American International University- Bangladesh (AIUB)
Faculty of Engineering

Course Name:	Data Communication	**Course Code:**	CoE 3201
Semester:	Spring 2023-24	**Term:**	Final
Total Marks:	30	**Submission Date:**	12-5-2024
Faculty Name:	Sadman Shahriar Alam	**Assignment:**	01

Course Outcome Mapping with Questions

Item	COs	POIs	K	P	A	Marks	Obtained Marks
Q1	CO5	P.f.2.C6	K7	P1, P3, P7		15	
Q1	CO5	P.f.2.C6	K7	P1, P3, P7		15	
					Total:	30	

Student Information:

Student Name:	**RIFAH SANZIDA**	**Student ID: 22-47154-1**	
Section:	**F**	**Department: BSc CSE**	

Marking Rubrics (to be filled by Faculty):

Problem #	Excellent [5]	Proficient [4]	Good [3]	Acceptable [2]	Unacceptable [1]	No Response [0]	Secured Marks
	Detailed unique response explaining the concept properly and answer is correct with all works clearly shown.	Response with no apparent errors and the answer is correct, but explanation is not adequate/unique.	Response shows understanding of the problem, but the final answer may not be correct	Partial problem is solved; response indicates part of the problem was not understood clearly.	Unable to clarify the understanding of the problem and method of the problem solving was not correct	No Response/(Copied/identical submissions will be graded as 0 for all parties concerned)	
1							
2							
Comments						Total marks (30)	

Use your ID AB-CDEFG-H

(If any value in your ID is zero, consider the next digit from your ID for calculation.)

1. An internet service provider (ISP) has a network with multiple users requiring different bandwidth allocations. The ISP needs to multiplex the traffic of 7 users, each with different bandwidth requirements, using Frequency Division Multiplexing (FDM). The bandwidth requirements of the users are as follows: User 1 needs (B+C) Mbps, User 2 needs (C+D) Mbps, User 3 needs (D+E) Mbps, User 4 needs (E+F) Mbps, User 5 needs (F+G) Mbps, User 6 needs (G+H) Mbps, and User 7 needs (H+E) Mbps.

To multiplex the traffic efficiently, a guard band of (G+H+B+5) Mbps is required between each user's bandwidth allocation to avoid interference. Illustrate the configuration of the multiplexing and demultiplexing using the frequency domain with proper labeling. Compute the minimum bandwidth requirement as well.

2. A telecommunications company is designing a multiplexing system for transmitting data from six different sources. Each source generates data at varying rates. The bandwidth requirements for multiplexing are as follows: Source 1 requires (B+C) Mbps, Source 2 requires (H+E) Mbps, Source 3 requires (D+E) Mbps, Source 4 requires (G+H) Mbps, Source 5 requires (C+D) Mbps, and Source 6 requires (E+F) Mbps. The multiplexing technique to be used is Statistical Time Division Multiplexing (STDM).
Given the requirements above, find:
(a) What is data rate management technique that can be used for multiplexing
(b) The data rate of each source.
(c) The duration of each character in each source.
(d) The frame rate.
(e) The duration of each frame.
(f) The number of bits in each frame.
(g) The data rate of the link.

