BRAC UNIVERSITY
Department of Computer Science and Engineering

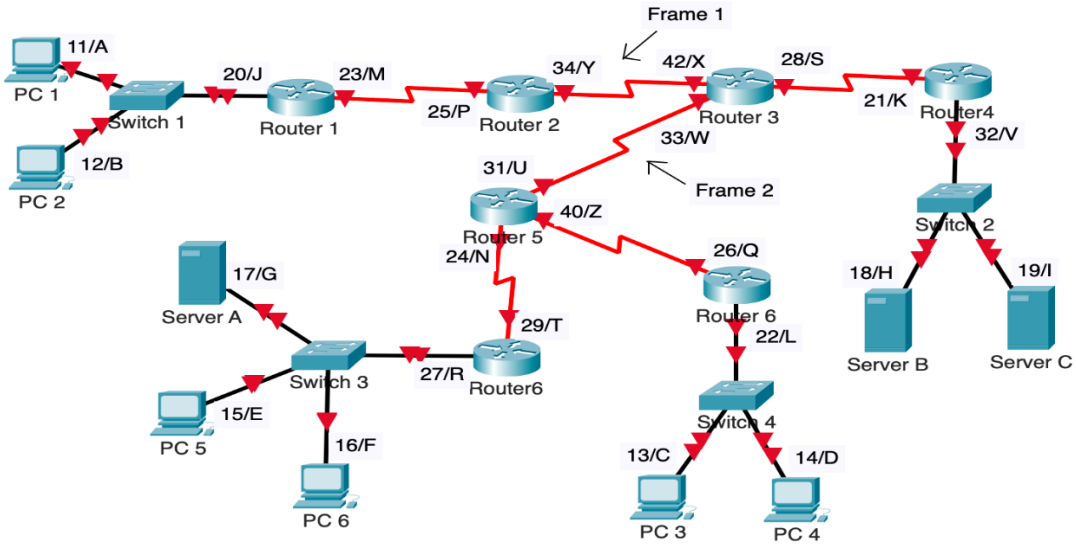
Examination: Semester Midterm | Semester: Summer 2024
Duration: 1 hour 20 min | Full Marks: 45

CSE 320: Data Communications

Answer the following questions.
Figures in the right margin indicate marks.

SET A

Name:	ID:	Section:

1. [CO1]	a)	Suppose a university campus has four departments. Each department has a faculty area and a student area. Each area can communicate with each other as they are connected centrally using a switch. If one area gets disconnected, other areas remain active. The devices in both areas use a central backbone line and are connected using multipoint connections only. Finally, each department has connections with each other. **Identify** the topologies from the above scenario and **draw** the hybrid topology, assuming there are 3 nodes in each area. **Count** the total number of communication links in this hybrid topology.	[3+2]
	b)	Consider the network topology shown below. Assume the physical addresses to be the uppercase letters and the logical addresses to be the numbers. For the Devices, use a Port number from the dynamic range (49152 - 65535).  i. How many networks are there in total?	[1+5]

		ii. Data is coming from Server A which uses port number 23 and it is intended for PC2. Considering this situation, **complete** Frame 1 below by writing the appropriate Destination and Source Physical, Logical and Port Addresses. iii. PC5 is trying to send a data to Server C, which is a Web Server using port 80. Considering this situation, **complete** Frame 2 below by writing the appropriate Destination and Source Physical, Logical and Port addresses.	

	D. Mac	S. Mac	D. IP	S. IP	D. Port	S. Port		
Frame 1							Data	Trailer

	D. Mac	S. Mac	D. IP	S. IP	D. Port	S. Port		
Frame 2							Data	Trailer

	c)	Melissa is **streaming a music video on her smart TV [1]** from an online service. As she watches, the streaming application on her TV requests the video from the server. The server responds by sending the **compressed video data [2],** which is broken into **packets [3]** labeled with both the server's and TV's IP addresses. These packets travel over the internet, enter Melissa's home network through her Wi-Fi router, and are directed to her TV. The **TV reassembles the packets [4],** decompresses the video, and plays it smoothly on the screen. **Identify** the layers of OSI model which are responsible for the phrases in bold.	[4]
2. [CO2]	a)	**What** is the difference between baseband and broadband transmission? **Which** type of channel is used by these transmission techniques? If a non-periodic signal having lowest frequency of 150 kHz has a bandwidth of 45000 Hz, then calculate the highest frequency contained in that signal. **Draw** the frequency domain diagram of this signal whose maximum amplitude is 15 V.	[3+3]
	b)	Suppose you are sending a doc file containing 5 pages at a speed of 64kbps through a noiseless channel. Each page includes 80 characters and the doc file has been encoded using ASCII [8 bit]. The channel through which the file is being shared has 17 levels. The signal strength of the channel is 245 W. i. **Calculate** the bandwidth of the channel in Hz. ii. If the capacity of the channel is 25% less than the noiseless channel's bitrate, **calculate** the power of noise.	[2+3+2]

