# Communication Electronics

## Practical File

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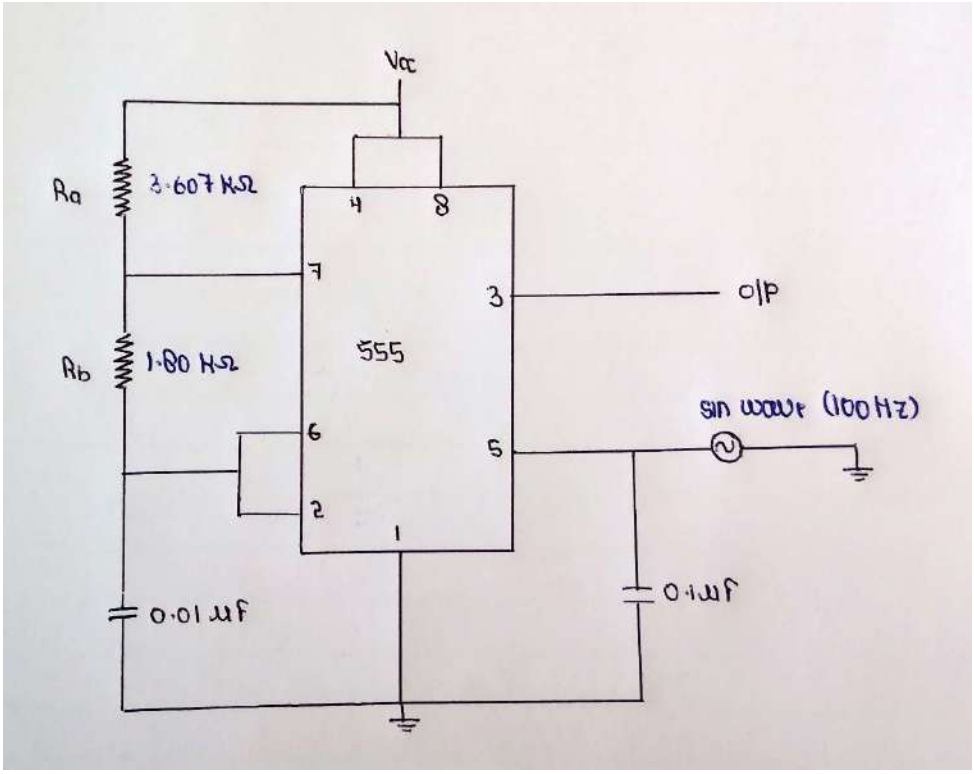
**EXPERIMENT: 1**

**AIM:** To generate FM using 555 timer.

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

**Circuit Diagram:**



**Calculation:**

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

$T = 0.05\ ms$

$0.693(R_a + 2R_b)C = 0.05\ ms$ ——— (1)

For 75% duty cycle

$$0.75 = \frac{R_a + R_b}{R_a + 2R_b}$$ ——— (2)

Now, from Eqn (1)

Let $C = 0.01\ \mu F$

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

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

$$\text{or, } R_a + 2R_b = 7.215 \times 10^{3}\ \Omega$$ ——— (A)

Now from (2)

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

$R_a + R_b = 5.411\ K\Omega$ ——— (B)

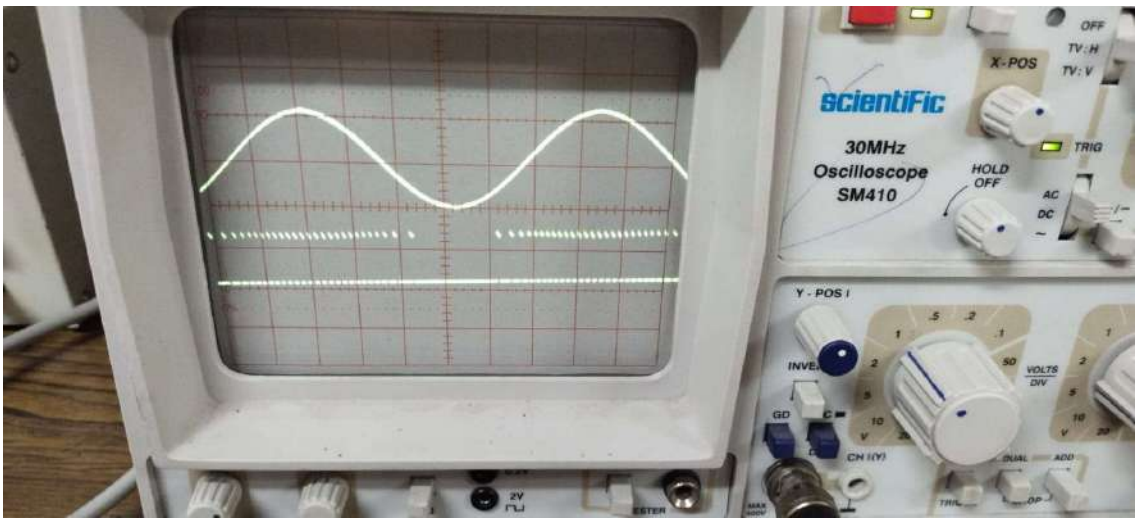
Subtracting B from A

$R_b = 1.804\ K\Omega$

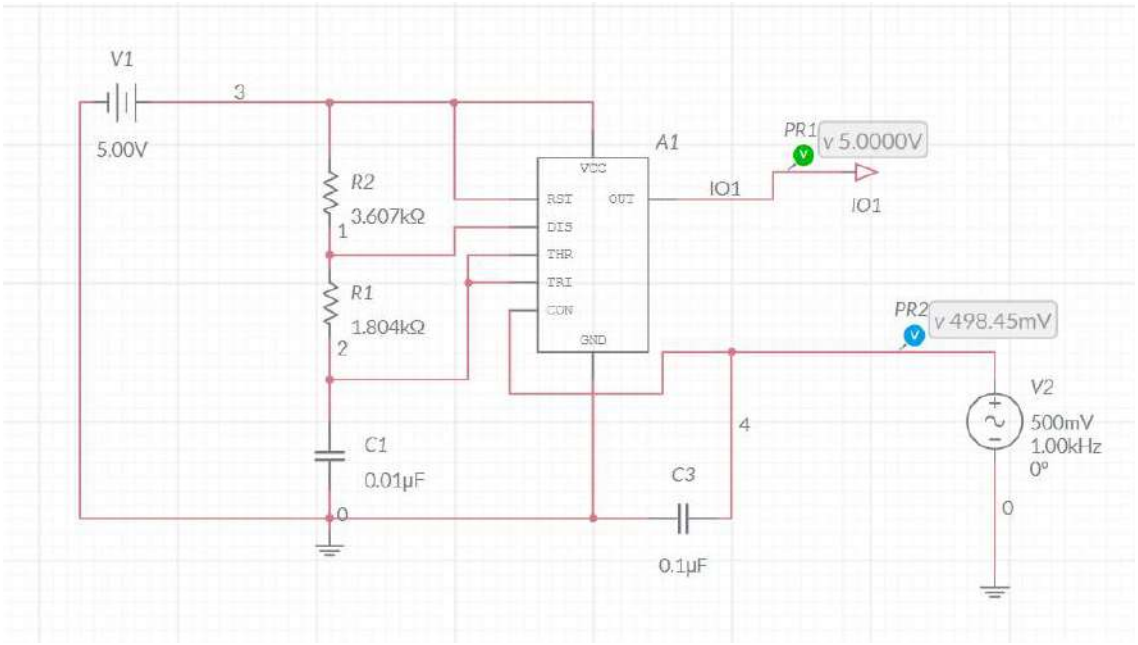
From (B)

