Assignment #2

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Sec 'D'.

Question #1

1) Frequency is inversely proportional to the period. if the period is small than frequency will be high.

$$F = \frac{1}{T}$$

2) The amplitude of a signal measures the value of the signal at any point. The frequency of a signal refers to the number of periods in one second. The phase describes the position of the waveform relative to time zero.

3) 1- Attenuation
2- Distortion
3- Noise

4)

BaseBand Transmission	Broad Band Transmission
1) Base Band transmit single data signal at a time	Broad Band transmit multiple data signal simultaneously at the same time.
2) Base Band uses digital signals in transmission	Broad Band uses analog signals in transmission.
3) Base Band supports bi-directional communication	Broad Band supports uni-directional communication
4) Mainly used in Ethernet LAN networks	Mainly use in cable and telephone networks.

6)

7)

5) Low Pass Channel:

Lowpass channel has bandwith starting from zero.

Band Pass Channel:

Band pass channel has a bandwith that doesn't start from zero.

6) It provides mathematical function to determine the max bit rate for noisy (less) channel.

7) Shannon Capacity provides mathematical function to determine the max bit rate for noisy channel.

8) The given signal may be periodic if its frequency repeats at regular interval of time. The given signal is non-periodic if the frequency of signal is random.

c)

9) Continous.

10) Discrete.

Exercise Questions:

1)

a) $T = \frac{1}{f} = \frac{1}{24} = 41.6\,ms$

b) $T = \frac{1}{8 \times 10^6} = 125\,ns$

c) $T = \frac{1}{140 \times 10^3} = 7.1\,\mu s$

2) a) $f = \frac{1}{T} \Rightarrow \frac{1}{5} = 0.2\ Hz$

b) $f = \frac{1}{12 \times 10^{-6}} = 83333.3\ Hz$

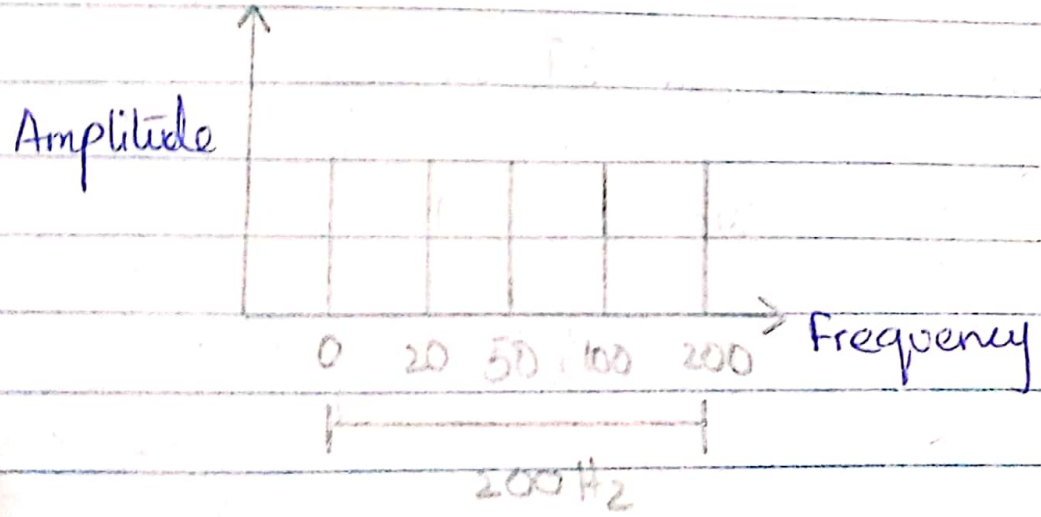
c) $f = \frac{1}{220 \times 10^{-9}} = 4545454.5\ Hz$

