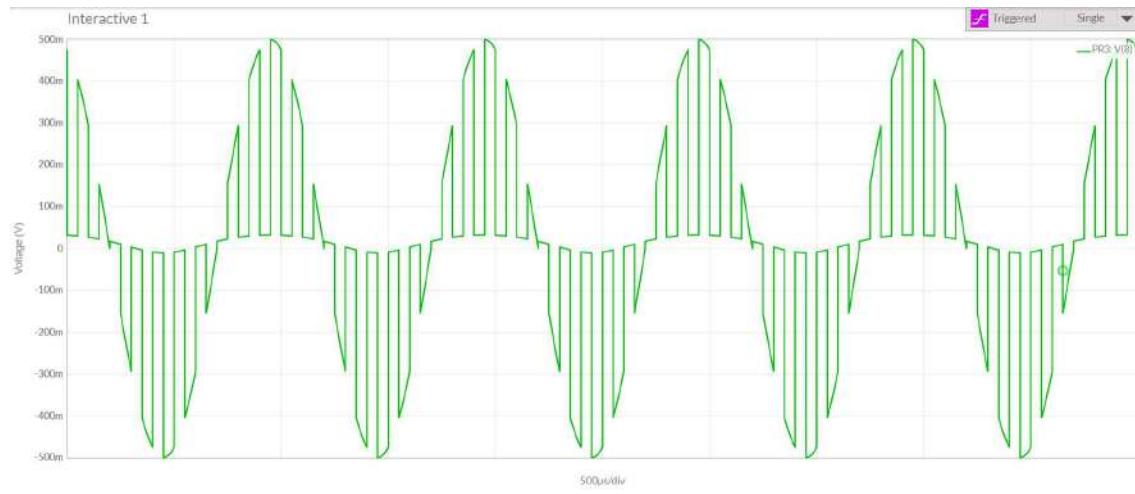


Observation:



Multisim Observations:





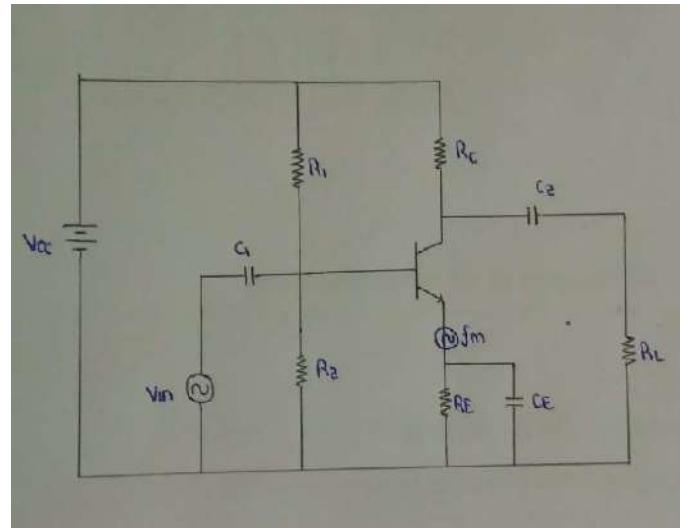
Result: PAM wave is generated using multiplier circuit.

EXPERIMENT : 4

AIM: To generate AM wave.

Apparatus: Breadboard, resistors, Capacitor, Transistor, function generator, CRO/DSO.

Circuit Diagram:



Calculation:

$C_1 = C_2 = 10 \mu F$	$R_E = 100 \Omega$	$C_E = 100 \mu F$	$\beta = 350$	$V_{BE} = 0.7V$
$I_C = 5mA$	$V_{CC} = 20V$	$S = 10$	$V_{CE} = 10V$	$V_{AV} = 50mV$

$$V_{CEQ} = V_{CC} - I_C (R_C + R_E)$$

$$S = \frac{\left\{ (\beta+1) \left(1 + \frac{R_E}{R_B} \right) \right\}}{\left\{ (\beta+1) + \left(1 + \frac{R_E}{R_B} \right) \right\}} \quad \text{--- (1)}$$

we have $I_C = \beta I_B$

$$I_B = 14.2 \mu A$$

$$R_C = \frac{100}{5 \times 10^{-3}} \times 26 \times 10^{-3}$$

$R_C = 520 \Omega$

$$V_{CEQ} = V_{CC} - I_C (R_C + R_E)$$

$$R_E = 11980 \Omega$$

$R_E \approx 1.5 \text{ k}\Omega$

using eqn (1)

