Name: Iqbal Hussain
Id: 13690

Page (1)

Q 1 (a)

Ans: For best ~~pr~~ performance in a wireless environment, it is key that wireless environment, it is key that wireless device are able to distinguish recieved signals as legitmate information they should be listening to & ignore & background signals on the spectrum. there is a concept known as the signal to noise ratio or SNR that ensures the best wireless.

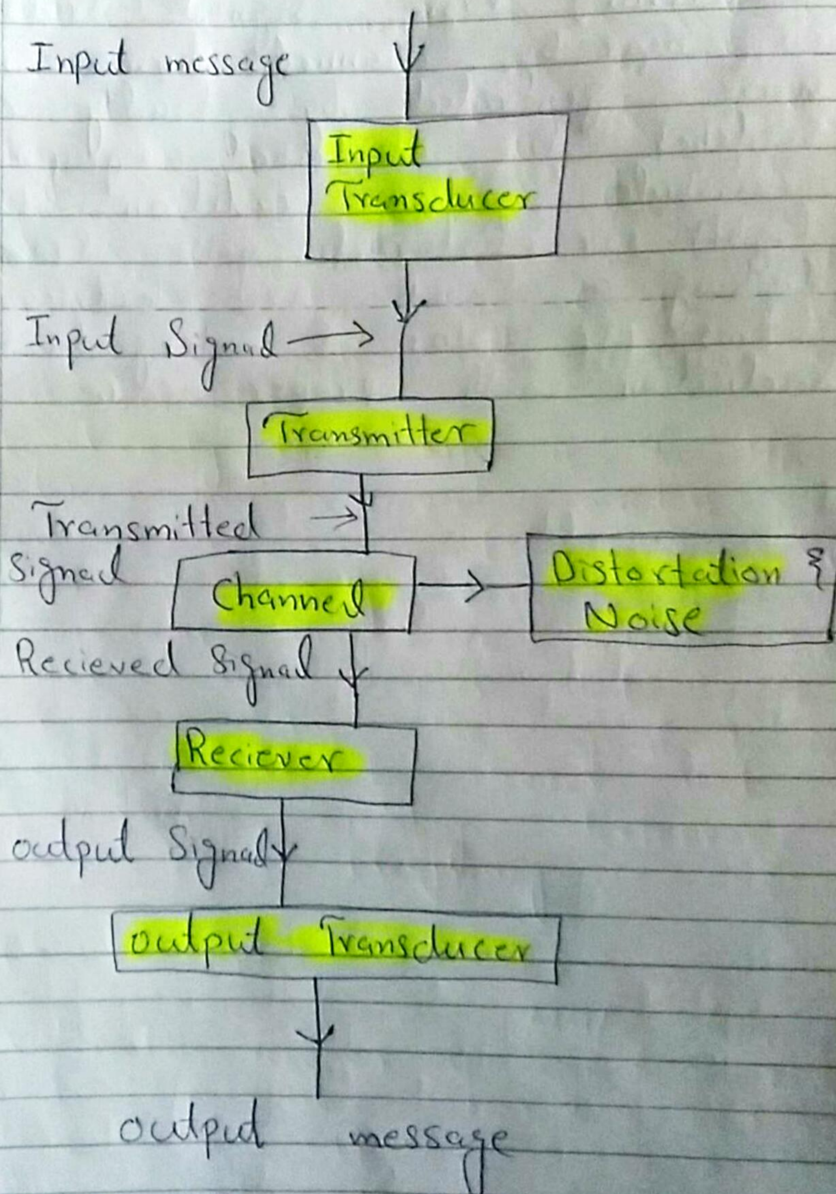
functionally, the SNR is the difference between the recieved wireless signal and the noise floor. the noise floor is simply erroneous background transmissions that are emitted from either other devices that are too far away for the signal to be intelligible, or by devices that are inadvertantly creating interferrence on the same frequency.

For example:
if a client device's ~~ra~~ radio recieves a signal at 75dBM and the noise floor is 90 dBM then the effective SNR is 15dBm this would then reflect as a singnal strength of 15 dB for this wirless connection.

Name: Iqbal Hussain
Id : 13690

Q 1 (b)

Ans: Block diagram:



The signal is not only distorted by the channel but it is also contaminated along the path by undesirable signals lumped under the broad term

Name : Iqbal Hussain
Id : 13690 Page < 3

noise, which are random and unpredictable signals from causes external & internal. External noise includes inteference from signals transmitted on near by channels, human-made noise generated by faulty contact switches for electrical equipment automobile ignition radition, flurocesent lights or natural noise from lighing. as well as electrical storms & solar & intergalactic radiation. with proper care.

