~ 3256 km^2

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

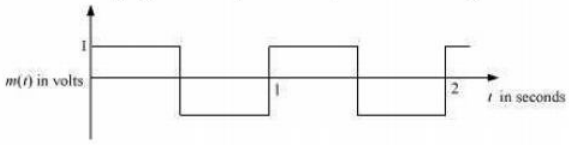
Using the relation for modulation index:

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

$$\therefore A_m = m\ A_c$$
$$= 0.75 \times 12 = 9 \text{ V}$$

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:

$$\omega_m = \frac{2\pi}{T_m}$$

$$= 2\pi \text{ rad s}^{-1} \quad \ldots (i)$$

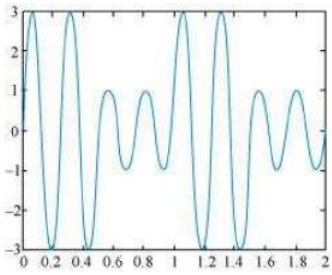
The angular frequency of the carrier signal is calculated as:

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

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.



(ii) Modulation index, $m = \frac{A_m}{A_c} = \frac{1}{2} = 0.5$

********** END **********