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Subject:- Communication System.

Q#01 part(a).

Ans:-
The SNR of an access point Signal, measured at The user device, decrease As to range to the user Decrease because the applicable Free space loss between The user and the acces point reduce Signal level. The Same goes for the Signals propagating from the user device device to The access point. An increase In RF interference from Micro wave ovens and Cordless phones, which increase The noise level, also decrease SNR.

SNR directly Impacts The performance of a wireles Lan Connection. A higher SNR value means that the Signal Strength is Stronger in Relation to the noise levels, which allows higher dat rates And fewer retransmission - all Of which offers better ~~put~~ throughput // Of Course the Opposite is also true. A lower SNR Requires wireless lane device to opperate at lower data rates, which Decrense throughput a SNR Of 30 dB for ex. may allow An 802.11g client radio and Access point to Communicate At 24 Mbps; where as, a SNR Of 15 dB may only provide for 6 Mbps.

40 dB SNR = Excellent Signal (5 bars); always associated; Lightening fast.

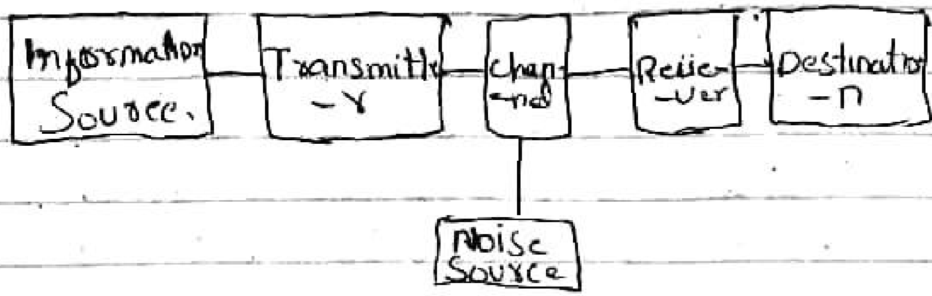
25 dB to 40 dB SNR = very good Signal (3-4 bars) also associated very fast.

15 dB to 25 dB SNR = Low Signal (2 bar), always associated, usually fast.

10 dB - 15 dB SNR = very low signal (1 bar) mostly associated mostly slow.

5dB to 10dB SNR = No Signal; Not associated: no go.
These values seem consestenly with testeny.

Part (b):-



The block digram of communication System, Including the information Source, transmitter, Channel, Reciever And destination blocks.

(i) Information Source:-
The information Source convert this information Int physical quantity.

(ii) Transmitter:-
The objective of The transmitter blocks is to collect the incomming messeye And to modify it in Suitable fashion (if needed), Such that, it can be Transmitted via the chosen chanel to the recieving point.

iii) **Channel:-**

Channel is the physical Medium which Connect the Transmitter with that of the Reciever.

(iv) **Reciever:-**

The reciever block Recieve the incoming modified Version of the message Signals from the Channel And process it to recreate The original (non-electrical) form Of the messege Signals.

(v) Destination:-

The destination is The final block in the Communication System which Recieves the messege Signals And process it to comprehend The information present in it.

Part (C):-

when transmission Distance increase the Signal ~~Source~~ Tend to loss, So Carries Signals is added along with the messege Signal (to Strengthen the original message Signal). After reaching the reciever, The original Signal is recieved

By filtering or removing the Carrier Called Demodulation.

part (D):-

If you send degital Data directly through the Air you will probabbly interfiring with other transmitter So to Sepparate the defferent Channel the Signal is modulated In a given frequency band. Obusly you can do this by Digital modulation But due to Harmonics you will impact other Channel (modulation with a Square Signals has lots of harmonics) And during you demodulation Depending on the others Channel your Signal will be destarted Moreover you Can Suffered of Bandwidth problem of your power amplifier which will Destorted also your transmission.

Part (e):-

This is aperiodic Signal with period $T_0 = 2\pi / w_0$. the Suitable meusure of its Size is power. Because it is A peoiodic Signals, we may Compute its power by everaging

Overaging its energy over One period $2\pi/\omega_0$. However For the Sake of generalty we Shall Solve this problem By overaging over Infinitly Large time interval using Eq:

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

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

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

The first term in the right Hand Side equals $c^2/2$ while the Second term is zero because it The integral apearing in this Term present the area under A Senusside over a very large Time interval T with $T \to \infty$. This area is at most equal To the area of half the cycle because of cancellation of the positive and negative Areas of a Sinusoid. The Second Term is the area multiplied by $c^2/2T$ with $T \to \infty$ clearly this term is zero and

$$P_1 = \frac{c^2}{2}$$

This shows a well known fact that a sinusoid of amplitude C has a power $C^2/2$ regardless of its angular frequency ($\omega \neq 0$) and its phase θ. The rms value is $C/\sqrt{2}$. If the signal frequency is zero (dc or a constant signal of amplitude C), the reader can show that the power is C^2.

