



~ 3256 km²

Question 15.5:

A carrier wave of peak voltage 12 V is used to transmit a message signal. What should be the peak voltage of the modulating signal in order to have a modulation index of 75%?

Answer

Amplitude of the carrier wave, $A_c = 12$ V

Modulation index, $m = 75\% = 0.75$

Amplitude of the modulating wave = A_m

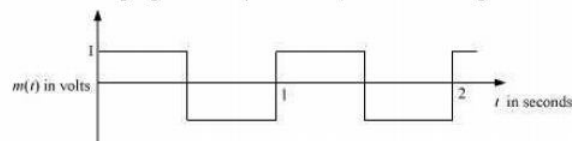
Using the relation for modulation index:

$$m = \frac{A_m}{A_c}$$

$$\begin{aligned} \therefore A_m &= m A_c \\ &= 0.75 \times 12 = 9 \text{ V} \end{aligned}$$

Question 15.6:

A modulating signal is a square wave, as shown in Fig. 15.14.



The carrier wave is given by $c(t) = 2 \sin(8\pi t)$ volts.

- (i) Sketch the amplitude modulated waveform
- (ii) What is the modulation index?

Answer

It can be observed from the given modulating signal that the amplitude of the modulating signal, $A_m = 1$ V

It is given that the carrier wave $c(t) = 2 \sin(8\pi t)$

∴ Amplitude of the carrier wave, $A_c = 2$ V

Time period of the modulating signal $T_m = 1$ s

The angular frequency of the modulating signal is calculated as:

$$\begin{aligned}\omega_m &= \frac{2\pi}{T_m} \\ &= 2\pi \text{ rad s}^{-1} \quad \dots (i)\end{aligned}$$

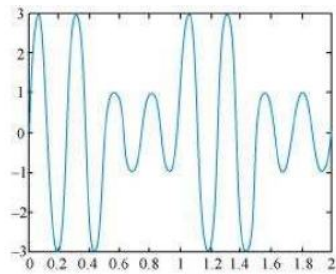
The angular frequency of the carrier signal is calculated as:

$$\omega_c = 8\pi \text{ rad s}^{-1} \quad \dots (ii)$$

From equations (i) and (ii), we get:

$$\omega_c = 4\omega_m$$

The amplitude modulated waveform of the modulating signal is shown in the following figure.



$$m = \frac{A_m}{A_c} = \frac{1}{2} = 0.5$$

(ii) Modulation index,

***** END *****