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Q 1:-

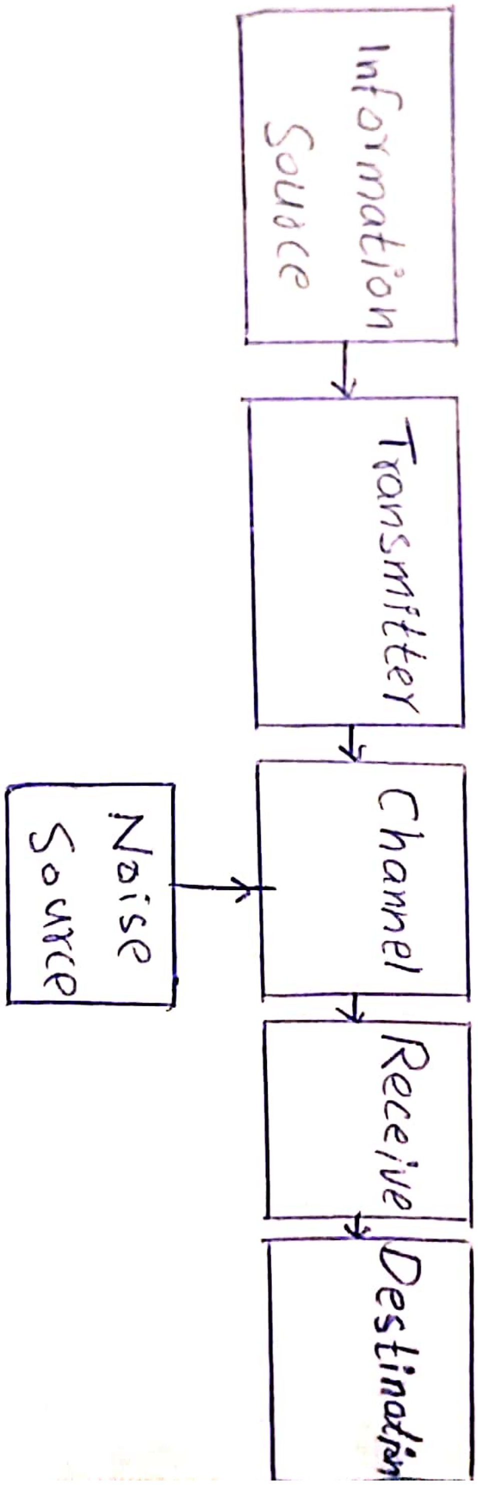
(a) Ans:- The SNR is the difference between the received wireless signal and the noise floor.

For example:-

If a client device's radio receives a signal at -75 dBm, and the noise floor is -90dBm, then the effective SNR is 15dB. This would then reflect as a signal strength of 15dB for this wireless connection.

Q 1:-

(b) Ans:- Block diagram:-



(1) Information Source:-

The information source convert this information into physical quantity.

(2) Transmitter:-

Channel is a physical medium which connects the transmitter block with the receiver block.

The objective of the transmitter block is to collect the incoming message signal and modify in a suitable fashion.

(3) Channel:-

Channel is the physical medium which connects the transmitter with that of the receiver.

The choice of a particular channel depends on the feasibility and also the purpose of the communication system.

(4) Receiver:-

The receiver block receives the incoming modified version of the message signal from the ~~cal~~ channel and processes it to recreate the original (non-electrical) from of the message signal.

(5) Destination:-

Usually, humans will be the destination block.

Q 1:-

(c) Ans:

In addition to having different frequencies, wireless signals can be different in the way they convey information.

A wireless signal needs to be modulated - or changed - to send information

Q 1:-

(d) Ans:- If you send digital data directly through the air you will probably inter-fering with other transmitter so to separate different channel the signal is modulated in a given frequency band.

Moreover you can suffer of bandwidth problem of your power amplifier which will distorted also your transmission.