Q # 02: Part (B)

Amplitude modulat-3

- AM Spectrum
- power and band with of a Signal
- multiple Tone AM

$x_m(t)$, $x_c(t)$, $x_{Am}(t)$

$x_m(t) \rightarrow A_2 \cos \omega_m t$

$x_c(t) \rightarrow A_c \cos \omega_c t$

$x_{Am}(t) \rightarrow A_c [1 + m(\cos \omega_m t] \cos \omega_c t$

$x_w(t) \leftrightarrow X_m(t)$, $x_c(t) \overset{E}{\leftrightarrow} X_c(t)$, $x_{Am}(t) \rightarrow X(t)$

$$x_{Am}(t) = \underbrace{A_c \cos \omega_c t}_{x_1(t)} + \underbrace{x_m(t) \cos \omega_c t}_{x_2(t)}$$

$$X_{Am}(t) = X_1(t) + X_2(t)$$

$\rightarrow X_m(t)\, e^{j\omega_c t} \longleftrightarrow X(\omega_c - \omega_m)$

Euler equation $\cos \omega_c t = 1/2 \left[e^{j\omega_c t} + e^{-j\omega_c t} \right]$

$$x_{am}(t) = A_c \cos \omega_c t + x_m(t) \cos \omega_c t$$

$$= \underbrace{\frac{A_c}{2} \left(e^{j\omega_c t} + e^{-j\omega_c t} \right)}_{X_1} + \underbrace{\frac{x_m(t)}{2} \left(e^{j\omega_c t} + e^{-j\omega_c t} \right)}_{X_2}$$

$= \frac{1}{2} xm(t) e^{jw_c t} + \frac{1}{2} xm(t) e^{-jw_c t}$

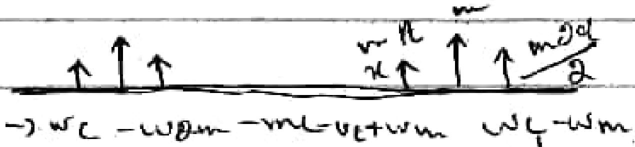
$= \frac{1}{2} X(w_c - w_m) + \frac{1}{2} X(w_c + w_m)$

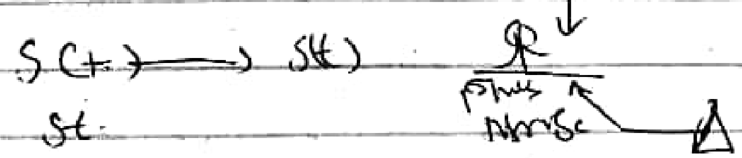
$X_1(t) = \pi A(\delta(w - w_c) + \delta(w + w_c))$

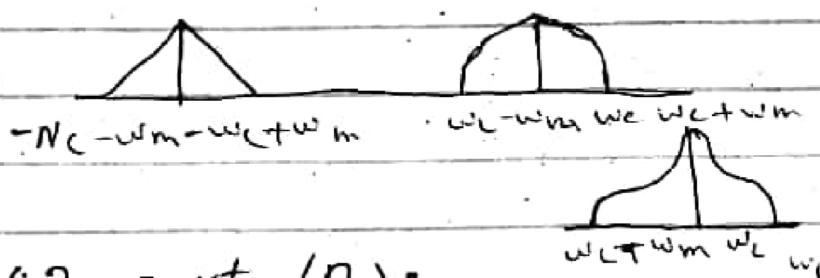
$X_{am}(t) = \pi A[(\delta(w - w_c) + \delta(w + w_c)) +$

$\frac{1}{2}(X(w_c - w_m) + \pi(w_c + w_m))]$

$w_c, w_c + w_m, w_c - w_m$







Q# 02 part (A):-

Ans $5 \cos 2\pi 10^6$

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

$S = 20$ km

$f = 10^6$

put the values

$h = \frac{3 \times 10^{8}}{4 \times 10^{2}}$

$h = 75$ meter.