Name: Iqbal Hussain
Id : 13690

Q:1 c
Ans: When transmission distance increases the signal tend to loss, so carrier signal is added along with the message signal (to strength then the original message signal) After reaching the reciever the original signals is recieved by filtering or removing the carrier signal called demodulation.

Q:1 d
Ans: The world is analog even digital is just a "convenient force" that hides the reality of its analog implementation, thus the intract with the real world, for example to send a radio signal, its generally easier to skip t8 Pretense for efficiency sake.

The reason for this is "baseband" digital signals dont propagate well or effeciently because their effective "radio frequency" can range from oHz to 10x the clock frequencies used, and radio waves have radically different propagation method and efficacies in that range. Hence we use something called "modulation" to put the signal at one narrow range of frequiencies that known controllable propagation features

Name : Iqbal Hussain

Id : 13690

Q:1 (c)

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 $2\pi/\omega_0$. However for the sake of generality, we shall solve this problem by averaging over an infinetly large time interval using.

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

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

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

The first Term on the right hand side is equal to $C^2/2$. Moreever, the second term is zero because the integral appearing in this term represents the area under a sinsoid 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 cancelations of the +ive & -ive areas of sinusoid. The

Name : Iqbal Hussain

Id : 13690

Page (6)

Q.
A.

Second term is this area multiplied by $C^2/2T$ with $T \to \infty$. clearly this term is zero. &

$$P_g = C^2/2$$

this shows that a sinusoid of amplitude C has a power $C^2/2$ regardless of the value of its frequency w_0 ($w_0 \neq 0$) & 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:2 (a)
Ans:

$5 \cos 2\pi 10^6$

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

$S = 20 Km \Rightarrow C = 3 \times 10^8$

$f = 10^6$

put the values

$h = c/4f$

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

$h = 75$ meter

or $h = 0.075$ Km

Name: Iqbal Hussain

Id : 13690

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

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

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

$h = \frac{3\times 10^{\cancel{8}5}}{4\times 10^{\cancel{3}}}$

$h = \frac{3\times 10^5}{4}$

$h = 75,000$ meters

or

$\frac{75,000}{1000}$

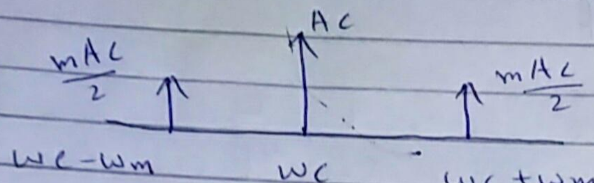
$h = 75$ Km

Q:2 the

Name: Iqbal Hussain
Id: 13690

Q:2 (b)
Ans:

Power of AM wave.



$x_{Am}(t) = A_c \cos w_c t = \frac{mA_c}{2}\left[\cos(w_c - w_m) + \cos(w_c + w_m)\right]$

$X_m(t) = \pi A\,(\delta(w_c - w) + \delta(w + w_c) + \frac{1}{2}$
$[x(w_c - w_m) + x(w_c + w_m)]$

Power = Power(LSB) + P(USB) + P_c
A_c/V_c A_m/V_m

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

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

$P_c = \frac{V_c^2}{R} \Rightarrow V_c^2/V2R$

$P_m = V_m^2/R$

$V_m^2/P_m R \Rightarrow \left(\frac{mV_c}{2}\right)^2/2R$

$\frac{m^2 V_c^2}{4 \cdot 2R} \Rightarrow m^2 . P_c$

Name : Iqbal Hussain

Id : 13690

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

Bandwidth $= f_H - f_L$

$$B = (\omega_c + \omega_m) - (\omega_c - \omega_m)$$

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

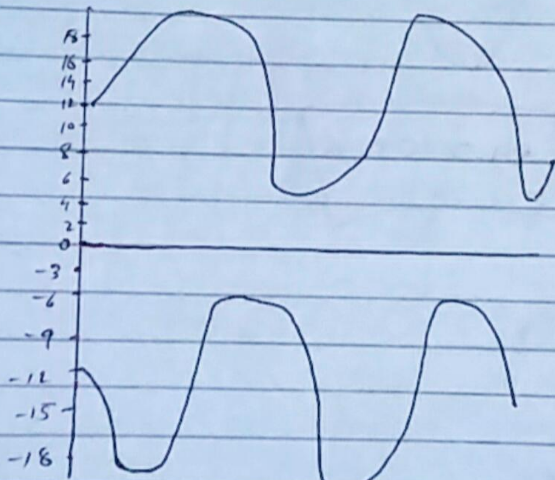
Q:3 (a)