Q1:-

(e) Ans:- $f(t) = C\cos(\omega_0 t + \theta)$

This is a periodic signal with period $T_0 = 2\pi/\omega_0$. The suitable measure of this signal is its power. Because it is a periodic signal, we may compute its power by averaging its energy over one period $2\pi/\omega_0$.

$$P_f = \lim_{T \to \infty} \frac{1}{T} \int_{-T/2}^{T/2} C^2 \cos^2(\omega_0 t + \theta)\, dt$$

$$P_f = \lim_{T\to\infty} \frac{1}{T} \int_{-T/2}^{T/2} \frac{C^2}{2} [1 + \cos (2w_0 t + 2\theta)] dt$$

$$= \lim_{T\to\infty} \frac{C^2}{2T} \int_{-T/2}^{T/2} dt + \lim_{T\to\infty} \frac{C^2}{2T} \int_{-T/2}^{T/2} \cos(2w_0 t + 2\theta) dt$$

The first term on the right-hand side is equal to $C^2/2$. large time interval T with $T\to\infty$. The second term this area multiplied by $C^2/2T$ with $T\to\infty$ clearly this term is zero and,

$$P_f = \frac{C^2}{2}$$

amplitude C has a power $C^2/2$ value of its frequenry w_0 ($w_0 \neq 0$) and phase θ The rms value is $C/\sqrt{2}$.

Q(2)

(a) $5 \cos 2\pi 10^6 t$

$h = \frac{\lambda}{4} = \frac{c}{4f}$

$S = 20 km$

$f = 10^6 Hz$

put values

$h = \frac{c}{4f}$ $\because c = 3 \times 10^8$

$h = \frac{3 \times 10^8}{4 \times 10^6}$

$h = 75 meter$

$3\cos 2\pi 10^3 t$

$h = \frac{c}{4f}$

$f = 10^3 \Rightarrow h = \frac{c}{4f}$

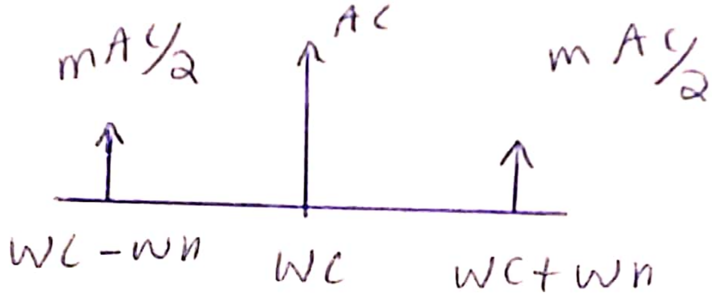
$h = \frac{3 \times 10^8}{4 \times 10^3}$

$h = \frac{3 \times 10^8}{4 \times 10^3}$

$h = 75{,}000$ meters

Q(2)

(b) Power of AM wave :-



$x_{Am}(t) = A_c \cos w_c t = m\frac{A_c}{2}[\cos(w_c - w_m t$

$\cos(w_c + w_m)]$

$x_m(f) = \pi A_c(\delta(w - w_c) + \delta(w + w_c) + \frac{1}{2}$

$\{x(w_c - w_m) + x(w_c - w_m)\}]$

Power = Power (Lower side band) +

P (upper S.B) + Pc Ac/Vc

$Vc, Rms = Vc / \sqrt{2}$

$Vm, Rms = Vm / \sqrt{2}$

$$Pc = \frac{Vc^2}{R} \Rightarrow Vc^2 / \sqrt{2} R \Rightarrow V^2 / 2R$$

$$Pm = Vm^2 / R \Rightarrow Vm^2 \overset{R}{\Rightarrow} \left(\frac{mVc}{2}\right)^2 / 2R$$