$3 \cos \pi 10^3 t$

$h = c/4f$

$f = 10^3 \Rightarrow h = c/4f$

$h = \frac{3\times10^{\cancel{8}\,5}}{4\times10^3}$

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

$h = 75000$ meters.

Question #03 part (B)

Ans Given that

$(E_c) = 7v$.

$f_c = 1MHZ$

$Bm = 5v$ and $f_m = 5KHZ$

i) modulation Index $= \frac{E_m}{E_c} = \frac{5v}{7}$

$M = 0.50$

ii) Equation for modulated wave is:

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

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

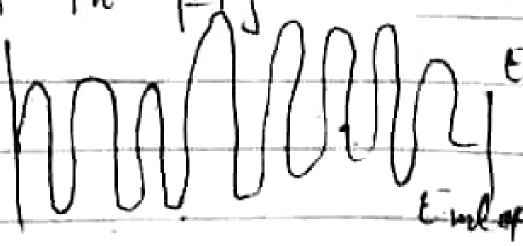
$s(t) (2\pi \times 1 \times 10^6 t)$

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

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

iii) The modulus wave form has shown in fig

Emx = 10.5



ii) Spectrum of modulated

$f_{USB} = f_c + f_m = 1\times10^6 + 5\times10^3$

$= 1000\times10^3 + 5\times10^3$

$= 1000\times10^3 + 5\times10^3$

1000 kHz

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

Am of each Sme Sydmb

$m/2 \times I = C$

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

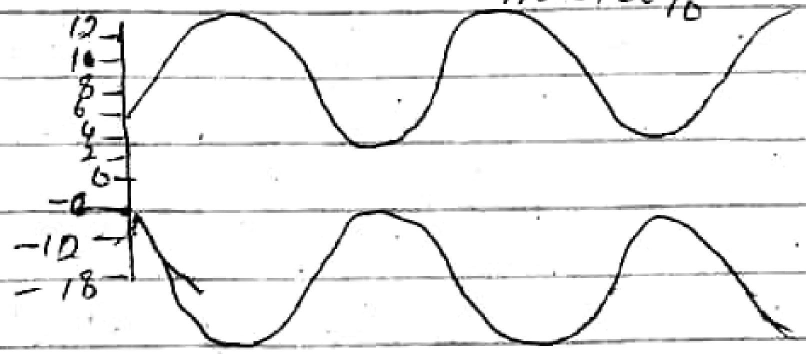
Q # 03 part (A)

$e_c(t) = 2 \sin wt$

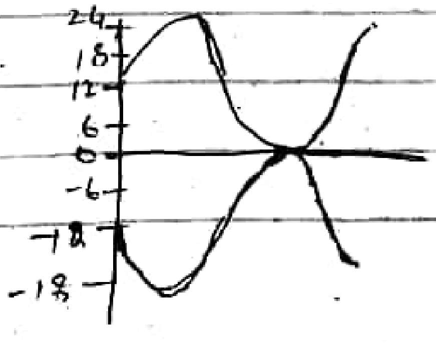
$e_m(t) = ?$

(i) $A_m = 6$, $A_C = 12$ $(A_C > A_m)$

$m < 100\%$



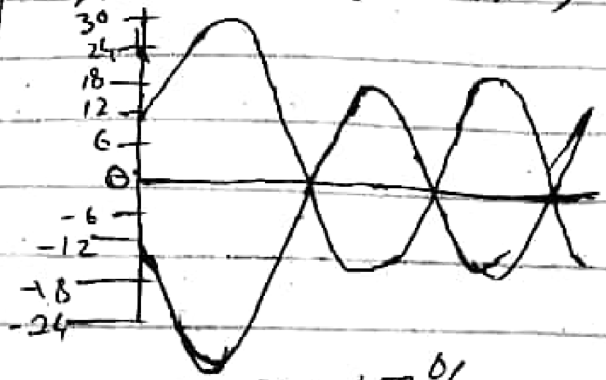
ii) $A_m = 12$, $A_C = 12$ $(A_C = A_m)$



$m = 100\%$

iii) $Am = 18$

$Ac = 12$ $(Ac < Am)$



$m > 100\%$

i) If the value is less than 1, i.e, the modulation index is 0.5, then the modulated out put would look like the following figure. It is called as Under modulation. Such a wave is called is under modulated wave.

iii) If the value of the modulation index is greater Than 1, i.e 1.5 or So, then the wave will be an ove modulated wave.