CSE-320

Assignment-2

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Answer to :— Q1

(a)

A non periodic composite signal is a group of sine waves with continuous frequencies in the frequency domain.

(b)

Bandwidth of a signal is defined as the difference between the upper and lower frequencies of a signal generated.

Highest frequency = 50 kHz

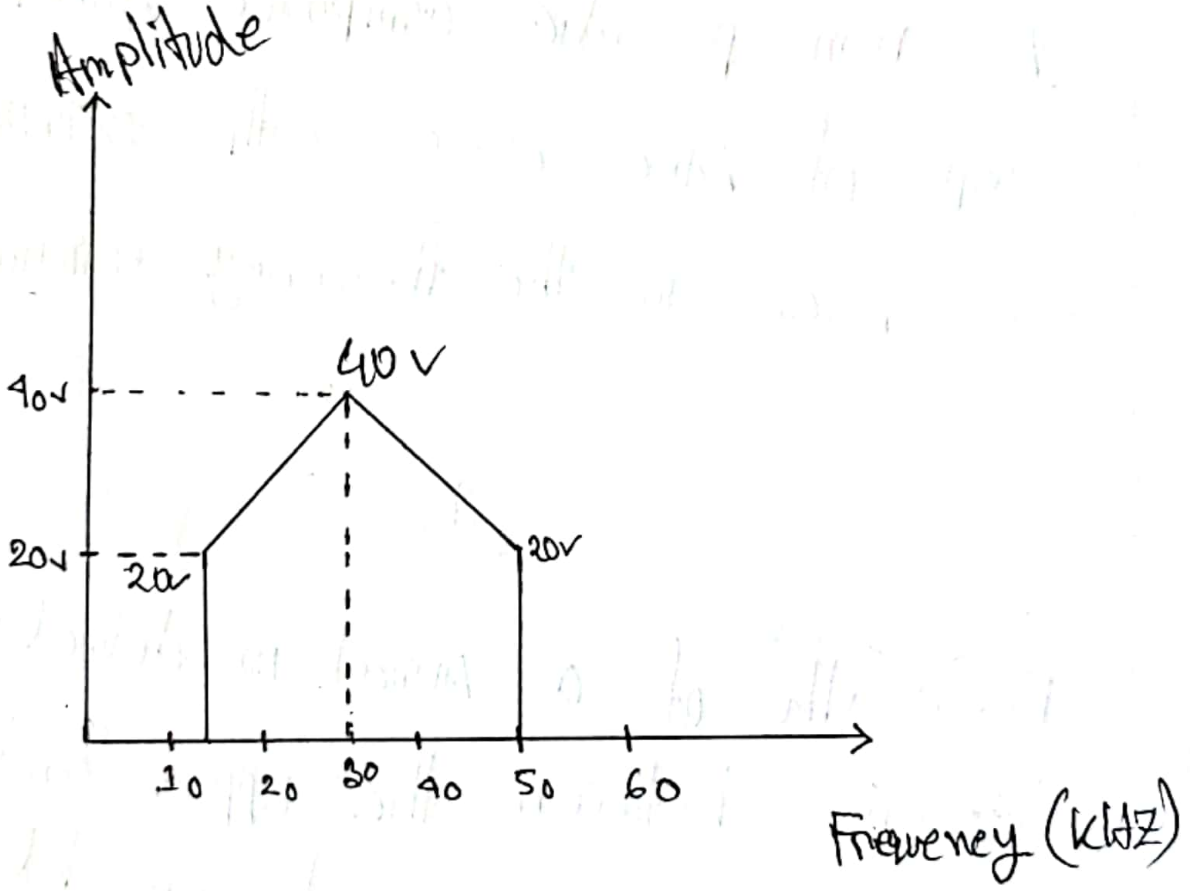
Lowest frequency = 15 kHz

Bandwidth = 50 kHz - 15 kHz

= 35 kHz (Ans)

Answer to 1(c)

Frequency spectrum is as follows.