$$= \frac{m^2 Vc^2}{4 \cdot 2R} \Rightarrow m^2 \cdot Pc$$

$$Pt = Pc\left(1 + \frac{m^2}{2}\right)$$

Bandwith $= fH - fL$

$$B = (wc + wm) - (wc - wm)$$

$$\boxed{B = 2wm}$$

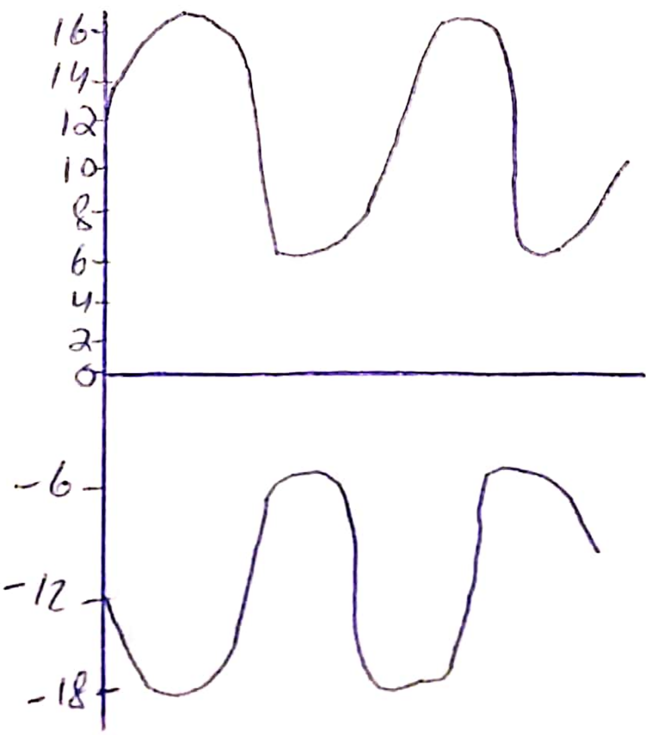
Q(3)

a :- Sol:-

$e_c(t) = 12 \sin \omega t$

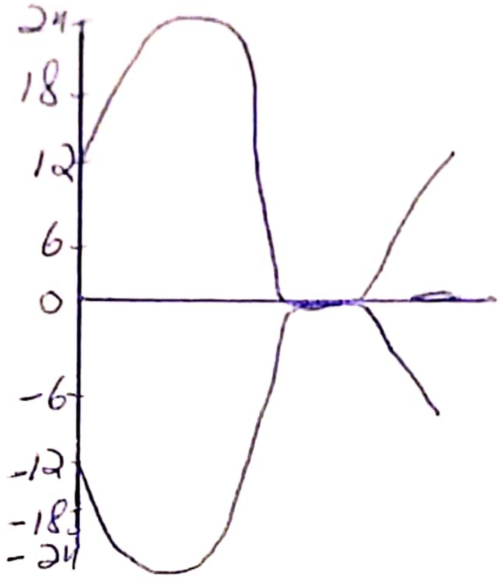
$e_m(t) = ?$

① $A_m = 6,\ A_c = 12 \quad (A_c > A_m)$



$m < 100\%$

(2) Am = 12, Ac = 12 (Ac = Am)

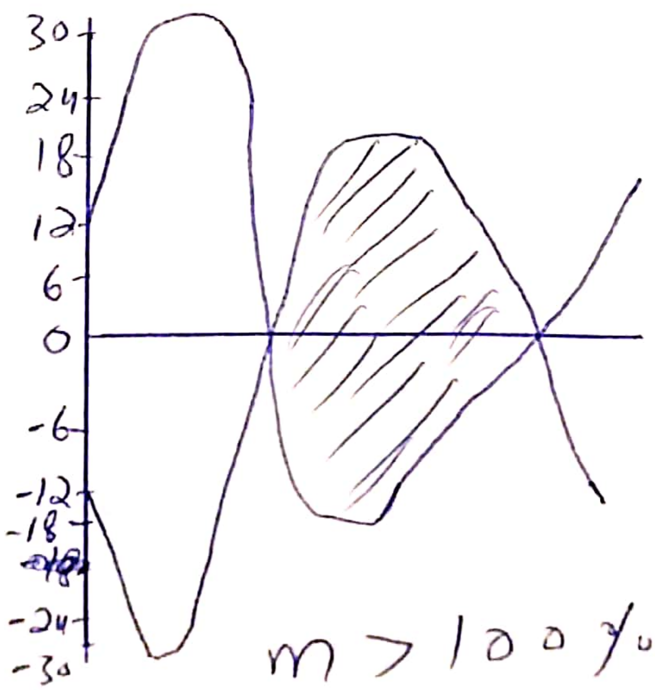


m = 100%

③ Am = 18

Ac = 12

(Ac < Am)