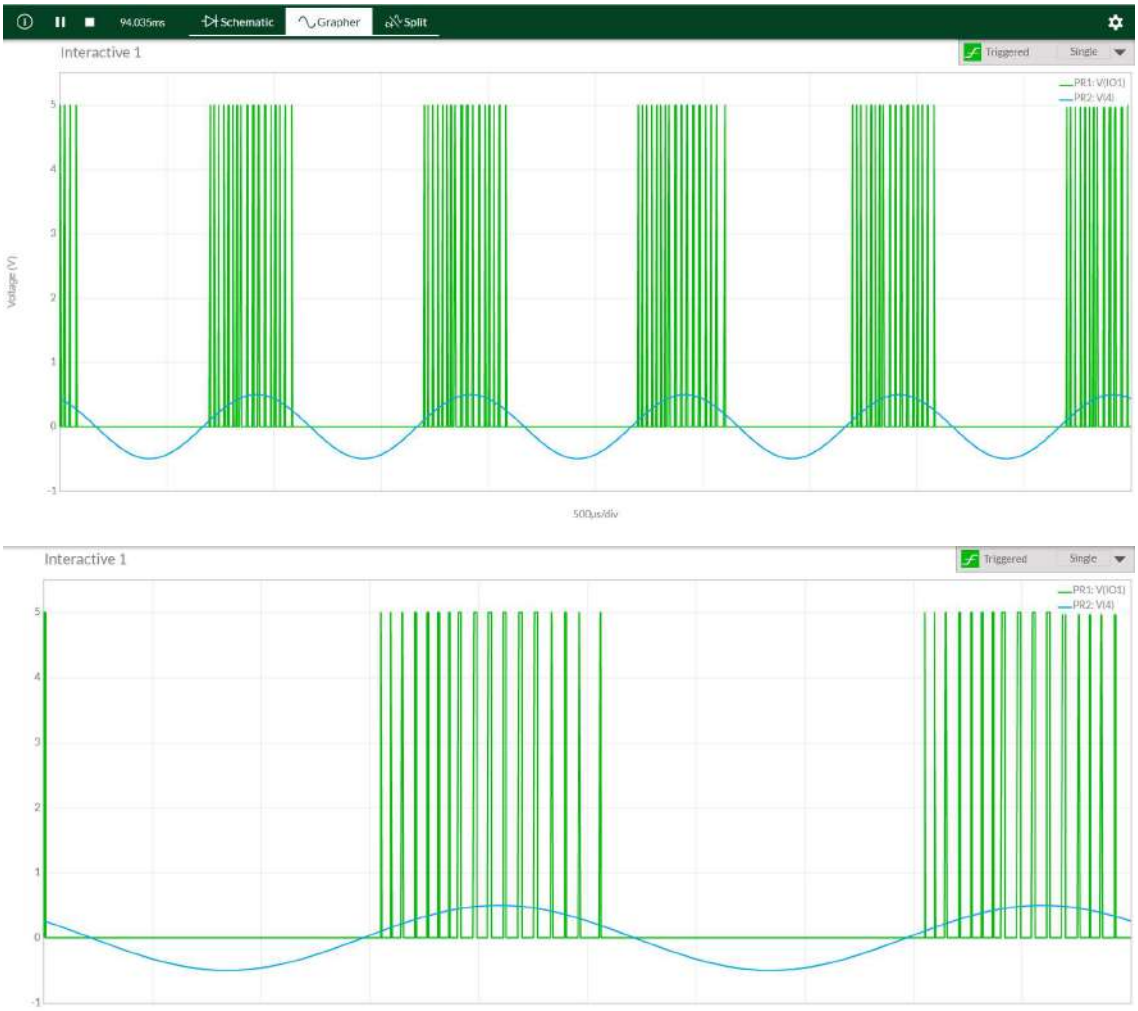
$R_a = 3.607\ K\Omega$

## Observations:




## Multisim Observations:






**Result:**

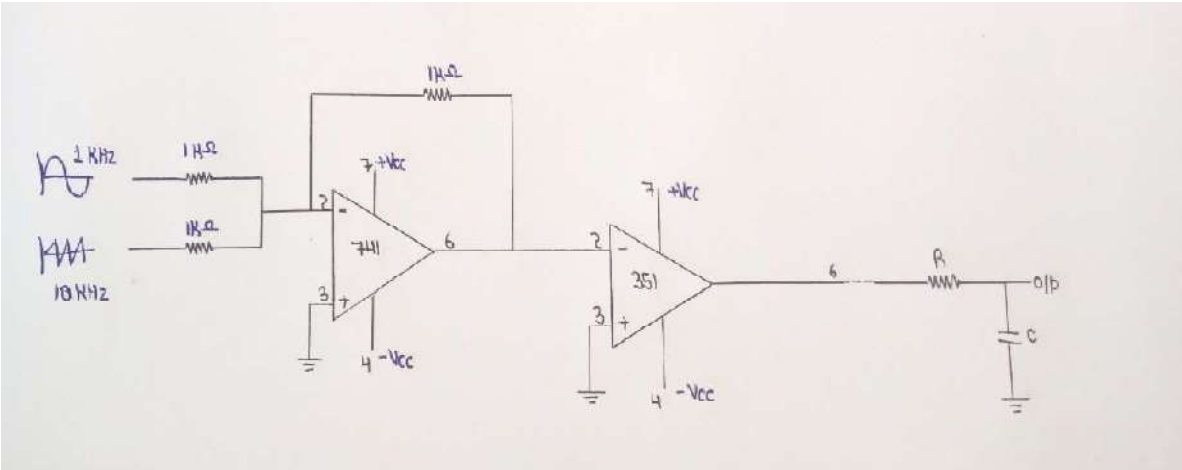
We have successfully completed Frequency Modulation using 555 timer.

**EXPERIMENT : 2**

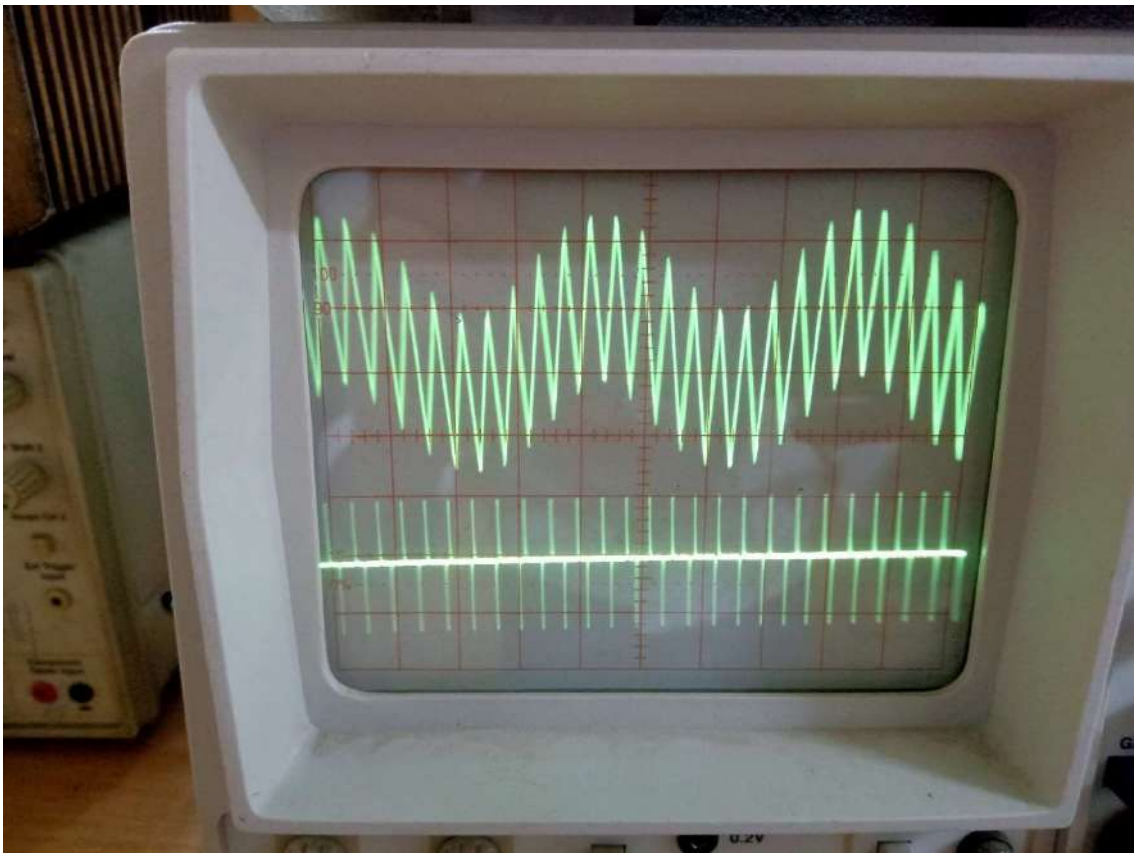
**AIM:** To generate PWM wave.