$$10 = \frac{351 \left(1 + \frac{R_E}{1500} \right)}{351 + \left(1 + \frac{R_E}{1500} \right)}$$

$$R_E = 12940 \Omega$$

$$R_H = 14k\Omega$$

$$V_{TH} = I_B R_H + V_{BE} + I_E R_E$$

$$V_{TH} = (14.2 \times 10^{-6} \times 14 \times 10^3) + 0.7 + (6 \times 10^{-3} \times 1.5 \times 10^3)$$

$$V_{TH} = 0.1988 + 0.7 + 7.5$$

$$V_{TH} = 8.3988 V$$

$$V_{TH} = 0.4 V$$

$$\frac{R_2}{R_1 + R_2} = \frac{V_{TH}}{V_{CC}} \quad \text{and} \quad R_H = \frac{R_1 R_2}{R_1 + R_2}$$

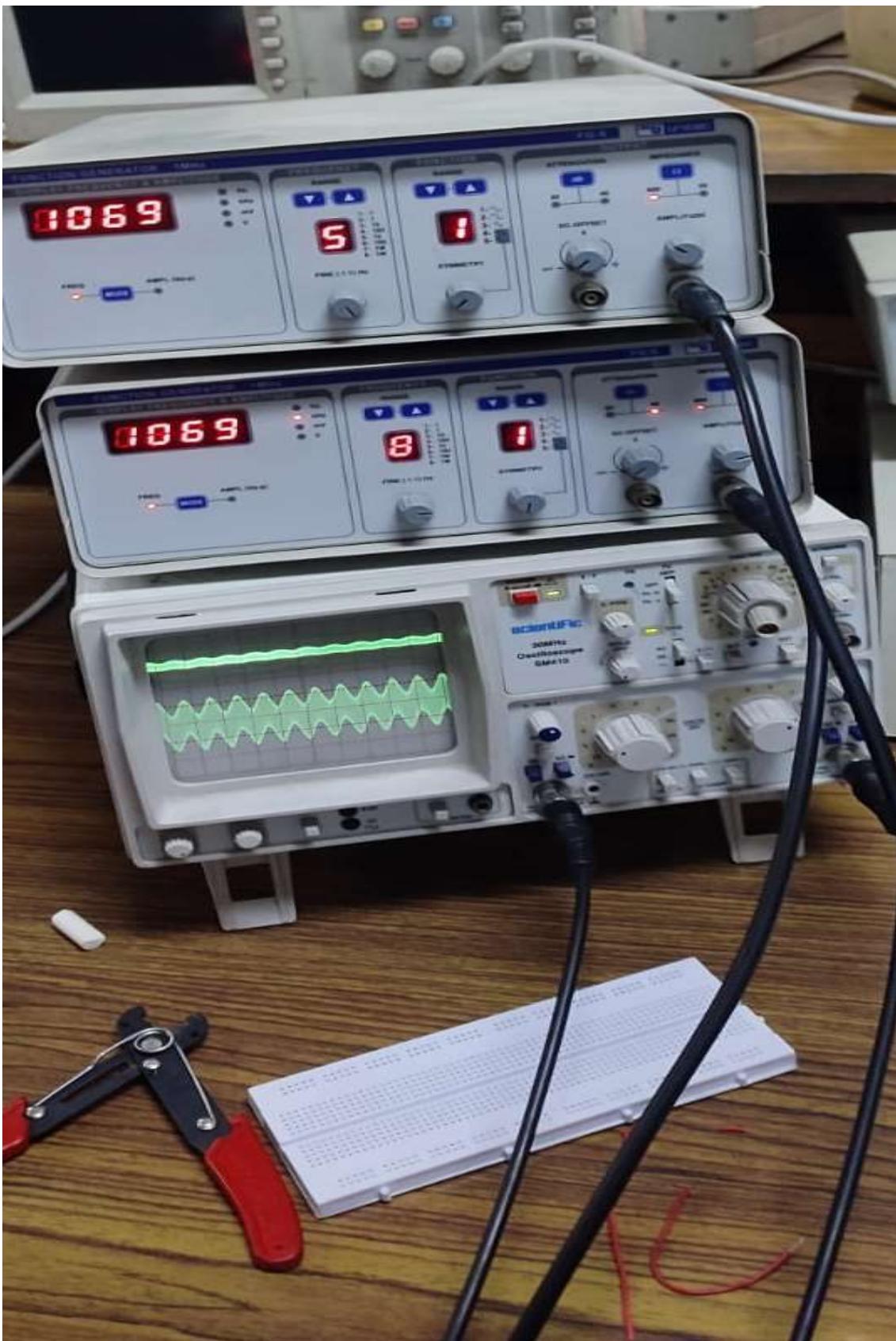
$$\frac{R_2}{R_1 + R_2} = 0.42 \quad \text{--- (1)} \qquad \frac{R_1 R_2}{R_1 + R_2} = 14 \text{ k}\Omega \quad \text{--- (2)}$$

