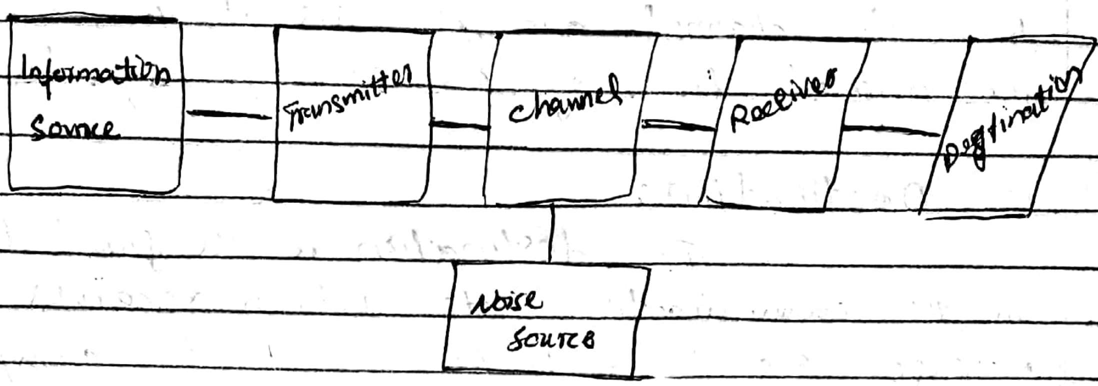
Hamza 16469

Q1

(a) The SNR of an access point measured at the user device decreases the range to the user increases because the applicable free space loss between the user and the access point reduce signal level. SNR directly proportional impacts the performance of a wireless LAN connection. A higher SNR values means the signal strength is stronger in relation SNR requires wireless LAN device to operate at lower data rates.

" The fundamental parameters that control the rate and quality of information transmission are the channel bandwidth B and the signal power S ."

Q1 (b)



The block diagram of a communication system will have five blocks, including the information source, transmitter, channel, receiver and destination.

① Information source:

⇒ The objective of any communication system is to convey information form one point to another. The information comes from the information source, which originates it.

⇒ Information source produce information signal.

② Transmitter:

The objective of the transmitter block is to collect the ~~e~~ incoming message signal and modify it in a suitable fashion (if needed), such that, it can be transmitted via the chosen channel to the receiving point.

③ channel:

channel is the physical medium which connects the transmitter with that of the receiver ~~re~~ block.

④ Receiver: The receiver block receives the incoming modified version of the message signal from the channel and processes it to recreate the original from of the message signal.

⑤ Destination:

The destination is the final block in the communication system which receives the message signal and processes it to comprehend the information present in it.

The message frequency is too low to travel and reach the destination (because the losses are too ~~much~~ much) during the transmission, we modulate it into higher frequency carrier and send it.

As there is no digital signal in nature. ~~only~~ So we cannot transmit or receive the digital signal.

(1)
(e) $f(t) = C\cos(\omega_0 t + \theta)$

This is periodic signal with period $T_0 = 2\pi/\omega_0$. we may compute its power by averaging it energy over one period $2\pi/\omega_0$.

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

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

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

The first term on the right-hand side is equal to $C^2/2$. Moreover, the second term is zero because ~~of cancellations of the positive~~ the intergral appearing in this term ~~represent the~~ area under a sinusoid over a very large time interval T with $T\to\infty$. The second term is this area multiplied by $C^2/2T$ with $T\to\infty$. Clearly this term is zero. and

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

$$RMS = \frac{\sqrt{C}}{\sqrt{2}} = \boxed{\frac{C}{\sqrt{2}}}$$

Q2.

(a) $f_1 = 5\cos 2\pi 10^6$ $f_2 = 3\cos 2\pi 10^3 t$

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

$S = 20\ km$

$f = 10^6$

put the values

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

$h = \frac{3\times10^8}{4\times10^6}$

$h = 75$ meters

$3\cos \pi 10^3 t$

$h = c/4f$

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

$h = \frac{3\times10^{8}}{4\times10^3}$

$h = \frac{3\times10^5}{4}$

Q2
(b)

$$P_c = \frac{V^2}{R} \qquad \because V_{rms} = \frac{V_c}{\sqrt{2}}$$

$$= \frac{V_c^2}{\sqrt{2}^2 R} = \frac{V_c^2}{2R}$$

$$P_c = \frac{V_c^2}{2R}$$

$$P_m = \frac{V_m^2}{2R}$$

$$P_{LSB} = P_{USB}$$

$$= \frac{\left(\frac{mV_c}{2}\right)^2}{2R} = \frac{m^2 V_c^2}{4} \Big/ 2R$$

$$= \frac{m^2 V_c^2}{4 \times 2R} = \frac{m^2 P_c}{4}$$

$$P_t = P_c + P_{LSB} + P_{USB}$$

$$= P_c + \frac{m^2 P_c}{4} + \frac{m^2 P_c}{4}$$

$$= P_c + \frac{m^2 P_c + m^2 P_c}{4} = P_c + \frac{2m^2 P_c}{4}$$

$$P_t = P_c\left(1 + \frac{m^2}{2}\right)$$

Q3

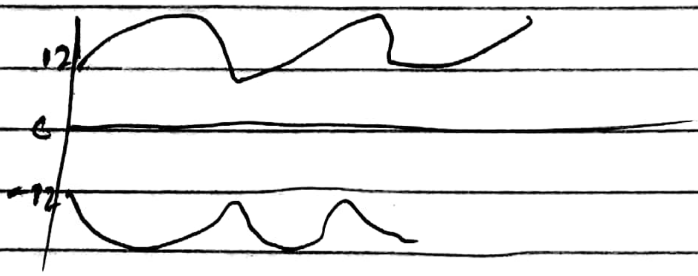
(a)