Non - periodic composite signal is a group of sine waves with continuous frequencies in the frequency domain

Ans to q.n. 2

(a)

The difference is signal strength between point A & point B is because of attenuation. Attenuation is the loss of signal strength in the networking cables. As the signal is transmitted, the strength of signal decreases with increase in distance. The signal weakness because of wave dispersion. The weaked signal also leads to scattering and absorption.

2(b)

Given,

The signal power that is transmitted at point A = P_t = 98

The signal power that is ~~received~~ received point B = P_r = 65

$\therefore$ Attenuation = $10 \log_{10}\left(\frac{98}{65}\right)$

$= 1.78313$ dB

(Ans)

Answer to Q.n-3

Given that,

$SNR = 2000$

$B = 1200 \text{ kHz}$

$= 12000 \times 10^3 \text{ Hz}$

So, maximum data rate supported by this channel,

bandwidth $\times \log_2(1+SNR)$

$= 12000 \times 10^3 \times \log_2(1+2000)$

$= 131.598 \times 10^6$ bit per seconds.

This is a noisy channel. Because link has a signal to noise ratio. For this reason we had to use 'Shannon capacity'. In reality we cannot have a noiseless channel.

5)

Message size = $.6 \times 10^6$ bits

Bandwidth = 10×10^6 bps

$= 10^7$ bps

$\therefore$ Transaction time $= \dfrac{\text{Message size}}{\text{Band width}}$

$= \dfrac{6 \times 10^6}{10^7}$

$= 0.6$ s

$n=5$

Queing time $= 5 \times 5 \times 10^{-6} = 25 \times 10^{-6}$ sec

Processing time $= 10 \times 2 \times 10^{-6}$ sec

Latency $= 0.015 + 0.6 + 25 \times 10^{-6} + 20 \times 10^{-6}$

$= 0.62$ sec

Here, ~~trans~~ transmission time is dominant of total delay Queuing time is negligible.

The channel is always noisy. For that Shannon capacity is always used to determine the theoritical ~~we~~ data rate.

Answer to Q.-4

Given, that,

Distance $= 3000\ km$

$= \cancel{(3000 \times 1000)}$

$= 3000 \times 10^3\ m$

Propogation speed $= 2 \times 10^8\ ms^{-1}$

Propogation time $= \dfrac{\text{Distance}}{\text{propogation speed}}$

$= 0.015\ s$

Answer to Q.n. 5

Given,

$B = 8$ Mbps

Average of frames = 7000

Average bits = 9000

t = time = 1 min = 60 sec

Throughput of this network

$$= \frac{\text{Avg. Frames} \times \text{Avg. bits}}{t \times 10^6}$$

$$= \frac{7000 \times 9000}{60 \times 10^6} \text{ Mbps}$$

$= 1.05$ Mbps.