Ans:- (i) $A_m = 6$

$A_c = 12$

$(A_c > A_m)$

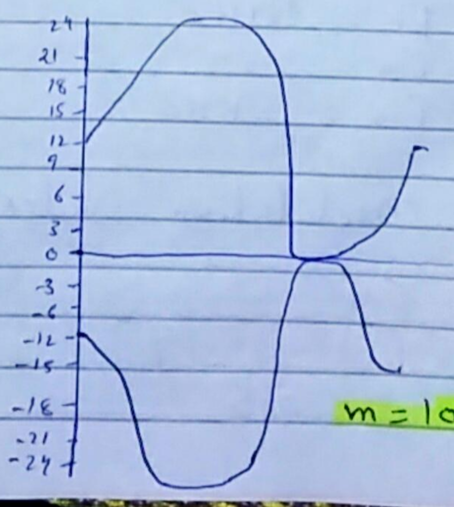
$m < 100\%$



(ii) $A_M = 12$

$A_c = 12$

$A_c = A_m$



$m = 100\%$

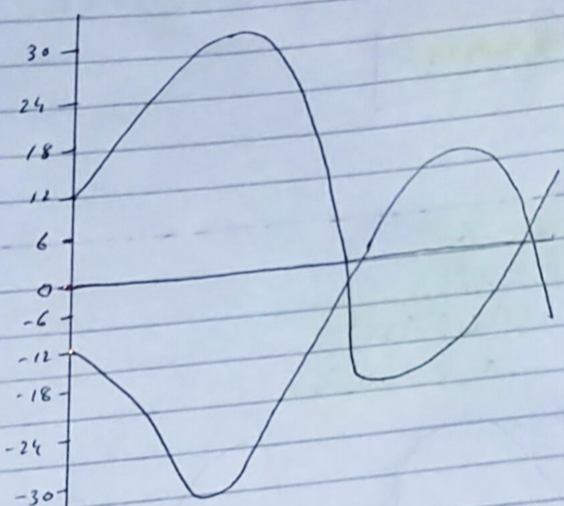
Name : Iqbal Hussain

Id : 13690 Page (10)

(iii) $A_m = 18$

$A_c = 12$

$(A_c < A_m)$



$\boxed{m > 100\%}$

Q:3 (b)
Ans:

Solution:

$E_c = 7V$

$f_c = 1MHZ$

$E_m = 3.5V$

$f_m = 5KHZ$

(i) modulation index

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

$M = 0.5$

Name : Iqbal Hussain

Id : 13690 Page (11)

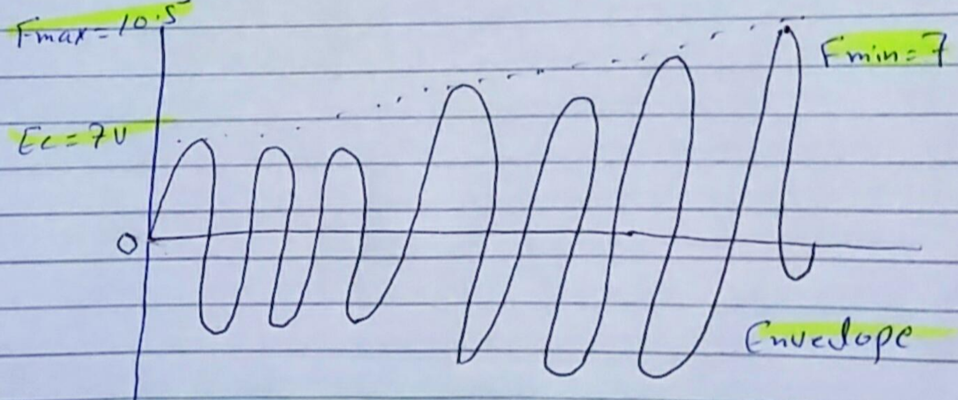
(ii) Equation for modulated wave

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

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

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

(iii) The modulated waveform:



(iv) Spectrum of Modulated wave.

$$f_{USB} = f_c + f_m = 1 \times 10^6 + 5 \times 10^3$$
$$= 1000 \times 10^3 + 5 \times 10^3$$
$$= 1000 \times 10^3 + 5 \times 10^3$$
$$1005\ KHZ.$$

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

Each sinusoidal of AM.

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