m > 100%

Q3:-

(b) <u>Sol</u>:-

$E_c = 7V$

$f_c = 1mHz$

$E_m = 3.5V$

$f_m = 5kHz$

(i) modulation index

$$\frac{E_M}{E_c} = \frac{3.5V}{7V}$$

$$m = 0.5$$

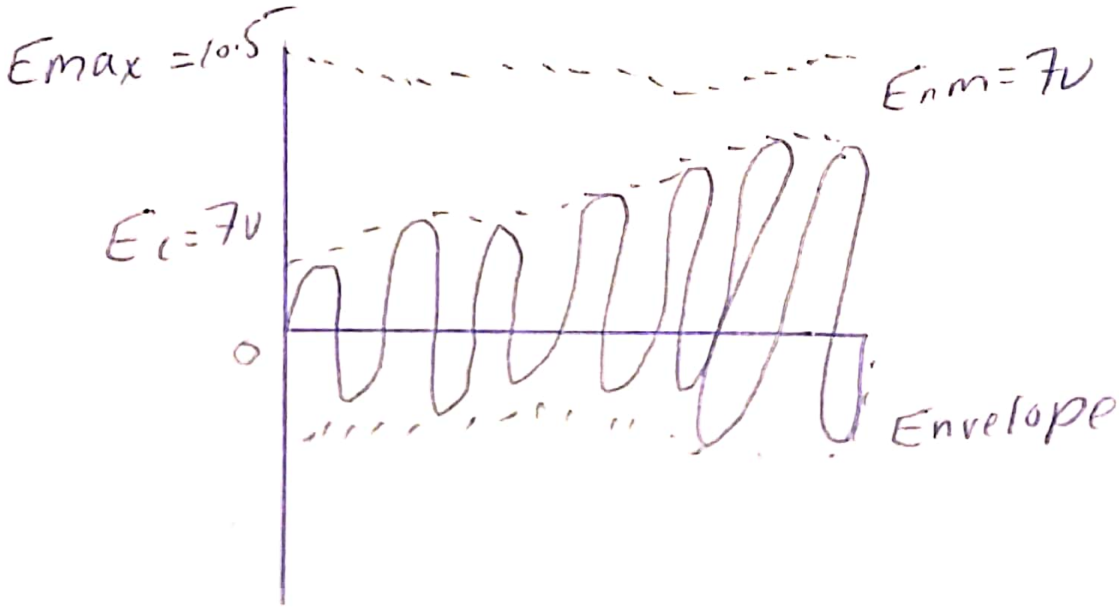
(ii) Equation for modulated wave is

$$s(t) = E_c\,(1 + m.\cos w_m t)(\cos w_c t)$$

$$s(t) = 7\,[1 + 0.5\cos ~~w_m(t)~~ (2\pi \times 5 \times 10^3 t)$$
$$\cos(2\pi \times 10^6 t)]$$

$$S(t) = 10[1 + 0.3\cos(10\pi \times 10^3 t)] \cos(2\pi \times 10^6 t)$$

(iii) The modulated waveform:-



(iv) Spectum of modulated

$f_{USB} = f_c + f_m = 1 \times 10^6 + 5 \times 10^3$

$= 1000 \times 10^3 + 5 \times 10^3$

$= 1000 \times 10^3 + 5 \times 10^3$

1005 KHZ

$f_{LSB} = f_c - f_m = 1000$ KHZ

Each sinusoidal of AM

$m/2 \times E_C$

$= 0.5/2 \times 7 \Rightarrow$ **1.75V**