Answer to Q.n. 6

Given,

Bandwidth = B = 35 Hz

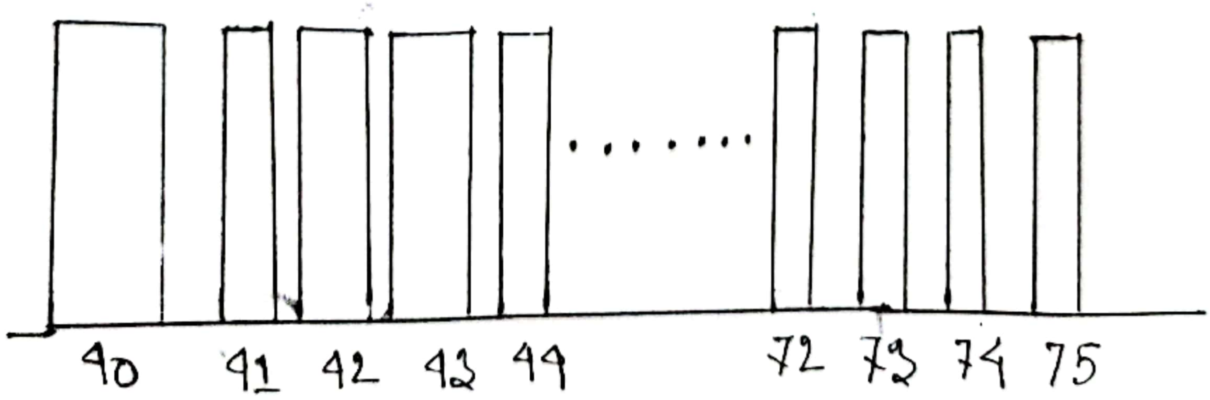
Highest frequency, f_x = 75 Hz

lowest frequency, f_i = ?

We know, $B = f_x - f_i$

$\Rightarrow 35 = 75 - f_i$

$\therefore f_i = 40$ Hz



Answer to Q.n-7

Data rate is the speed in which we transfer a data. It's denoted as how fast we can send data in bits per second over a channel. It consist's of 3 factors.

~~Tose~~ Those are,

(i) Available bandwidth

(ii) The level of noise

(iii) The level of signal we use.

Increasing level of signal reduce the reliabily of system

Ans to Q-n 8

Here, Bandwidth = 155 KHz

$= 155 \times 10^3 \text{ Hz}$

Level = 2

We know,

Maximum bit rate = $2 \times$ Bandwidth $\times \log_2(\text{Level})$

$= 2 \times 155 \times 10^3 \times \log_2 2$

$= 310000$ bps.

(Ans)

Answer to q.n-9

Attenuation defines the loss of power while a signal is travelling through a media. In case of 'Distortion' change the sine wave of a signal where attenuation doesn't. It is easy to overcome the effects of attenuation but it is hard to overcome the effects of distortion.

Answer to - 10

$P(signal) = 250$ milliwatts

$= 250 \times 10^{-3}$ watts

$P(noise) = 1.5 \times 10^{-6}$ w $\times$ n routers

Here,

$$SNR = \frac{P(signal)}{P(noise)}$$

$$= \frac{250 \times 10^{-3}}{1.5 \times 10^{-6} \times 14} \quad | \text{ n routers}$$

$= \cancel{11.9}\ 11904.7619$

Again,

$$SNR_{dB} = 10 \log SNR$$

$$= 10\log_{10}(11904.7619)$$

$$= 40.75$$

(Answer)

Ans to 11(a)

No of bits = 1

Bit Duration = 0.001 ms = 1×10^{-12} s

$\therefore$ Bit rate = $\frac{\text{No of bit}}{\text{Bit Duration}}$

$= \frac{1}{1 \times 10^{-12}}$

$= 10^{12}$ bps

Ans to - 11 (b)

Here,

No of bits = 3

Bit Duration = 2ms = 0.002 s

$$\therefore \text{Bit rate} = \frac{\text{No of bits}}{\text{Bit Duration}}$$

$$= \frac{3}{0.002}$$

$$= 1500 \text{ bps}$$

Ans to- 11 (c)

Given,

No of bits = 10

Bit Duration = 25 μ

$= 25 \times 10^{-6}$ s

$\therefore$ Bit rate $= \dfrac{\text{Number of bits}}{\text{Bit duration}}$

$= \dfrac{10}{25 \times 10^{-6}}$

$= 400000$ bps

(Ans)

Ans to qn.-12

We know,

A high SNR is more desirable.

From relation between SNR & noise power.

$$SNR \propto \frac{1}{\text{Noise power}}$$

Which determines when power of noise increases the SNR value decreases and when power of noise decreases the SNR value increases. Because, ~~they are~~, SNR is proportional to $(\text{Noise power})^{-1}$

In short, we can say that when SNR is low, it becomes noisy & when SNR is high it creates less noise which is more desireable

Ans to q.n-13

We know,

No. of bits $= \log_2(\text{Level})$

(i) No. of bits $= \log_2(37) = 5.21 = 6$

(ii) No of bits $= \log_2(138) = 7.108 = 8$

(iii) No of bits $= \log_2(512) = 9$