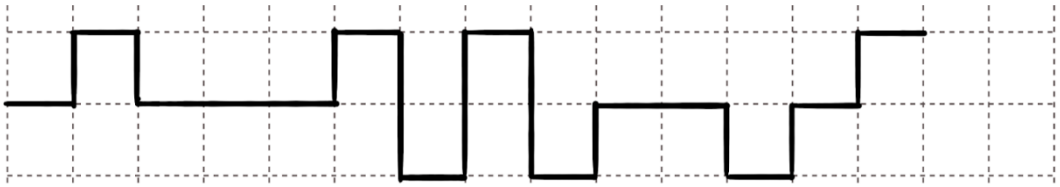
<table>
<tr><td></td><td></td><td>iii. Find out the transmission delay to send the file if the noiseless channel's bitrate is considered as the bandwidth of the device.</td><td></td></tr>
<tr><td></td><td>c)</td><td>Define attenuation. If the ratio of the signals is 5 in decibels, determine whether the signal strength of the second point will be higher or lower than the original signal.</td><td>[2]</td></tr>
<tr><td>3.
[CO2]</td><td>a)</td><td>To minimize the consecutive zero problem, we are using the following block coding scheme shown in the table. Based on the scheme, answer the questions below:

<table><tr><th>Data Sequence</th><th>Encoded Sequence</th></tr><tr><td>000</td><td>1100</td></tr><tr><td>001</td><td>0111</td></tr><tr><td>010</td><td>0101</td></tr><tr><td>011</td><td>1101</td></tr><tr><td>100</td><td>1110</td></tr><tr><td>101</td><td>1111</td></tr><tr><td>110</td><td>1011</td></tr><tr><td>111</td><td>1010</td></tr></table>
• What will be the original bitstream for the following encoded bit stream: 0101101011110101

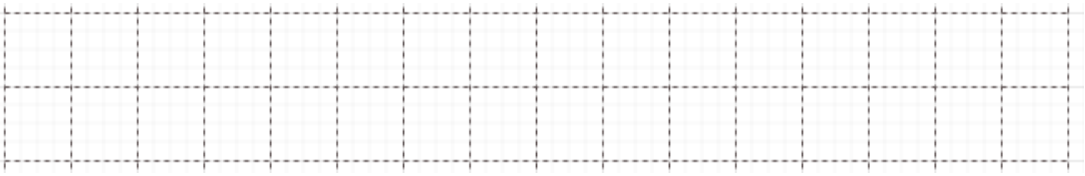
• Calculate the percentage of redundant bits required for the scheme.

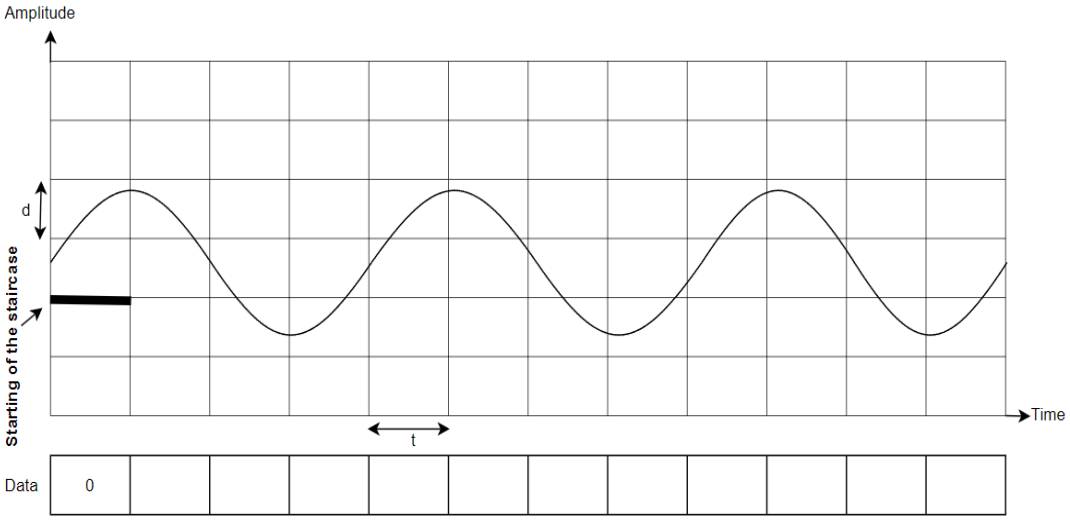
• For any encoded sequence, what will be the maximum number of consecutive 0's if we use this block coding scheme?</td><td>[5]</td></tr>
<tr><td>3.
[CO2]</td><td>b)</td><td>The signal is drawn using HDB3 scrambling technique.

• Decode the signal and write the bit stream.

• Now draw a digital signal using the Differential Manchester line coding scheme for the decoded bit stream. (sketch the signal in the question paper only)

  </td><td>[5]</td></tr>
<tr><td></td><td>c)</td><td>How does the number of levels affect the efficiency of the PCM?</td><td>[2]</td></tr>
</table>

	d)	**Draw** the staircase diagram and **generate the binary data** simultaneously in the below analog-to-digital modulation technique. (sketch it in the question paper only)  	[3]