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

$e_m(t) = 1 \sin \omega t$

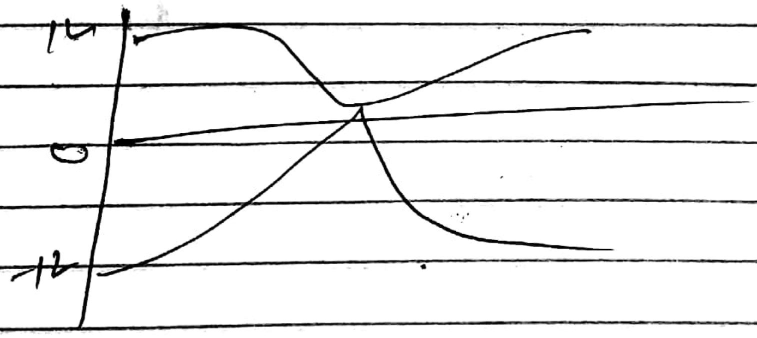
i) $A_m = 6$, $A_c = 12$ $\qquad A_C > A_m$

$m < 100\%$



ii) $A_m = 12$, $A_C = 12$ $\qquad A_C = A_m$

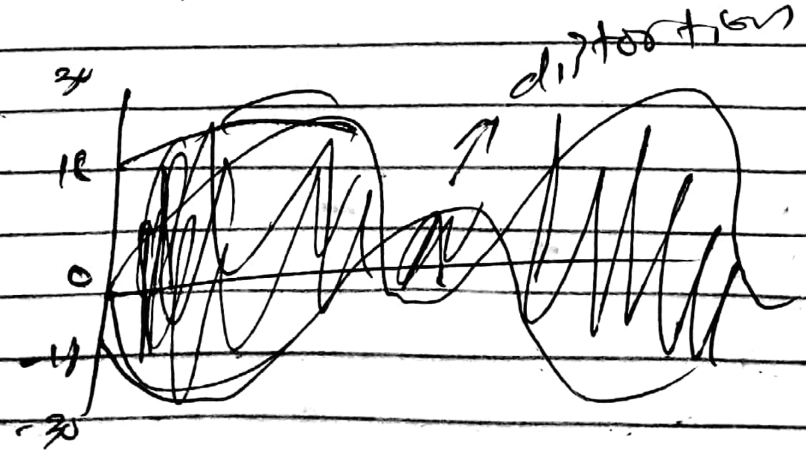
$m = 100\%$



$m = 100\%$

iii) $A_m = 18$

$A_C = 12$ $\qquad A_C < A_m$



Q No: 3
Part (b):

$A_c = 7\,V$
$f_c = 1\,MHz$
$A_m = 3.5\,V$
$f_m = 5\,KHz$

i): We know that

$X_{AM}(t) = A_c \cos\omega_c t\,(1 + m \cos\omega_m t)$

$= \cancel{7 \cos(2\times10^6 \pi t)\{1 + m \cos(7\times10^3 \pi t)\}}$

$= \cancel{7 \cos(2\times10^6 \cdot \pi t)\{1 + 3.5\times10^3}$

$X_{AM}(t) = 7 \cos(2\times10^6 \pi t)\left\{1 + \frac{3.5}{7} \times \cos(10\times10^3 \pi t)\right\}$

↳ equation for modulation wave.

→ Equation for message signal:

$X_m(t) = A_m \cos\omega t$
$= 3.5 \cos\omega t = 3.5 \cos(10\times10^3 \pi t)$

→ Equation for carrier wave:

$X_c(t) = A_c \cos\omega t$
$= 7 \cos(2\times10^6 \pi t)$

ii) Equation for modulated wave is :

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

$$s(t) = 7[1 + 0.5\cos w_m(t)(\cos w_c t)$$

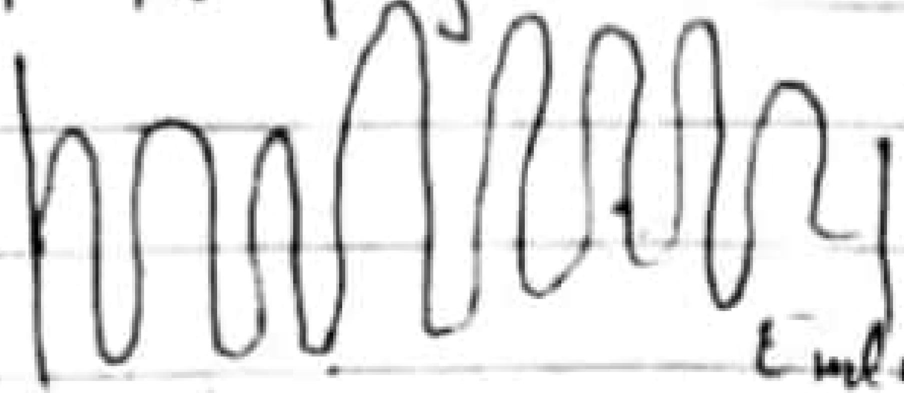
$$s(t)\ (2\pi \times 1 \times 10^6 t)$$

$$s(t) = 10[1 + 0.3\cos(10\pi \times 10^3 t)$$

$$\cos(2\pi \times 10^6 t)$$

iii) The modulus wave form has shown in fig

Emax = 10.5



iv) Spectrum of modulated

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

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

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

1000 kHz

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

Am of each side band

$\frac{m}{2} \times E_c$

$= \frac{0.5}{2} \times 7 = \boxed{1.75V}$

Scanned by CamScanner