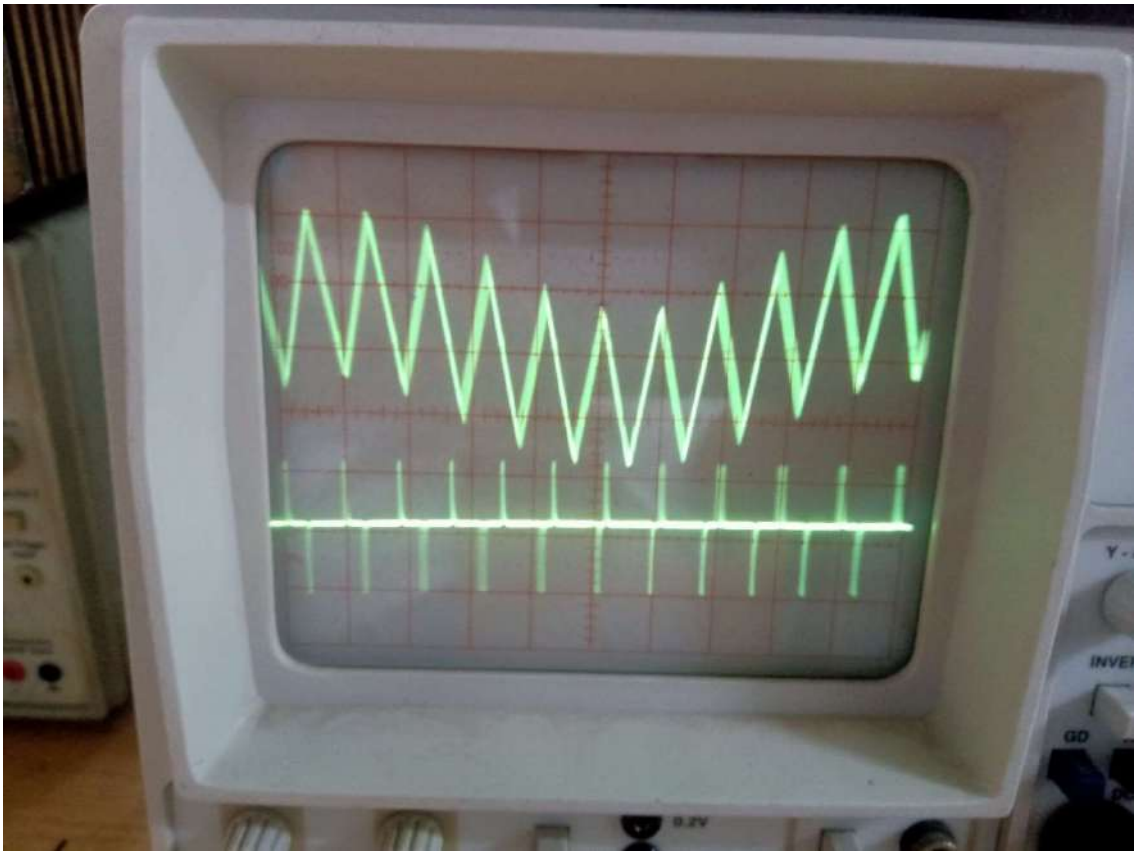
**Apparatus:** Breadboard, resistors, 741 Adder, 351 Comparator, function generator, CRO/DSO.