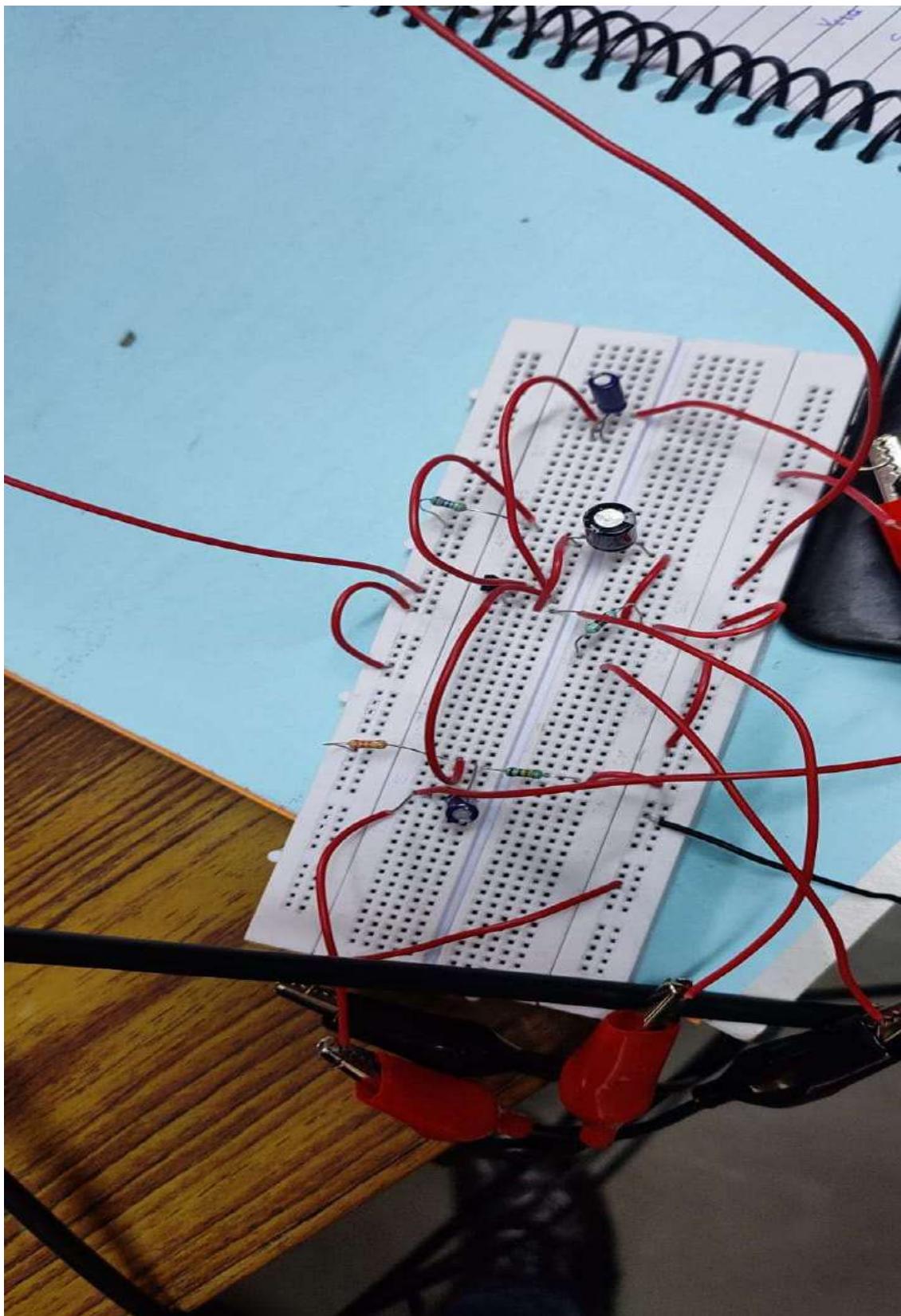
solving (1) and (2)

