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x————————x

QNo: 1

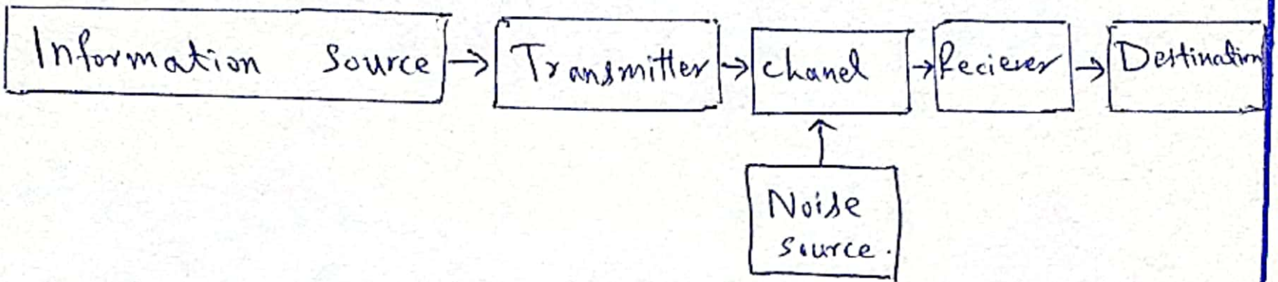
(a) How SNR is Related To Quality of Recieved . . . . ?

Sol: The SNR is the difference between The Recieved wirdess signal and The Noise floor.

For Example: If a client device's radio Recieves a signal at -75 dBM and the Noise floor is -90 dBm then the effective SNR is 15 dB. Thais would then reflect as a signal strength of 15 dB for This wireless connection. The SNR is the difference between the Recieved wireless signal and the Noise floor. The Noise floor is simply erroneous background Transmission that Requir are emitted from eighter other devices that are too far away for the signal To be Intelligble. or by devices that are Inadvertently creating interference on the same frequency.

(b)

Block Diagram of a Communication System:



The block diagram of a Communication system have five blocks.

(1) Information Source:

The object of any commonication system is to convey information from one point To the other. The Information comes from the Information source which originates it.

(2) Transmitter:

The object of the transmitter block is To collect the Incoming Message signal and Modify it in a suitable fashion (If needed) such that it can be Trans-Mitted via choosen chanel to the Recieving Point.

* channel is a Physical Medium which connects the Transmitter block with the reciever block.

(3) Channel:

Channel is the Physical Medium which connects the Transmitter with that of The Reciever.

* The Physical Medium Include copper wire, Coaxial cable, fibre optic cable etc.

(4) Reciever:

The Reciever blocks recieves the incoming modified version of the Message signal from the channel and process it to create the original form of the Message signal.

(5) Destination:

The destination is the final block in the communication which Recieves the Message signal and Process it to comprehend the information present it. Usually human will be destination block.

X ———————— X

Part (C)

When the Message frequency is too low to travel and Reach the long distance reach the during the Transmission we Modulate it whith a carrier signal and sanded. and Modulation process. Some parameters of carrier wave (amplitude, frequency) is Varied accordingly to the Modulating signal and is then Transmitted. It is Necessary to Modulate a Signal because

(1) It avoids Making of signals without using Modulation all the signals of some frequency will Mix and cannot be separated from each other.

(2) It Increases the range of communication

(3) Reduction in the hight of Antena.

Part (d)

Digital is an abstract Information it donot actually exist in Reality. All Signals are analog It mean we choose to Assign Physical values you can not send a digital signals over the air - It Must be first converted into something That exist in Reality like an analog signal which represent the Information To be Transmitted.

Part (e)

Sol: $f(t) = C\cos(w_0 t + \phi)$

This is ~~Period~~ the Periodic signal with its Period $T_0 = 2\pi/w_0$

Its Power is Completed by:

averaging its energy over a one period $= 2\pi/\omega_0$.

We shall this problem by averaging energy over infinity.

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

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

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

The Init Term $C^2/2$ represents the right side while the second term is zero. because sinusides represent the Area Under over a large time Interval.

