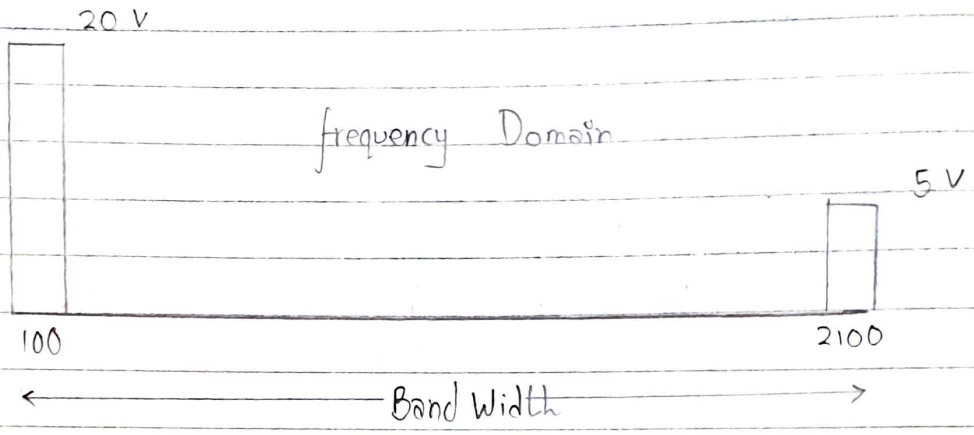
DC tut-4 19BCE245.

1) A periodic composite signal with bandwidth of 2000 Hz is composed of two sin waves. the first one has a frequency of 100 Hz with a maximum amplitude of 20 V. the second one has a maximum amplitude of 5 V Draw the bandwidth.

→



2100 - 100 = 2000

2) Which signal has wider bandwidth, a sine wave with a frequency of 100 Hz or a sine wave with a frequency of 200 Hz?

→ According to fourier analysis, if a signal is a simple signal i.e. like sine wave, of whatever frequency, its bandwidth is zero. So here in this case as they both are sine waves, they have same bandwidth of 0 Hz.

3) A device is sending out data at the rate of 1000 bps.

b. How does it take to send out a single character.

c. How long does it take to send a file of 100,000 character?

→ b) If single character is made up of 8 bits then,
8/1000 = 0.008 sec

c) As single character is of 8 bits,
so, {8 * 100000}/1000 = 800 sec.

4) The attenuation of a signal is -10 dB
What is the final signal power if it was originally 5W?

→ here, attenuation = -10 dB.
Original Power value P_1 = 5W = 5000 milliwatts

$\therefore dB = 10 \log_{10} (P_2/P_1)$
$\therefore -10 = 10 \log_{10} (P_2/P_1)$
$\therefore P_2/P_1 = 10^{-1} = \frac{1}{10} = 0.1$ milliwatts.

$\therefore$ final signal power value $(P_2) = 0.1 \times P_1$
$= 0.1 \times 5000$
$= 500$ milliwatts
or 0.5 watt

5) We measure the performance of telephone line (4 KHz of bandwidth) when the signal is 10 V, the noise is 5 mV. What is the maximum data rate supported by this telephone line?

→ here B = bandwidth. 4KHz = 4000 Hz.
S = signal = 10 V
N = noise = 5 mV
= 0.005 V
$C = B \cdot \log_2 (1 + S/N)$
$\therefore$ Capacity : $4000 \log_2 (1 + 10/0.005)$
$= 4000 \times 10.967$
$\therefore 43,866$ bps

6) A file contains 2 million bytes. How long does it take to download this file using 56 Kbps channel? 1 Mbps channel?
Here,

→ We have transmission time = $\frac{\text{message size}}{\text{bandwidth}}$

this file contains 2,000,000 × 8
= 16,000,000 bits.

with 56 Kbps channel = 56000 bps
It takes 16,000,000 / 56,000 = 285.7 s.

with 1 Mbps channel = 1000,000
It takes 16,000,000 / 1000,000 = 16 s