3) a) Phase shift $= 0°$

b) Phase Shift $= \frac{1}{4} \times \frac{90}{360} = 90°$

c) $P.S = \frac{3}{4} \times \frac{90}{360} = 270°$

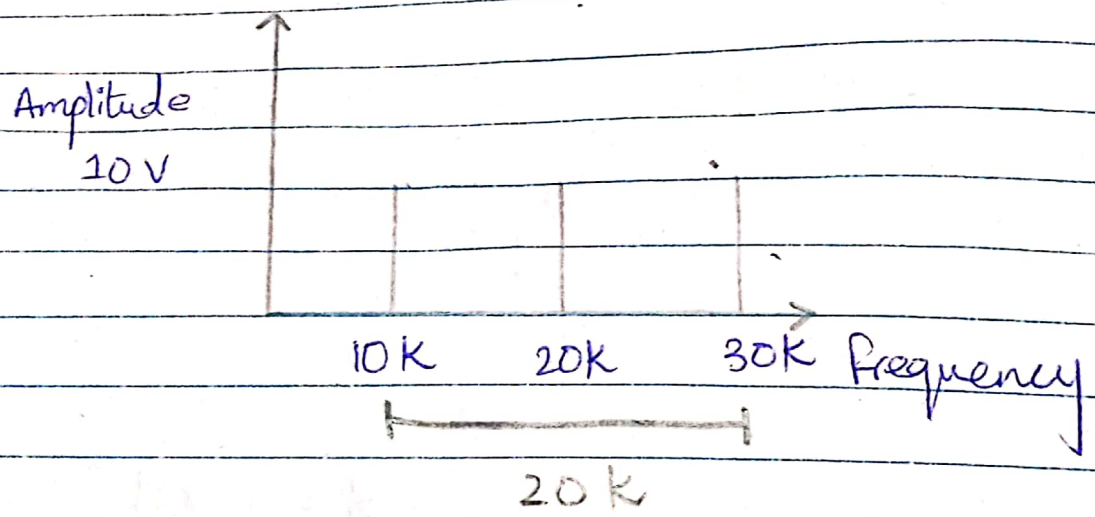
4) $B = f_H - f_L = 200 - 0 = 200\ Hz$



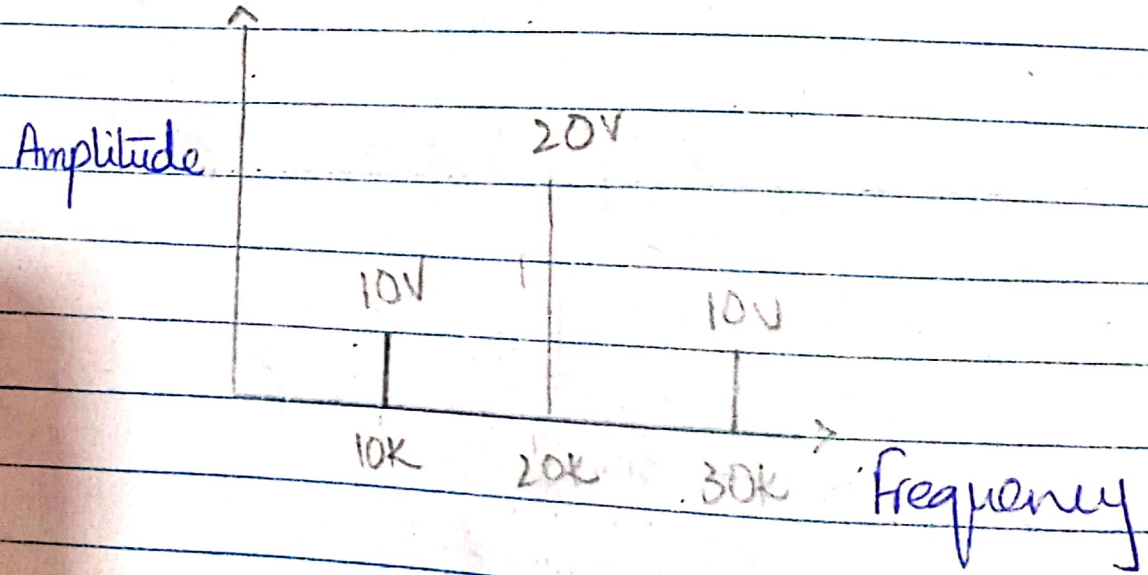
5) Bit Interval = 1/1000 = 0.001s

a) Time to send 10 bits = 10 x 0.001 = 0.01s
b) Time to send 8 bits = 8 x 0.001 = 0.008s
c)

6)



7)



2)

3)

4

8)

$C = 2W \log_2 L = 2(3000) \log_2 2 = 6000 \text{ bps}$

For 4 levels:

$C = 2W \log_2 L = 2(3000) \log_2 4 = 12000 \text{ bps}$

9) $C = 2W \log_2 L$

$265 = 2 \times 20000 \times \log_2 L$

$0.007 = \log_2 L$

$L = 2^{0.007} \Rightarrow 1.005$

10) $C = W \log_2 (1 + SNR)$

$C = W \log_2 (1+0) \Rightarrow W \log_2 0 = 0$

11) $-10 = 10 \log_{10} \frac{P_2}{P_1}$

$10^{-1} = P_2/5$

$0.1 = P_2/5$

$P_2 = 0.1 \times 5 \Rightarrow 0.5 \text{ W}$

12) $C = W\log_2(1+SNR)$

$\therefore C = 4000\times10^3 \times \log_2(1+1000)$

$C = 39868905.04$ bps

13) $C = W\log_2(1+S/N)$

$C = 4000 \times \log_2\left(1+\frac{10}{5\times10^{-3}}\right)$

$C = 43866.0$ bps

14) $SNR = \frac{20\cancel{N}}{\cancel{N}} = 20$

$SNR_{db} = 10\log_{10} SNR = 13.01$

15) a)

$SNR_{db} = 10\log_{10} SNR$

$40 = 10\log_{10} SNR$

$10^4 = SNR$

$SNR = 10000$

$\therefore C = 20\times10^3 \times \log_2 10000 = 265754.2$ bps

b) $SNR_{db} = 10 \log_{10} SNR$

$4 = 10 \log_{10} SNR$

$SNR = 2.511$

$\therefore C = 200 \times 10^3 \times \log_2 2.511 = 265652.4 \text{ bps}$

c) $SNR_{db} = 10 \log_{10} SNR$

$20 = 10 \log_{10} SNR$

$SNR = 100$

$C = 1 \times 10^6 \times \log_2 100 = 664386.1 \text{ bps}$