$R_1 = 33.33 \text{ k}\Omega$

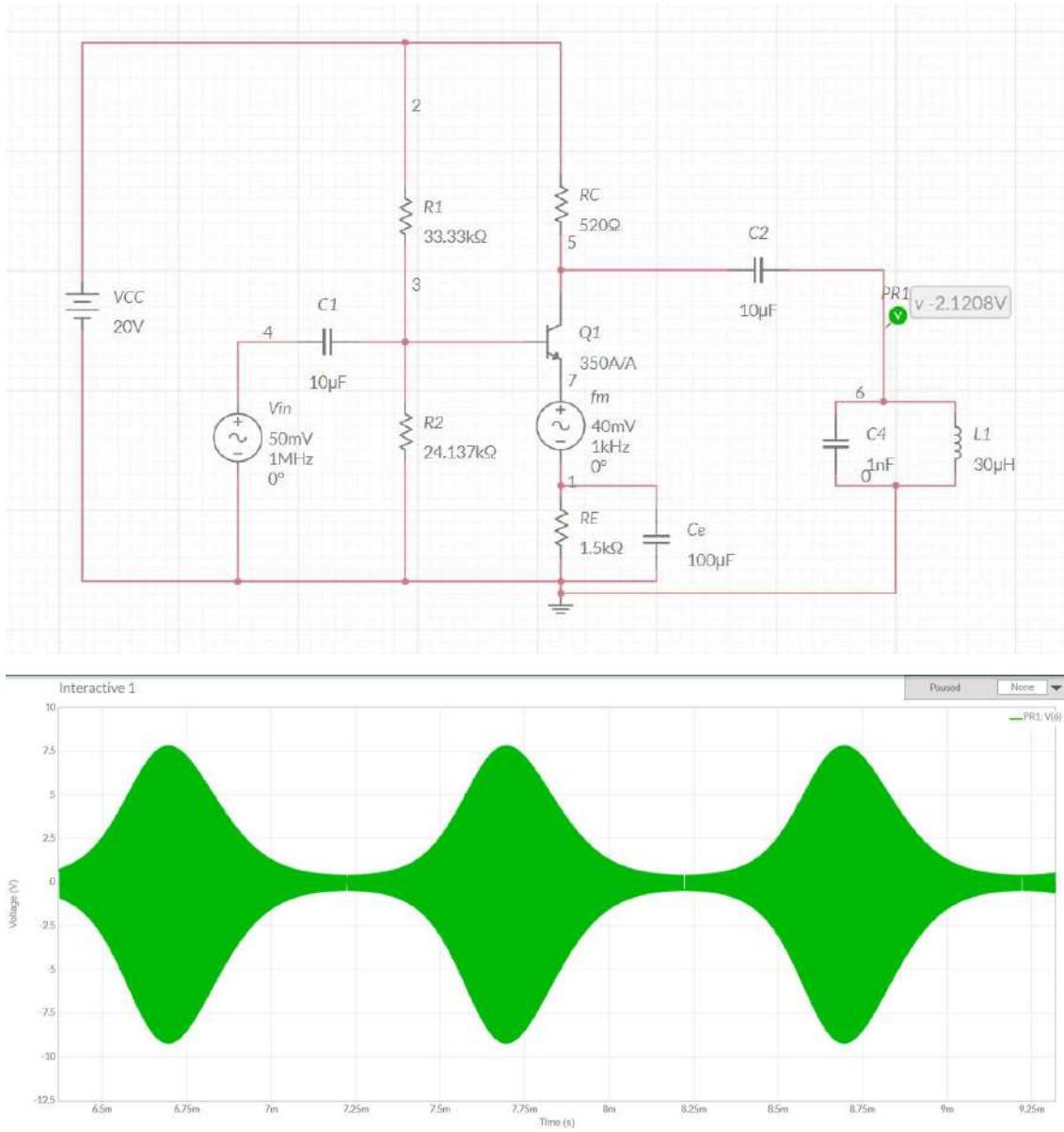
$R_2 = 24.137 \text{ k}\Omega$

Observation:





Multisim Observations:



Result: AM wave is generated using CE Amplifier.

EXPERIMENT : 5

AIM: To plot some basic functions using Scilab.

Apparatus: Scilab Software.