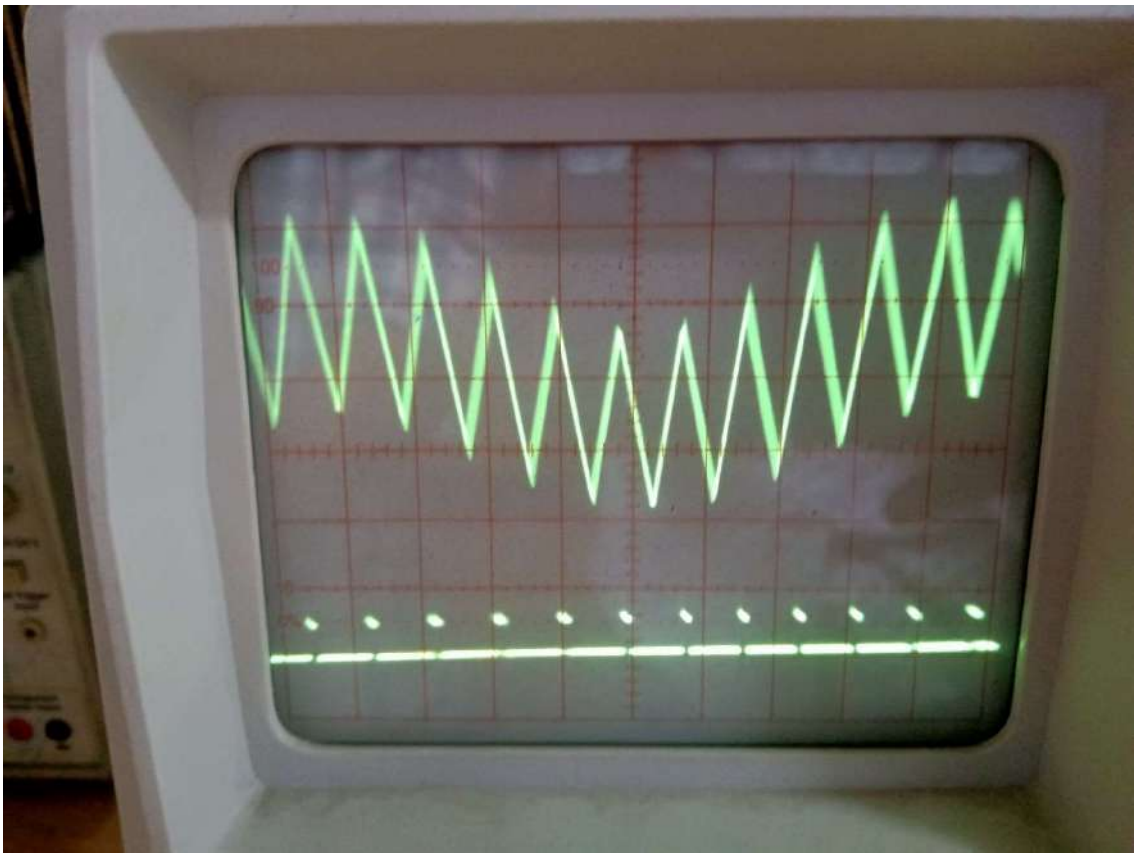
**Circuit Diagram:**

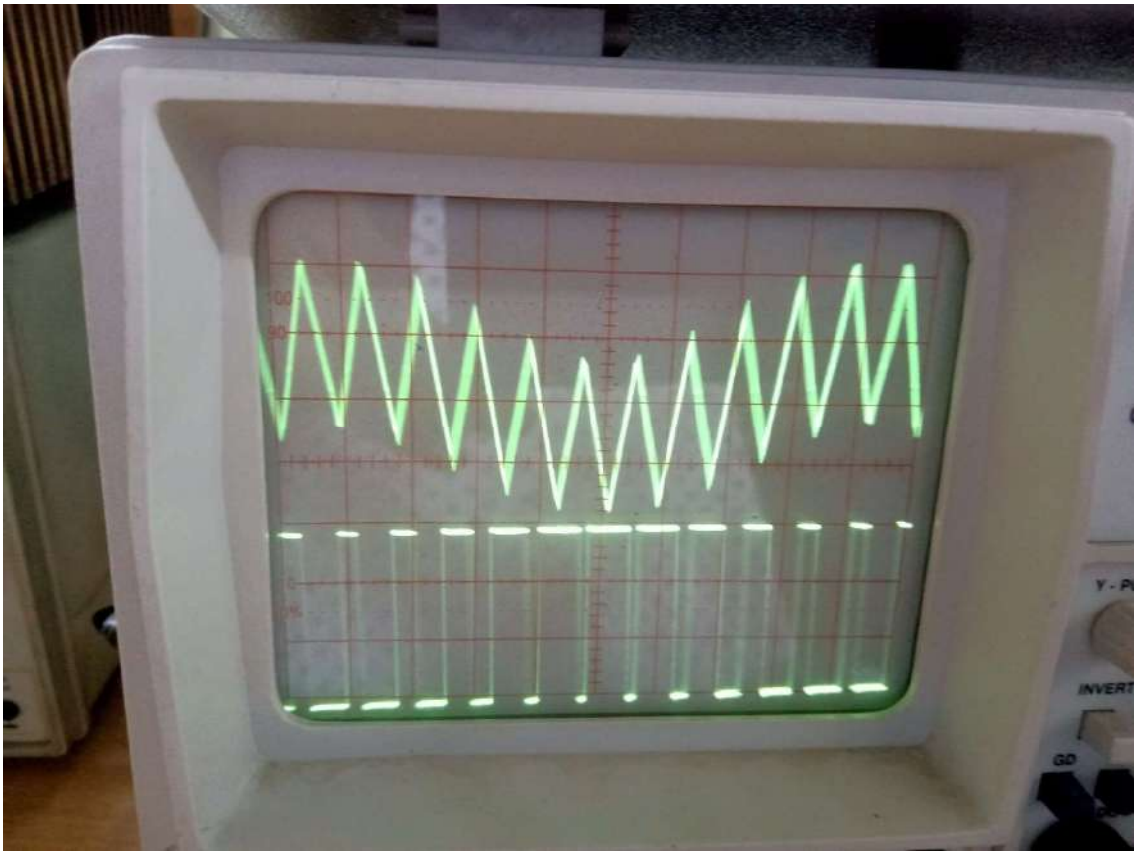



**Observation:**








INVERT

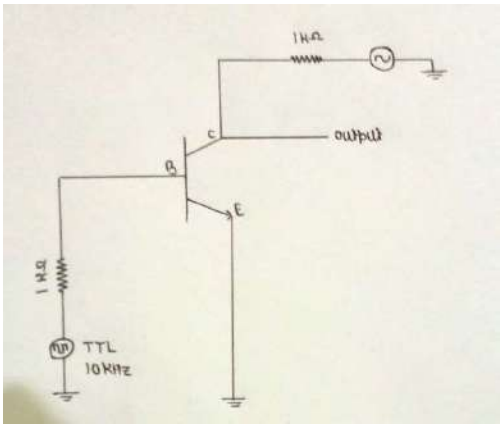
**Result:** We have successfully generated PWM wave.

**EXPERIMENT: 3**

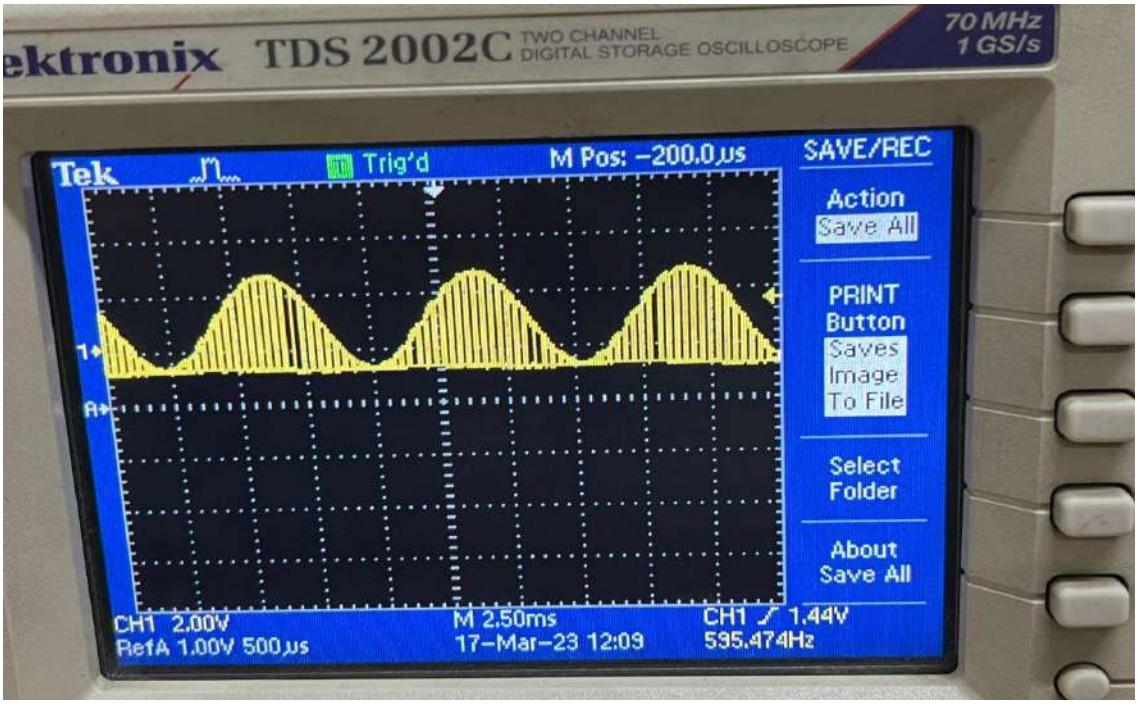
**AIM:** To generate PAM wave.