$\Rightarrow$ The second Term it this area Multiplied by $C^2/2T$.

$T \to \infty$ Then this term is zero.

$P_f = C^2/2 \Rightarrow$ The RMS value is $= V_{MS} = \frac{C}{\sqrt{2}}$.

Q No: 2
(a)

Sol: $5 \cos 2\pi 10^6$

$h = \lambda/4 = c/4f$

$S = 20$ km

$f = 10^6$

Put the values

$h = c/4f \Rightarrow \frac{3 \times 10^8}{4 \times 10^6}$

$h = 75$ Meter.

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

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

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

$h = \frac{3 \times 10^5}{4} \Rightarrow 75000$ Meters.

x ———— x

Q No: 2

Part (b)

Power of am Wave is equal to the sum of power of carrier Upper side band, lower side band, freq. Components.

$$P_T = P_c + P_{USB} + P_{LSB}.$$

We know that the standard formula for power of Cos signal is:

$$P = \frac{V_{rms}^2}{R} = \frac{(V_M/\sqrt{2})^2}{R}$$

Where V_{rms} is the rms value of Cos signal.

V_M is the peak value of Cos Signal.

first let us find the Power of the carrier the upper and lower sideband one by one.

Carrier power:

$$P_c = \frac{(A_c \sqrt{2})^2}{R} = \frac{A_c^2}{2R}.$$

Upper side band power:

$$P_{USB} = \frac{(A_c u / 2\sqrt{2})^2}{R} = \frac{A_c^2 u^2}{8R}$$

Similarly we will get.

$$P_{LSB} = \frac{A_c^2 \cdot u^2}{8R}.$$

$$P_t = \frac{A_c^2}{2R} + \frac{A_c^2 u^2}{8R} + \frac{A_c^2 u^2}{8R}$$

$$P_t = \left(\frac{A_c^2}{2R}\right)\left(1 + \frac{u^2}{4} + \frac{u^2}{4}\right)$$

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

x ———————————— x

Q No: 3

(a)

Draw AM wave form for . . . .

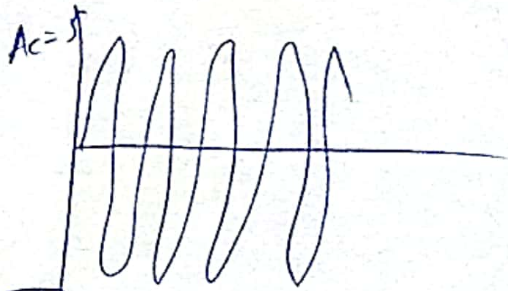
Sol: Modulation Index $= m = \frac{A_m}{A_c}$

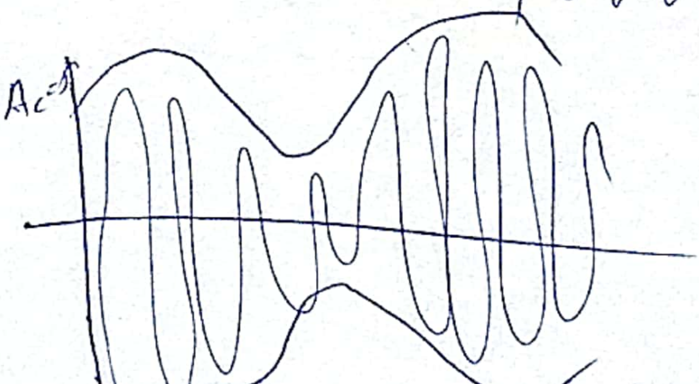
$m < 1 \Rightarrow A_c > A_m$

$M = 1 \Rightarrow A_c = A_m$

$M > 1 \Rightarrow A_c < A_m$

Wave form for less than 100 %.