Scilab Code:

```
clc;
clf;
w=6283;
t=0:0.01:100;
y1=sin(w.*t);
y2=cos(w.*t);
y3=cos(w.*t)+(1/3).*cos(3.*w.*t)+(1/5).*cos(5.*w.*t) +
(1/7).*cos(7.*w.*t);
subplot(2,2,1)
plot(t,y1)
title('sin(w.*t)', 'time', 'Amplitude')
xlabel('Time')
ylabel('Amplitude')
subplot(2,2,2)
plot(t,y2)
title('cos(w.*t)')
xlabel('Time')
ylabel('Amplitude')
subplot(2,2,3)
plot(t,y3)
title('cos(w.*t)+(1/3).*cos(3.*w.*t)+(1/5).*cos(5.*w.*t) +
(1/7).*cos(7.*w.*t)')
xlabel('Time')
ylabel('Amplitude')
```

AM4.sce (C:\Users\Nahant\AM4.sce) - SciNotes

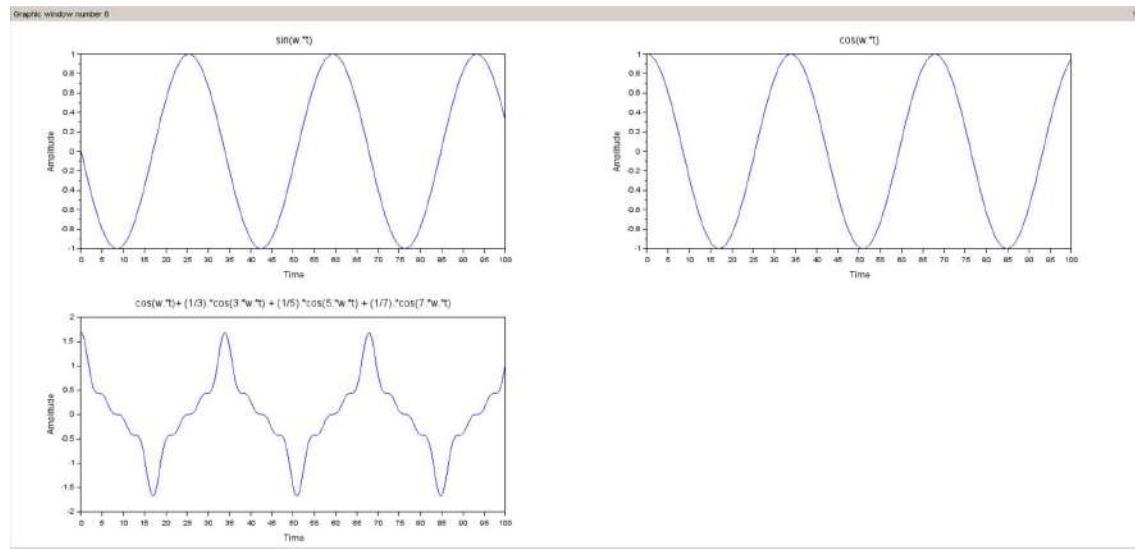
File Edit Format Options Window Execute ?

AM4.sce AM4.sce AM4.sce

```

1 clc;
2 clif;
3 w=6283;
4 t=0:0.01:100;
5 y1=sin(w.*t);
6 y2=cos(w.*t);
7 y3= cos(w.*t)+(1/3).*cos(3.*w.*t) +(1/5).*cos(5.*w.*t) +(1/7).*cos(7.*w.*t);
8 xlabel('Time')
9 ylabel('Amplitude')
10 subplot(2,2,1)
11 plot(t,y1)
12 title('sin(w.*t)','time','Amplitude')
13 xlabel('Time')
14 ylabel('Amplitude')
15 subplot(2,2,2)
16 plot(t,y2)
17 title('cos(w.*t)')
18 xlabel('Time')
19 ylabel('Amplitude')
20 subplot(2,2,3)
21 plot(t,y3)
22 title('cos(w.*t)+(1/3).*cos(3.*w.*t) +(1/5).*cos(5.*w.*t) +(1/7).*cos(7.*w.*t)')
23

```



EXPERIMENT : 6

AIM: To plot AM Modulated Signal using Scilab.

