National Institute of Technology Goa

Programme Name: B.Tech.

Mid Semester Examinations, October 2022

Course Name: **Principles of Data Communications**

Course Code: **CS200**

Date: 13/10/2022

Time: 9:30 AM - 11:00 AM

Duration:1 Hour 30 Minutes

Max. Marks: 50

ANSWER ALL QUESTIONS

1. (a) Suppose, N devices are connected with each other in a mesh topology. How many dedicated links are required to connect them?

   (b) The period of a signal is 200 ms. What is its frequency in kilohertz?

   (c) Why do we need a modem to send data over standard telephone lines?

   (d) A periodic signal has a bandwidth of 30 Hz. The highest frequency is 80 Hz. What is the lowest frequency? Draw the spectrum if the signal contains all frequencies of the same amplitude.

   [2+2+3+3=10]

2. (a) A digital signal has ten levels. How many bits are needed per level?

   (b) Suppose that the spectrum of a noisy channel is between 5 MHz and 10 MHz, and SNR_{dB} =10 dB. What is the maximum bit rate on this channel?

   (c) It is desired to send a sequence of computer screen images over an optical fiber. The screen is 2560×1600 pixels, each pixel being 24 bits. There are 60 screen images per second. How much bandwidth is needed?

   [2+4+4=10]

3. Assume we want to transmit the following binary string: 11010001. Show the resulting signal on the following line coding techniques:

   (a) Manchester

   (b) Differential Manchester

   (c) AMI

   [3+3+4=10]

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

   (b) We wish to transmit the information signal $v_m = 5sin(2\pi 6{,}000t)V$. Calculate the wavelength of the given signal.

   (c) What are the differences between amplitude modulation and frequency modulation?

[2+4+4=10]

5. (a) A telephone normally has a bandwidth of 3000 Hz (300 to 3300 Hz) assigned for data communications. The signal-to-noise ratio is usually 4095. What is the theoretical highest bit rate of the regular telephone line?

   (b) What are the advantages of fiber optics over copper as a transmission medium? Is there any downside of using fiber optics over copper?

[5+5=10]

* * *ALL THE BEST * **