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

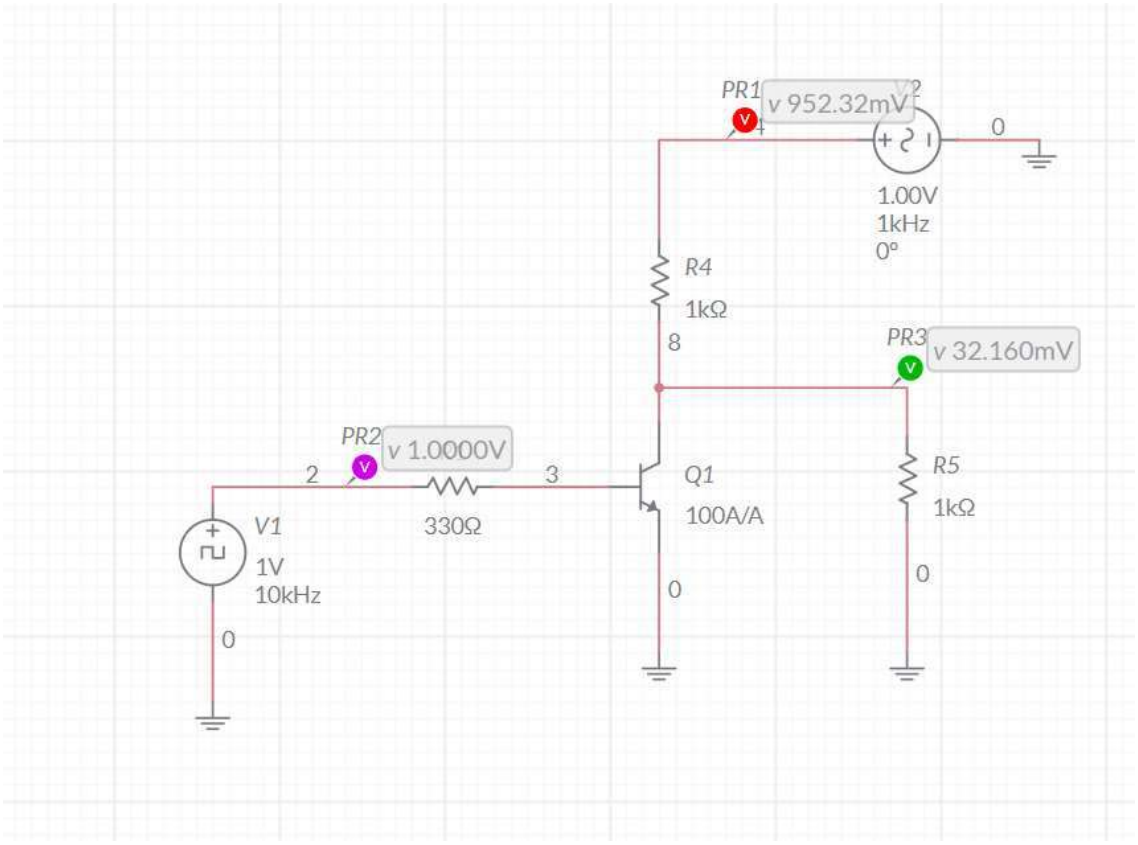
**Circuit Diagram:**

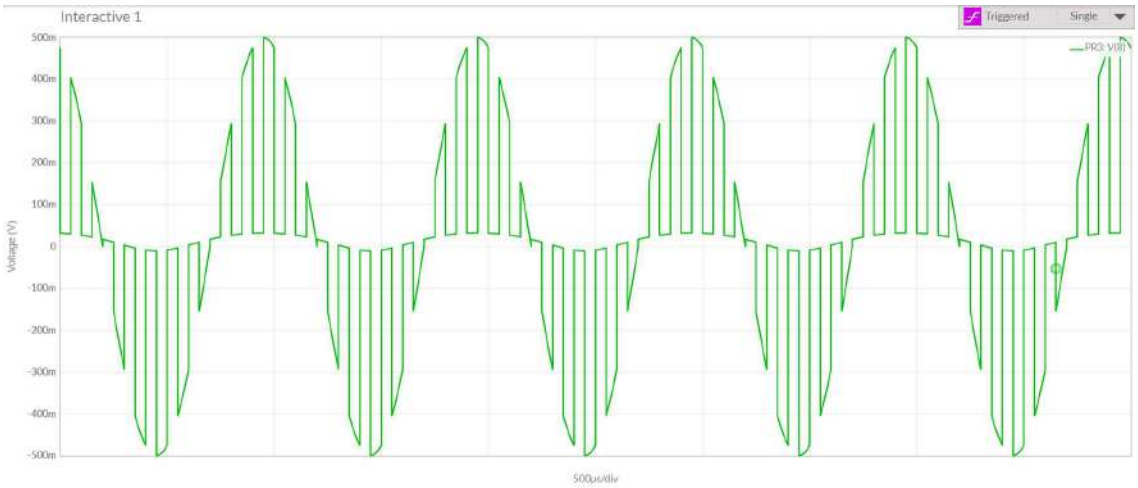



**Observation:**



## Multisim Observations:



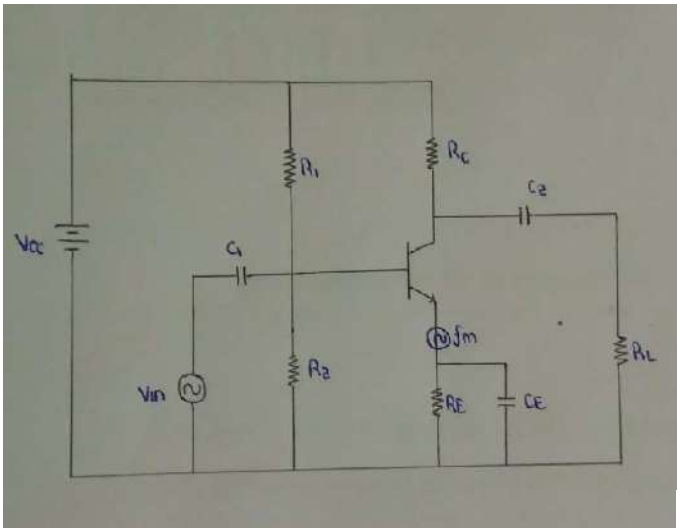

**Result:** PAM wave is generated using multiplier circuit.

**EXPERIMENT : 4**

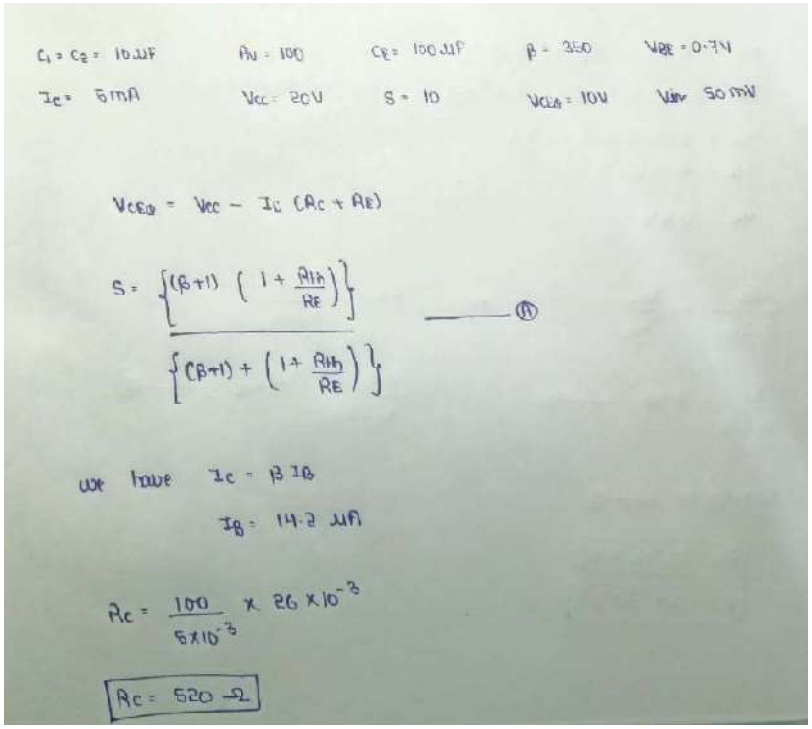
**AIM:** To generate AM wave.

