

**Indian Institute of Information Technology, Allahabad**  
**ELECTRONICS AND COMMUNICATION ENGINEERING DEPARTMENT**  
**Course Name: Analog Communication Laboratory**

**EXPERIMENT NO: 6**

**Objective:**

To generate amplitude modulated wave and determine its modulation index.

**Materials/ Component Required:**

Name of the Component/ Equipment	Quantity Required
Transistor (BC547)	1
Diode (IN4007)	1
Resistors	5
Capacitors	2
DSO	1
Function Generator	2
Regulated Power Supply	1

**Theory:**

**Amplitude modulation:** Modulation is a process of translating information signal from low band frequency to high band frequency that is suits the transmission medium. Information signal is usually of low frequency, so it cannot travel far. It needs a carrier signal of higher frequency for long distance destination. The inputs are carrier and information (modulating) signals while the output is called the modulated signal. Amplitude Modulation (AM) refers to the modulation technique where the carrier's amplitude is varied in accordance to the instantaneous value of the modulating or baseband signal's amplitude. An AM signal is represented as:

Sinusoidal carrier wave  $c(t)$  given as:

$$c(t) = A \cos w_c t ; \quad A = \text{Max. amplitude of the carrier wave}$$

$$w_c = \text{carrier frequency}$$

AM wave can be expressed as:

$$s(t) = x(t) \cos w_c t + A \cos w_c t$$

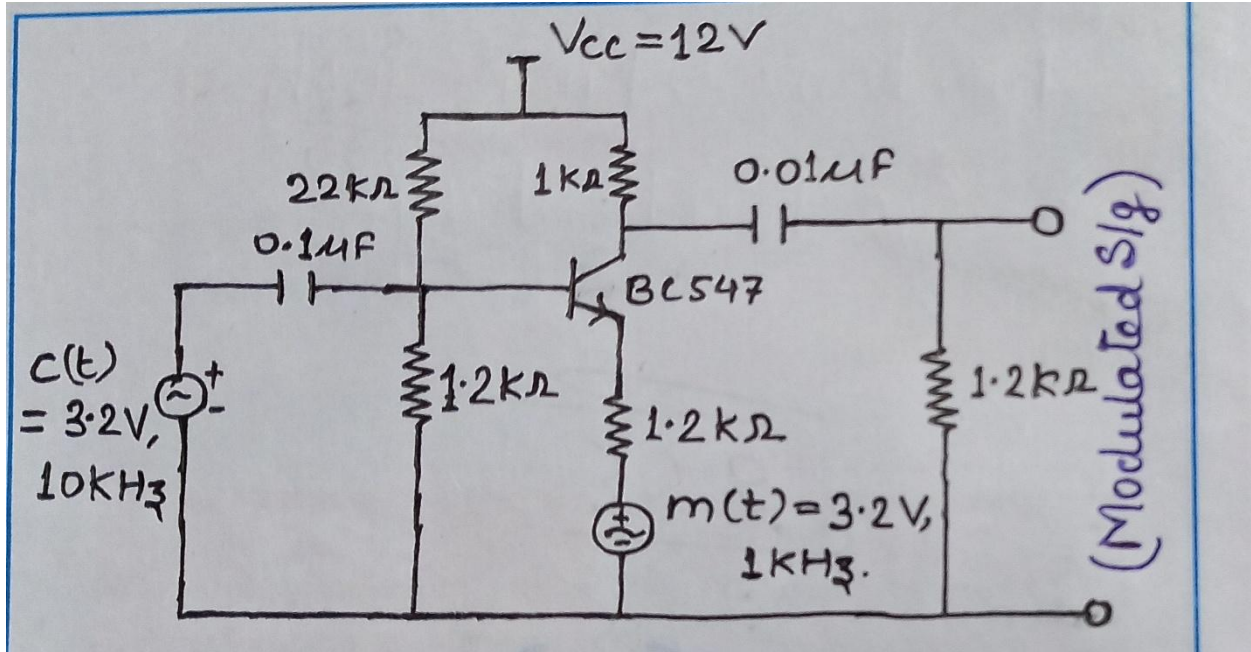
$$s(t) = [A + x(t) ] \cos w_c t$$

**Modulation Index:** The amount by which the amplitude of the carrier wave increases and decreases depends on the amplitude of the information signal and is known as modulation index or depth of modulation. The extent of amplitude variation in AM about an unmodulated carrier amplitude is measured in terms of a factor called modulation index.