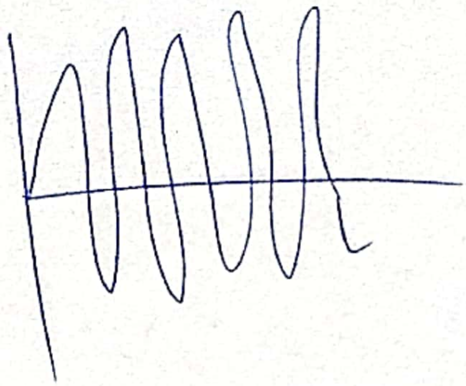




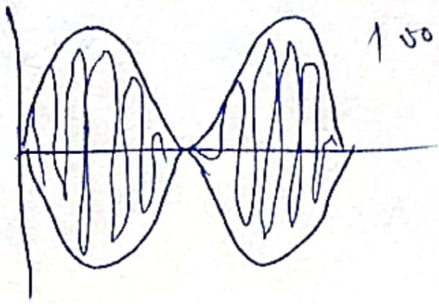
m < 100%

100% Modulation:

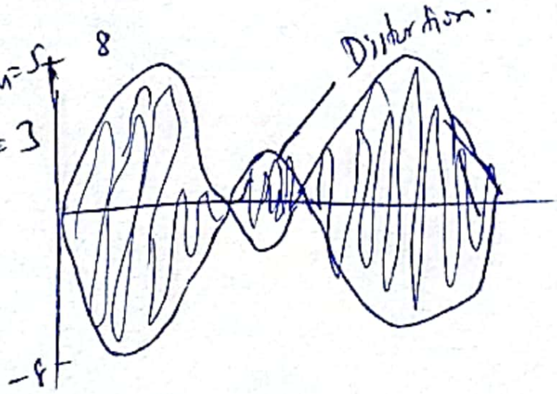
Ac= 3



Am= 3



(C) Greater then 100% Modulation:



X ———————————————— X

Q: 3 (b)

Given that:

$E_c = 7\,V$ $\quad f_c = 1\,MHz.$

$E_M = 3.5\,V$ $\quad F_b = 5\,KHz.$

(1) Equation for Carrier and Modulated waveform.

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

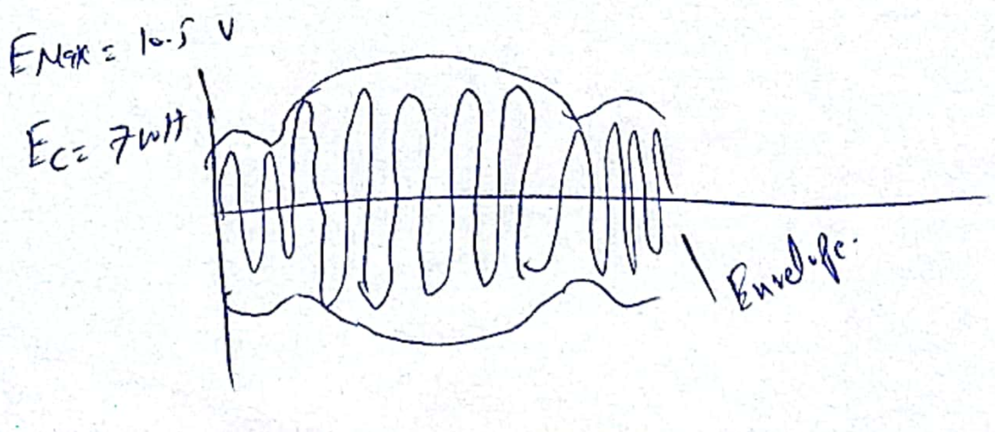
$s(t) = 7\,(1 + 0.5\cos(2\pi \times 5 \times 10^3 t)\cos(2\pi \times 1 \times 10^6 t)$

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

$st = E_M\,(1 + 0.5\cos(2\pi \times 5 \times 10^3 t)\cos(2\pi \times 10^6 t)$

$s(t) = 3.5\,(1 + 0.5\cos(10\pi \times 10^3 t)\cos(2\pi \times 10^6 t)$

(ii) Modulated waveform.



(iv) Spectrum of Modulated wave:

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

$= 1005 KHZ$

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

(V) calculate the percentage power in USB

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

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

x ———————————— x