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

**Circuit Diagram:**



**Calculation:**



$C_1 = C_2 = 10\,\mu F$ $A_V = 100$ $C_E = 100\,\mu F$ $\beta = 350$ $V_{BE} = 0.7\,V$

$I_C = 5\,mA$ $V_{CC} = 20\,V$ $S = 10$ $V_{CEQ} = 10\,V$ $V_{in} = 50\,mV$

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

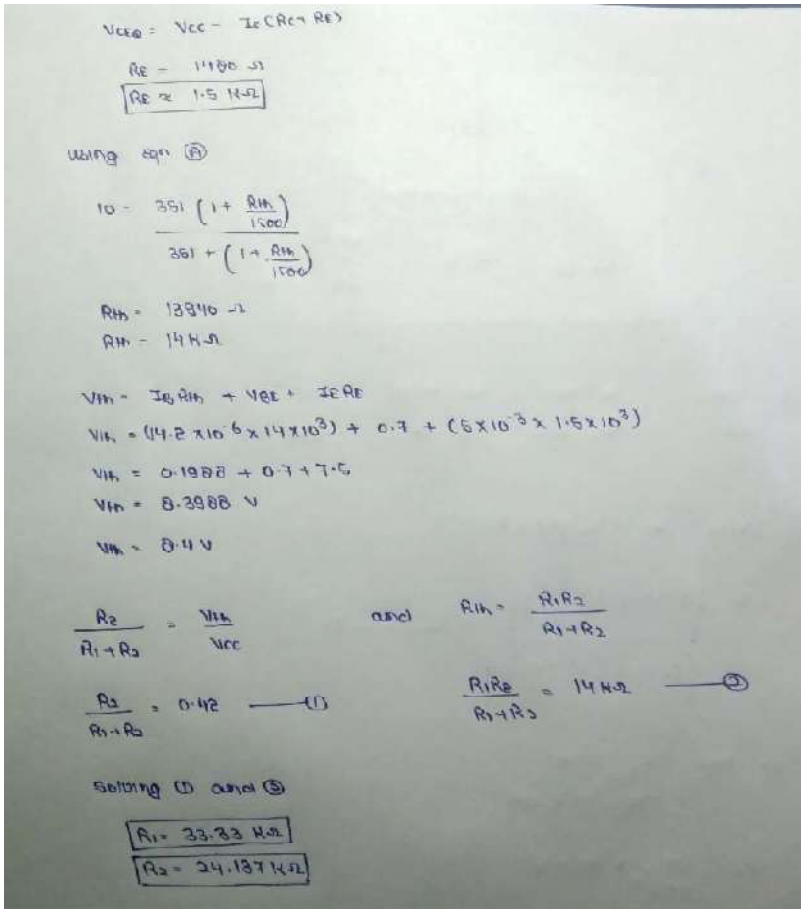
$$S = \frac{\left\{(\beta+1)\left(1+\frac{R_{th}}{R_E}\right)\right\}}{\left\{(\beta+1)+\left(1+\frac{R_{th}}{R_E}\right)\right\}} \quad \text{——— (A)}$$

we have $I_C = \beta I_B$

$I_B = 14.2\,\mu A$

$$R_C = \frac{100}{5\times10^{-3}} \times 26\times10^{-3}$$

$R_C = 520\,\Omega$



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

$R_E = 1.180\,k\Omega$

$R_E \approx 1.5\,k\Omega$

using eqn (A)

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

$R_{th} = 13840\,\Omega$

$R_{th} = 14\,k\Omega$

$V_{th} = I_B R_{th} + V_{BE} + I_E R_E$

$V_{th} = (14.2\times10^{-6}\times14\times10^{3}) + 0.7 + (5\times10^{-3}\times1.5\times10^{3})$

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

$V_{th} = 8.3988\,V$

$V_{th} = 8.4\,V$

$$\frac{R_2}{R_1+R_2} = \frac{V_{th}}{V_{CC}} \qquad \text{and} \qquad R_{th} = \frac{R_1R_2}{R_1+R_2}$$

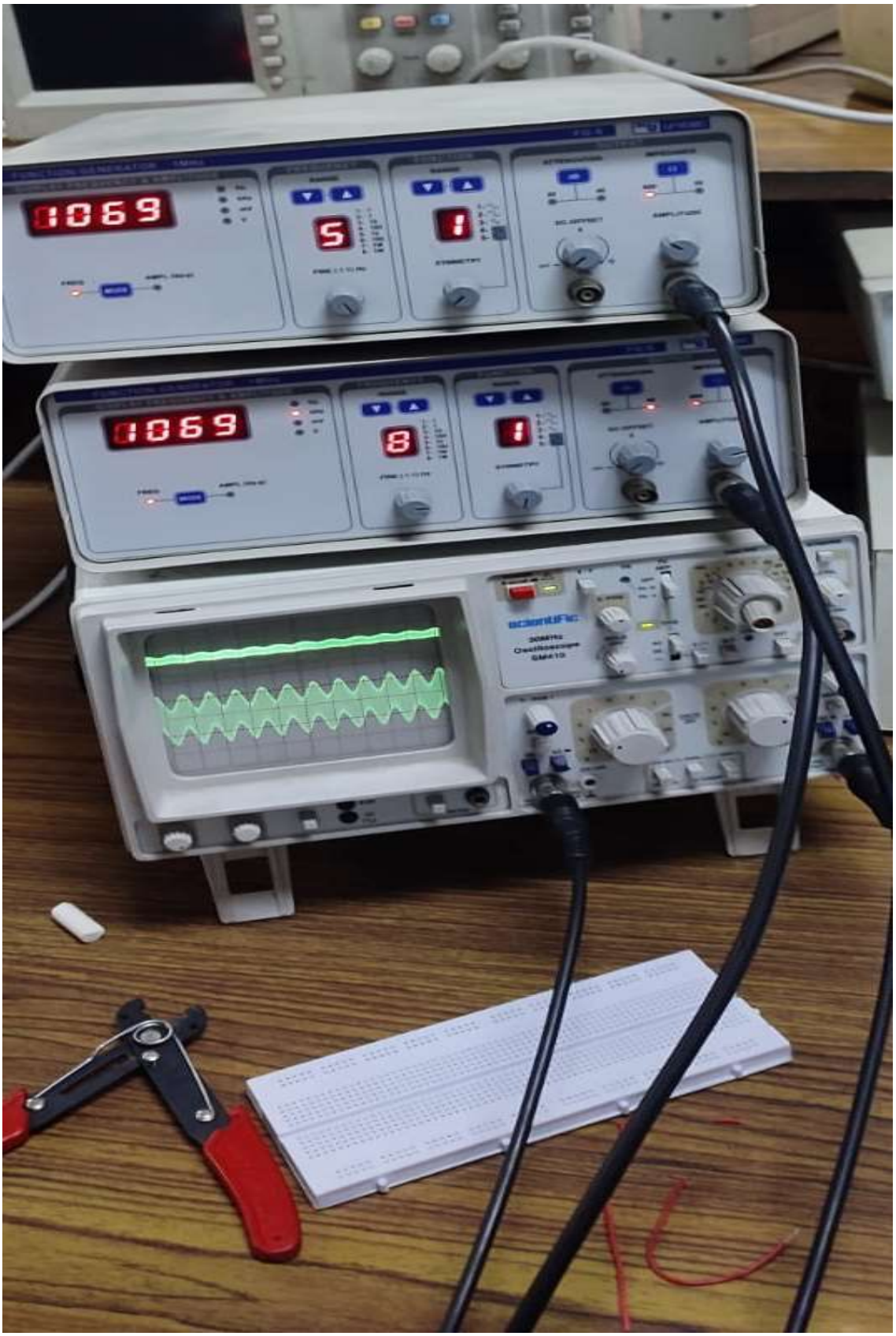
$$\frac{R_2}{R_1+R_2} = 0.42 \quad \text{——— (1)} \qquad \frac{R_1R_2}{R_1+R_2} = 14\,k\Omega \quad \text{——— (2)}$$