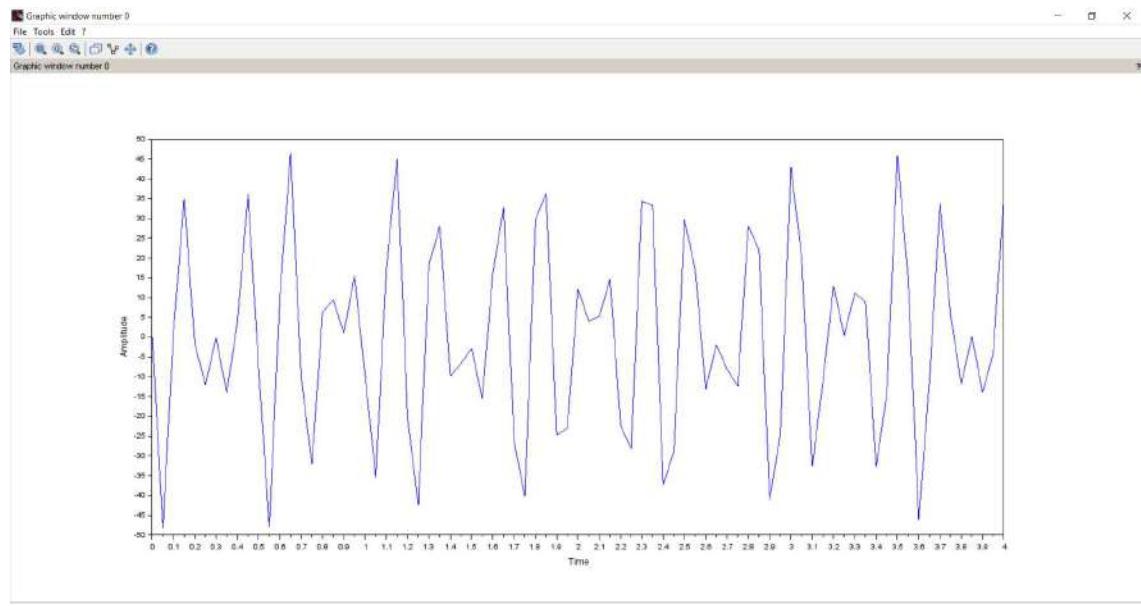
Apparatus: Scilab Software.

Scilab Code:

```
clc;
clf;
Vm=5
Vc=10
Wc=(10)^6
Wm=10^3
t=0:0.05:4
y= ((Vc.*Vm)/2).* (sin((Wm+Wc).*t)-sin((Wm-Wc).*t))
plot(t,y)
xlabel('Time')
ylabel('Amplitude')
```

The screenshot shows the Scilab interface with the following details:

- Title Bar:** AMSpec (C:\Users\Nishant\AM5.sci) - SciNotes
- Menu Bar:** File, Edit, Format, Option, Window, Execute ?
- Toolbar:** Includes icons for Open, Save, Run, Stop, and Help.
- Code Editor:** Displays the Scilab script code provided above.
- Output Window:** Shows the execution results, which include the plotted AM modulated signal graph.



EXPERIMENT : 7

AIM: To plot AM DSBFC Modulated Signal using Scilab.

Apparatus: Scilab Software.

Scilab Code:

```
clc;
clf;
Vm=5
Vc=10
Wc=(10)^6
Wm=10^3
t=0:0.05:8
y= [Vc.*sin(Wc.*t)]+[(Vm/2).* (sin((Wm+Wc).*t)-sin((Wm-
Wc).*t))]
plot(t,y)
title('DSBFC')
xlabel('Time')
ylabel('Amplitude')
```



The screenshot shows the Scilab interface with the code for generating an AM DSBFC signal. The code is identical to the one provided above, defining variables for carrier voltage (Vm), modulating voltage (Vc), carrier frequency (Wc), modulating frequency (Wm), time range (t), and the resulting signal (y). The plot is titled 'DSBFC' with axes labeled 'Time' and 'Amplitude'.

```
AM5.sce (C:\Users\Nishant\AM5.sce) - Scilab Notes
File Edit Format Options Window Execute ?
AM5.sce | AM4.sce | AM4.sce |
1 clc;
2 clf;
3 Vm=5
4 Vc=10
5 Wc=(10)^6
6 Wm=10^3
7 t=0:0.05:8
8 y= [Vc.*sin(Wc.*t)]+[(Vm/2).* (sin((Wm+Wc).*t)-sin((Wm-
Wc).*t))]
9 plot(t,y)
10 title('DSBFC')
11 xlabel('Time')
12 ylabel('Amplitude')
```

