CSE320: Data Communications

Set - A

Quiz-2

Total Marks: 15

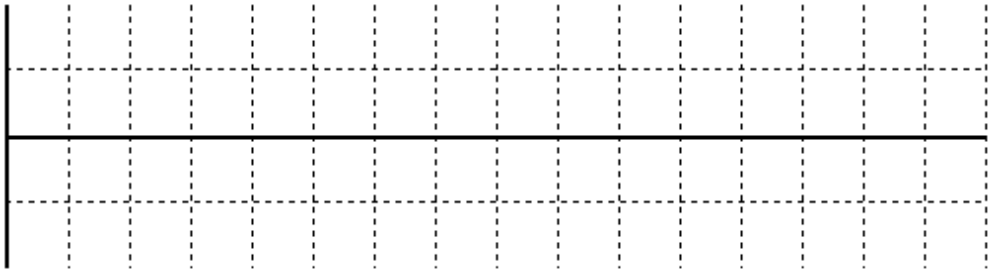
Name: **ID:** **Sec:**

1. (a) Given, a composite periodic signal passing through a channel consists of 7 frequency components of 250, 300, 550, 700, 900, 1150 and 2250 MHz, respectively. The signal-to-noise ratio **in decibel** for this channel is 36. Calculate the maximum bit rate. Assume, we choose a bit rate same as the maximum upper limit. Now, calculate the signal level for the channel. [2.5]

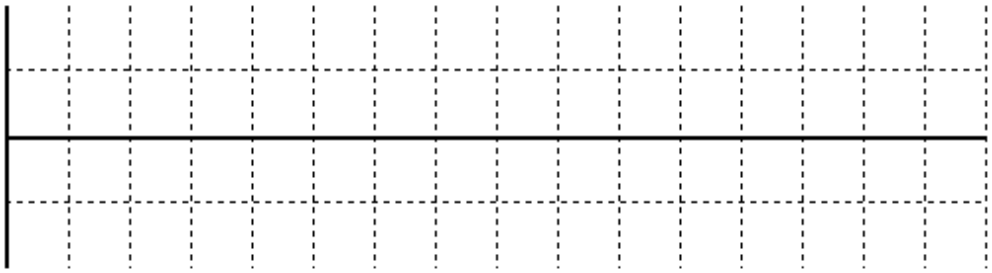
(b) Estimate the total delay (latency) for a frame of size 3 million bits that is being sent on a link with 4 routers each having a queuing time of 2 μs, 3ms, 4 μs and 5 ms, respectively. And the processing times of the router are 3 μs, 4 ps, 6 μs and 7 ps respectively. The length of the link is 3700 km. The speed of light inside the link is 2×10^8 m/s. The link has a bandwidth of 15 Mbps. [2.5]

2. Convert the following bit stream to digital signal using an appropriate encoding scheme that matches the requirements given. Write which signal encoding scheme you are using.
Data: **1 0 0 0 0 1 1 0 0 0 0 1**
Requirements:

(a) This bipolar encoding scheme does not support self-synchronization for long 0s but there is no DC component problem. [2.5]



(b) Now apply a technique to replace four consecutive 0s in the given data without increasing the number of bits and signals. [2.5]



3. The following figure depicts a sampled analog signal for digital signal representation. By applying the concept of **Pulse Code Modulation (PCM),** assume there will be **3-bit code words** for each sampled amplitude. Show the **Normalized Quantized Value**, **Quantization Code** and **Binary Encoded Value** for the given analog signal value at different time stamps. Assume that the sampling amplitudes are between **-20V** to **+20V**. [5]