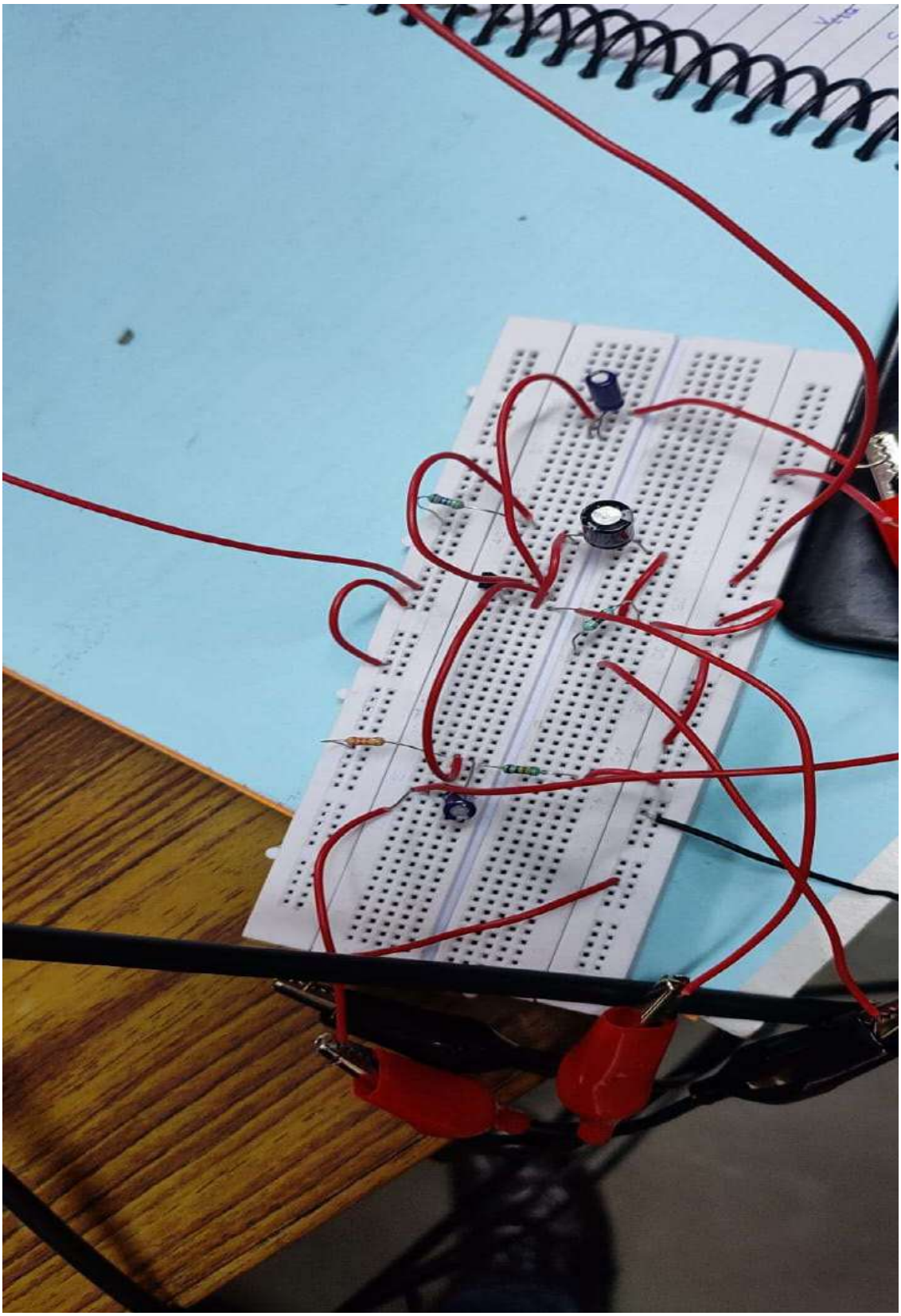
Solving (1) and (2)