$$m = \frac{V_{max} - V_{min}}{V_{max} + V_{min}} \times 100$$

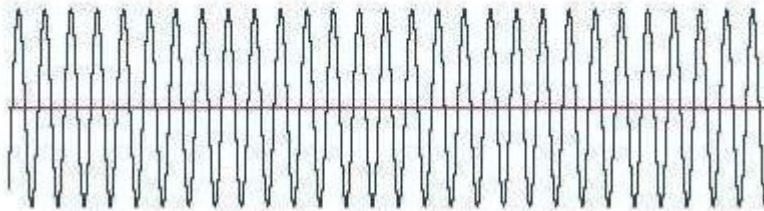
**Circuit Diagrams:**

For Modulation

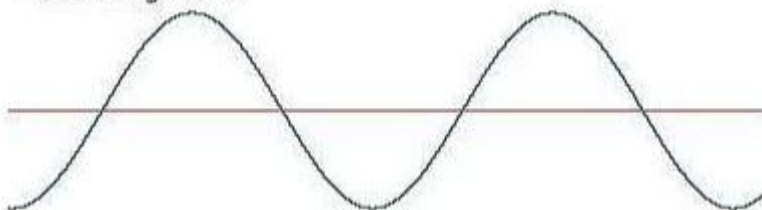


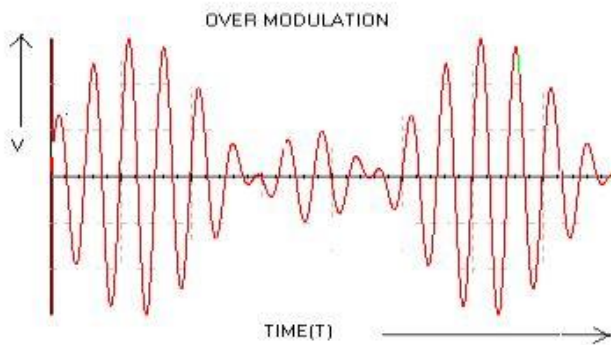
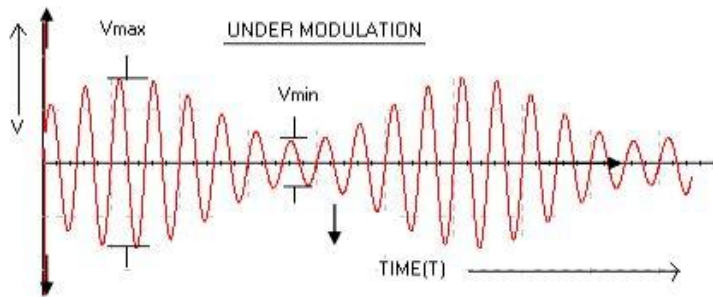
**Waveforms and graphs:**

Carrier



Modulating Wave





**Procedure:**

1. The circuit is connected as per the circuit diagram shown in Figure.
2. Switch on + 12 volts  $V_{CC}$  supply.
3. Apply sinusoidal signal of 1 KHz frequency and amplitude 3.2 Volts as modulating signal, and carrier signal of frequency 10 KHz and amplitude 3.2 Volts.
4. Now slowly increase the amplitude of the modulating signal up to 7V and note down values of  $V_{max}$  and  $V_{min}$ .
5. Calculate modulation index using equation

**Observation Table**

S.No.	Modulated Wave		Modulation Index
	$V_{max}$	$V_{min}$	
1			
2			
3			
4			

**Report:**

**Result:** Study of AM signal has been done. Modulation Index has been calculated.

**Precautions:**

1. Check the connections before giving the power supply.
2. Observations should be done carefully.