Physics Class 12th NCERT Solutions

JAGRAN Josh
Simplifying Test Prep

Chapter -15
Communication Systems
Class – XII
Subject – Physics

15.1. Which of the following frequencies will be suitable for beyond-the horizon communication using sky waves?

a) 10 kHz
b) 10 MHz
c) 1 GHz
d) 1000 GHz

Sol. b

15.2. Frequencies in the UHF range normally propagate by means of:

a) Ground waves.
b) Sky waves.
c) Surface waves.
d) Space waves.

Sol: d

15.3. Digital signals

i. do not provide a continuous set of values,
ii. represent values as discrete steps,
iii. can utilize binary system, and
iv. can utilize decimal as well as binary systems.
Which of the above statements are true?

a) (i) and (ii) only

b) (ii) and (iii) only
c) (i), (ii) and (iii) but not (iv)
d) All of (i), (ii), (iii) and (iv).

Sol: c

15.4. Is it necessary for a transmitting antenna to be at the same heightas that of the receiving antenna for line-of-sight communication? ATV transmitting antenna is 81m tall. How much service areas can itcover if the receiving antenna is at the ground level?

Sol.

No, it is not necessary.

Service Area Covered = πd^2

$= 3.14 \times 162 \times 6.4 \times 10^6$

$= 3258$ sq km

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

Sol.

