

Quiz-2**Total Marks: 15****Name:****ID:****Sec:**

1. (a) Given, a composite periodic signal passing through a channel consists of 9 frequency components of 100, 400, 750, 900, 1100, 1350, 1700, 1950 and 2100 MHz, respectively. The signal-to-noise ratio for this channel is 3981. Calculate the maximum bit rate. Assume, we choose a bit rate $\frac{3}{4}$ of the maximum upper limit. Now, calculate the signal level for the channel. [2.5]

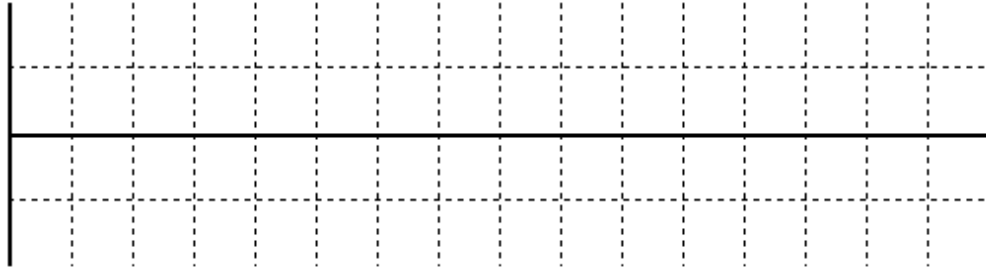
(b) Estimate the total delay (latency) for a frame of size 4 million bits that is being sent on a link with 4 routers each having a queuing time of 2 ms, 3 μ s, 4 ms and 5 μ s, respectively. And the processing times of the router are 3 ps, 4 μ s, 6 ps and 7 μ s respectively. The length of the link is 2700 km. The speed of light inside the link is 2×10^8 m/s. The link has a bandwidth of 16 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.

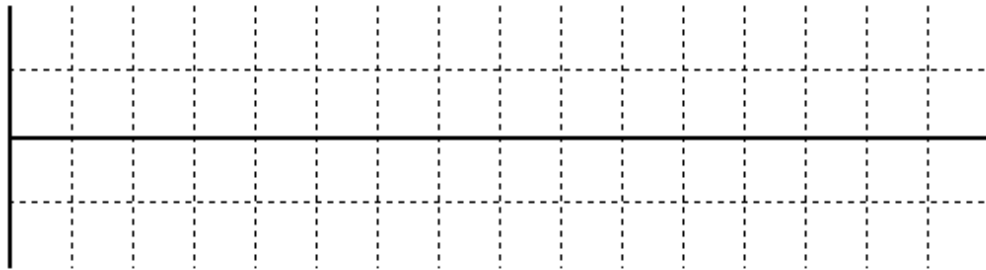
Data: **1 0 1 0 0 0 0 0 0 0 1**

Requirements:

(a) This polar encoding scheme supports self-synchronization and there is no DC component problem but it requires more bandwidth. [2.5]



(b) Now apply a technique to replace octet of 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 **-24V to +24V**. [5]