$R_1 = 33.33\,k\Omega$

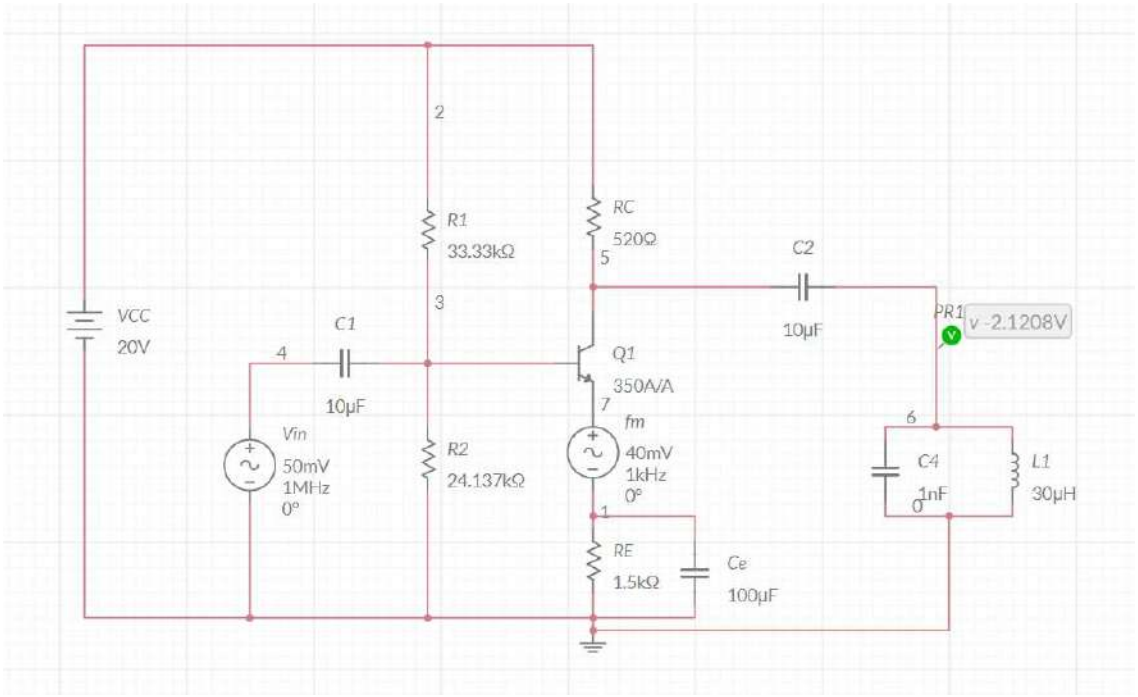
$R_2 = 24.137\,k\Omega$

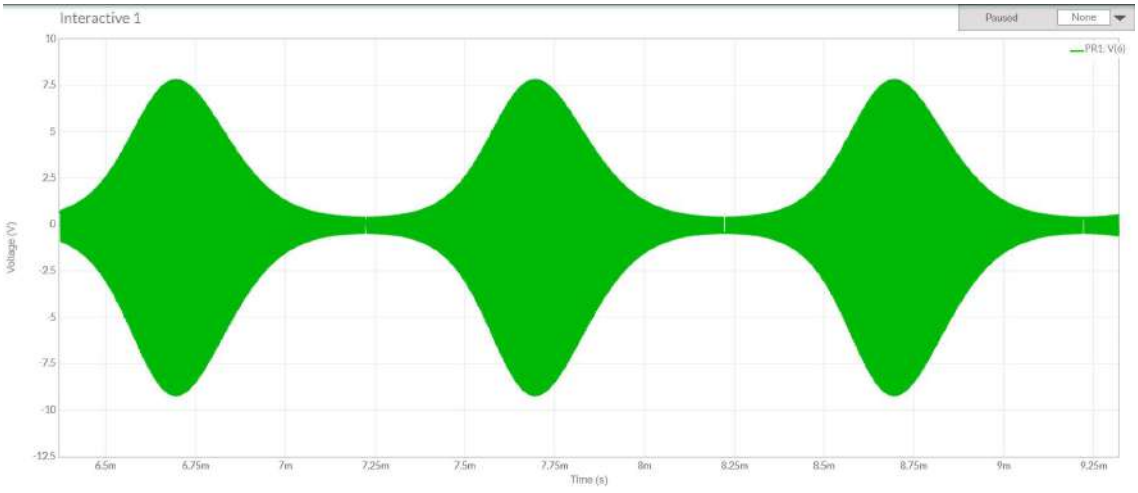
**Observation:**





**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\Nishant\AM4.sce) - SciNotes

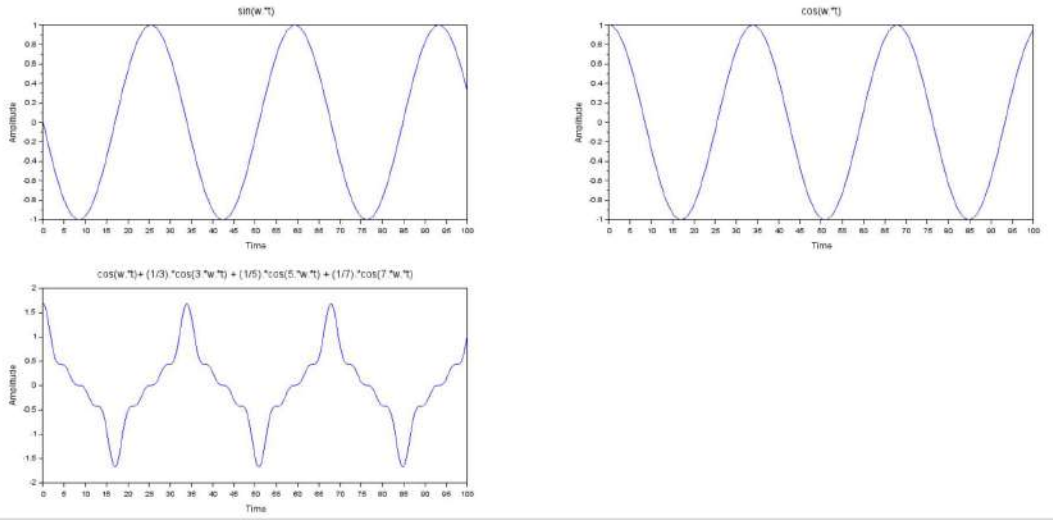
File Edit Format Options Window Execute ?

AM.sce AM5.sce AM4.sce

```
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);
xlabel('Time')
ylabel('Amplitude')
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)')

```

Graphic window number 0



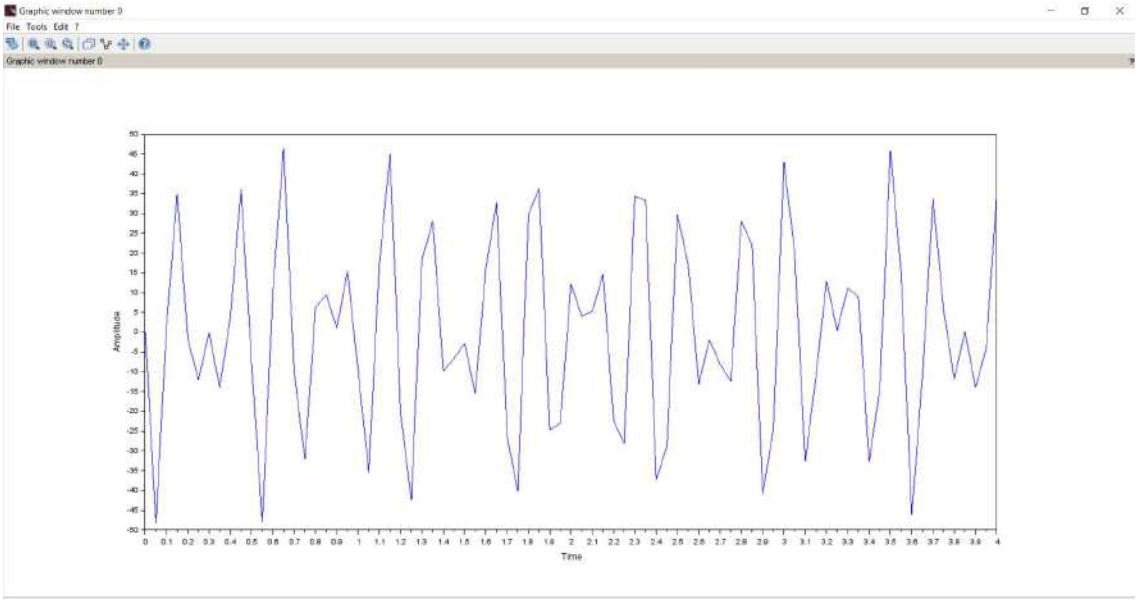
**EXPERIMENT : 6**

**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')
```


Graphic window number 0
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Graphic window number 0
Amplitude
Time

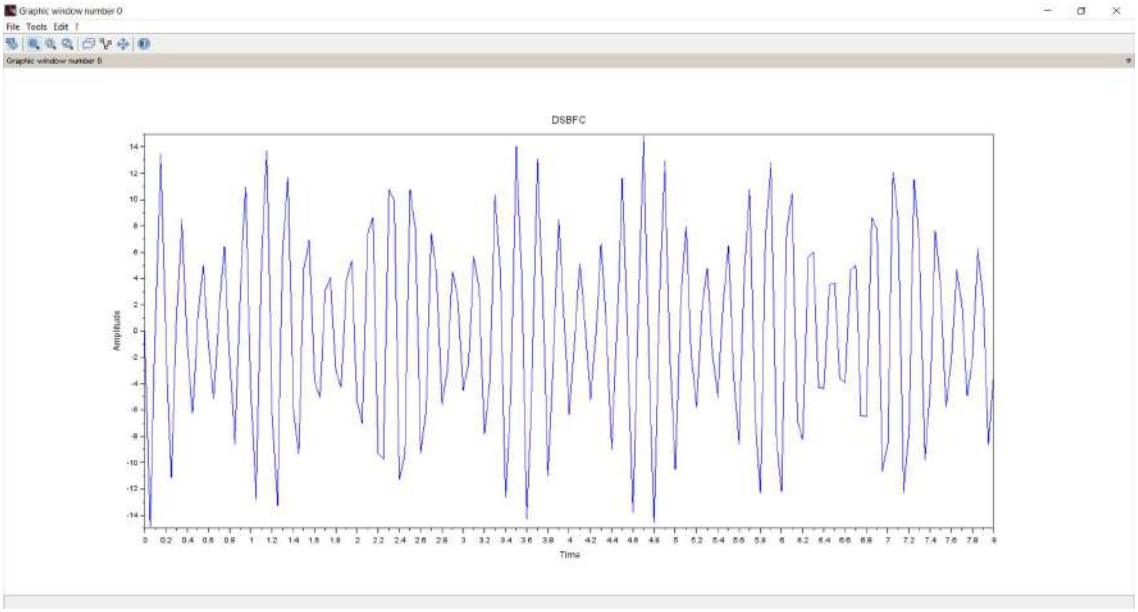
**EXPERIMENT : 7**

**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')
```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File Tools Edit ?
Graphic window number 0
DSBFC
Amplitude
Time