Modulation Index = Am / Ac

$0.75 = Am / 12$

$Am = 9$ V

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

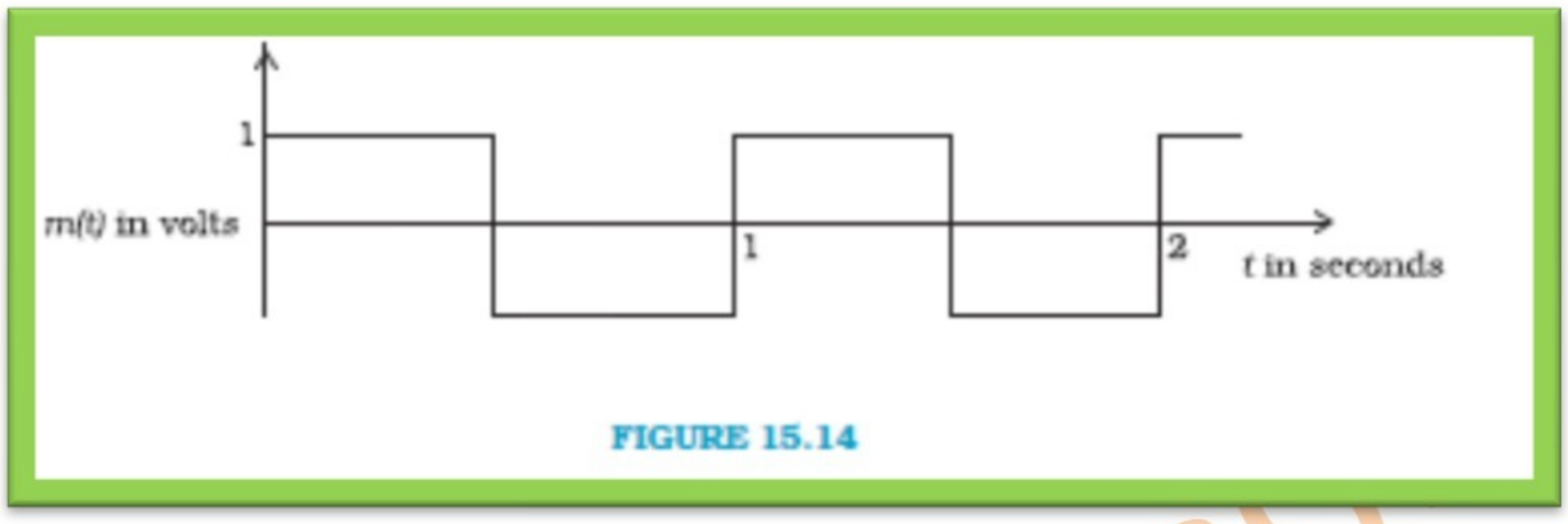


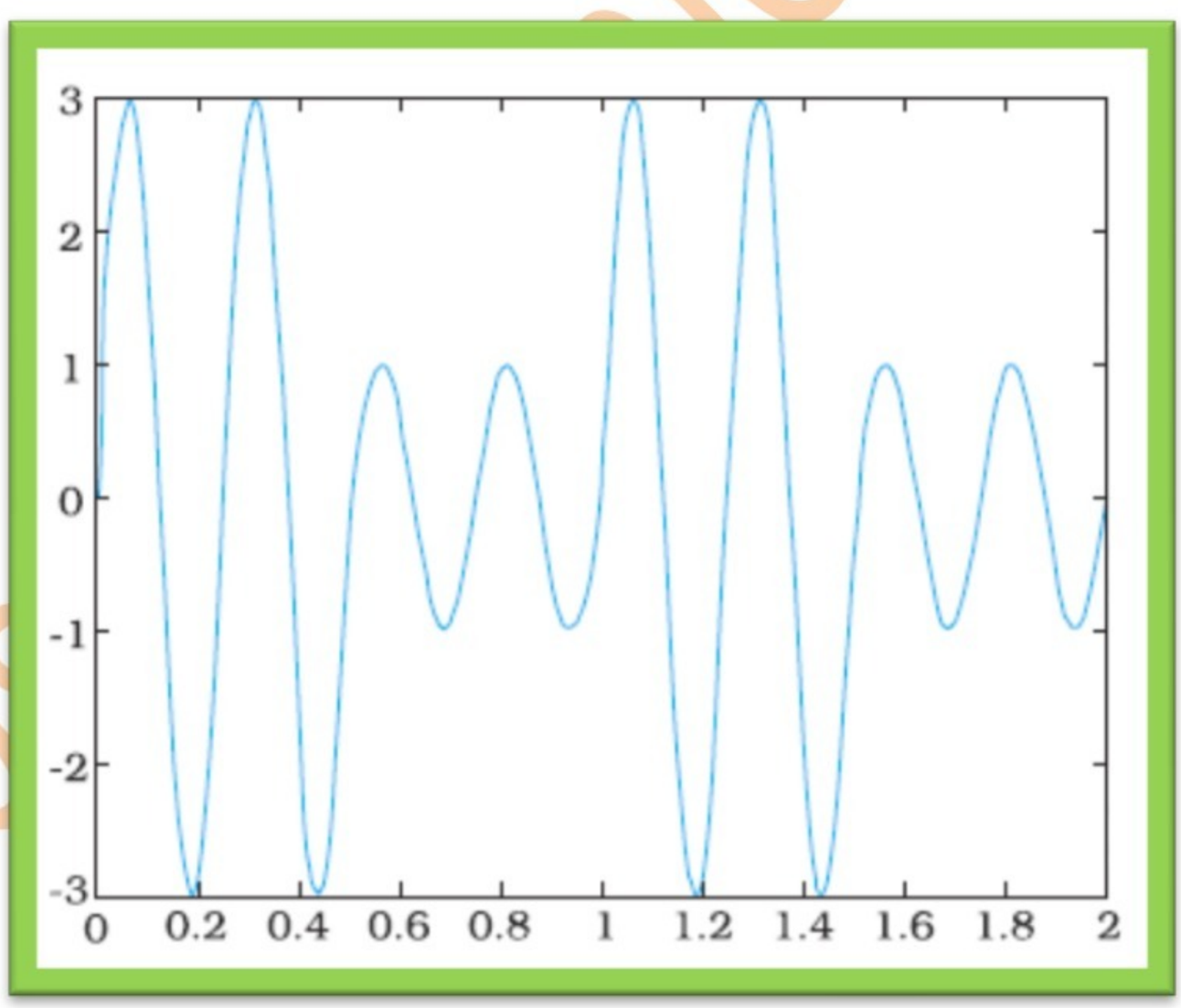
FIGURE 15.14

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

i. Sketch the amplitude modulated waveform

ii. What is the modulation index?

(i)



(ii) Modulation Index = Am / Ac

= 1 / 2

$= 0.5$

15.7. For an amplitude modulated wave, the maximum amplitude is foundto be 10V while the minimum amplitude is found to be 2V. Determinethe modulation index, μ.What would be the value of μ if the minimum amplitude is zero volt?

Sol.

Modulation Index = Am / Ac
= (M1 – M2) / (M1 + M2)
= (10 – 2) / (10 + 2)
= 2 / 3

If M2 = 0,
Modulation Index = 1

15.8. Due to economic reasons, only the upper sideband of an AM wave istransmitted, but at the receiving station, there is a facility forgenerating the carrier. Show that if a device is available which canmultiply two signals, then it is possible to recover the modulatingsignal at the receiver station.

Sol.

Let the received signal be $A_1\cos(w_c + w_m)t$
Carrier wave = $A_c\cos w_c t$

Multiplying above two signals
$A_1A_c\cos(w_c + w_m)t \cos w_c t$
$= [A_1A_c / 2].[\cos(2w_c + w_m)t + \cos w_m t]$

Using a low-pass filter,

the modulating signal = $\frac{A_1 A_c}{2} COS\omega_m t$