Ans to the Ques NO. 1

Here,

My ID is 22-47154-1

Now, AB-CDEFG-H = 22-47154-1

A=2, B=2, C=4, D=7, E=1, F=5, G=4, H=1

User 1 needs (B+C)=(2+4)=6Mbps

User 2 needs (C+D)=(4+7)= 11Mbps

User 3 needs (D+E)=(7+1)= 8Mbps

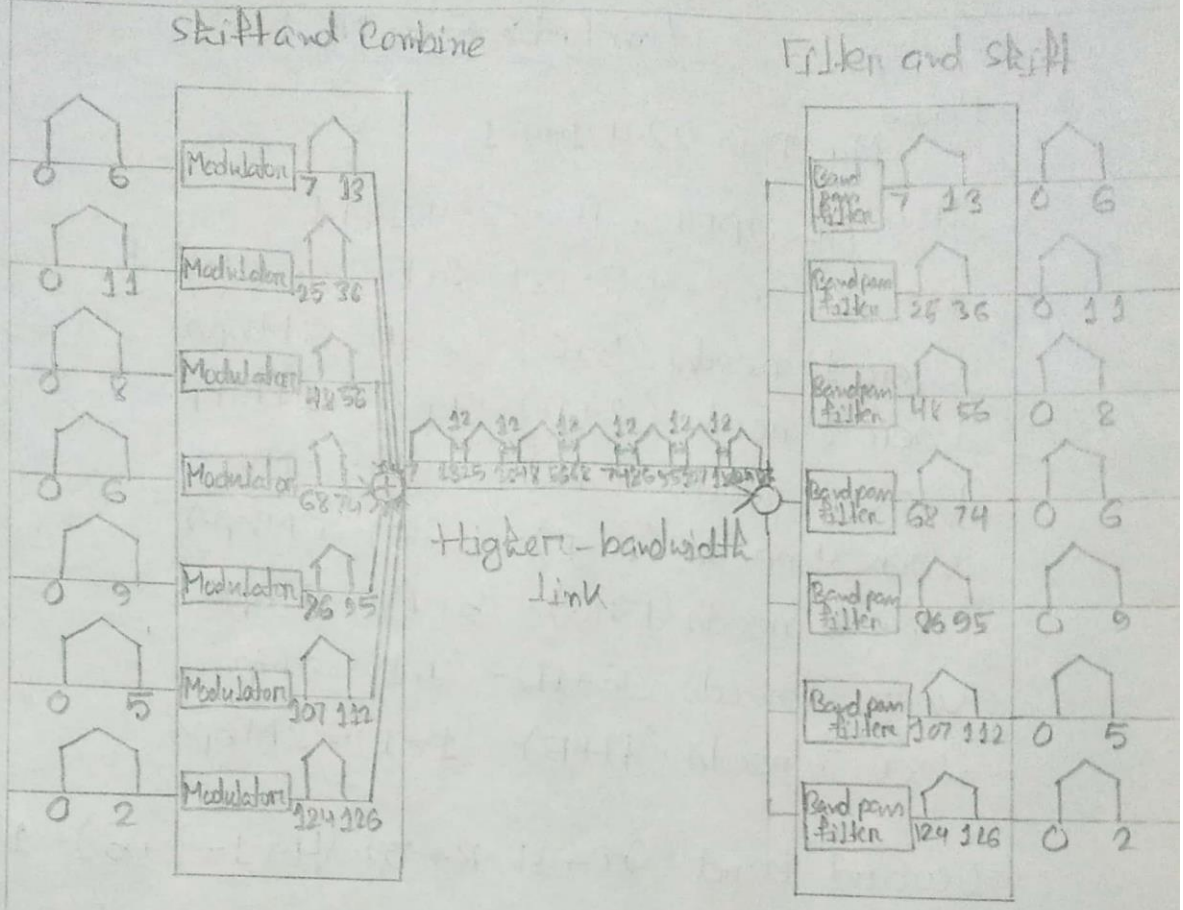
User 4 needs (E+F)=(1+5)= 6Mbps

User 5 needs (F+G)=(5+4)=9Mbps

User 6 needs (G+H)=(4+1)=5Mbps

User 7 needs (H+E)=(1+1)=2Mbps

Guard band (G+H+B+5)=(4+1+2+5)= 12Mbps



Let,

Bandwidth start from 7 MHz

So, The minimum bandwidth require = (126 − 7) MHz

= 119 MHz

Ans to the Ques NO. 2

Here, My ID is 22-47154-1

Now, AB-CDEFG-H = 22-47154-1

A=2, B=2, C=4, D=7, E=1, F=5, G=4, H=1

Source 1 requires (B+C) = (2+4) = 6 Mbps

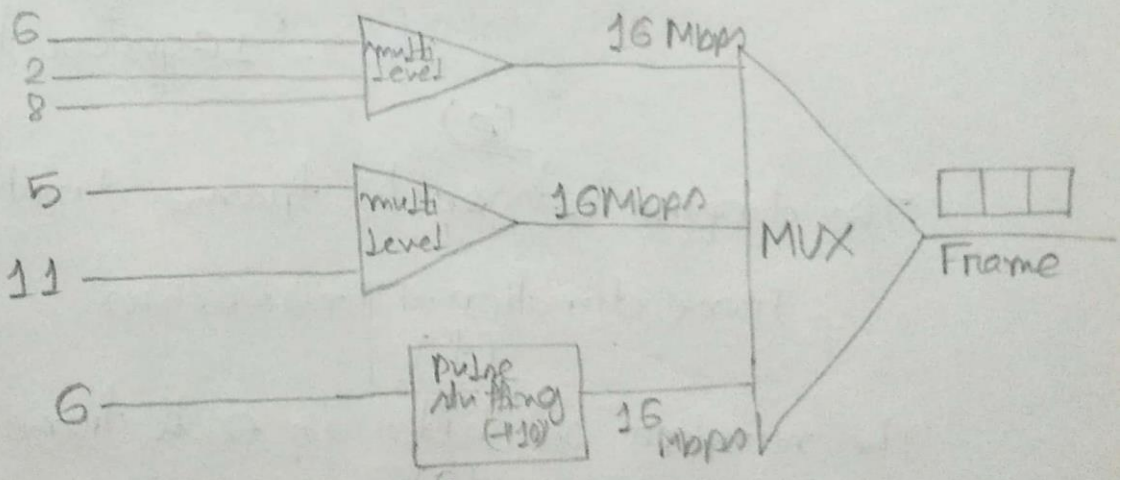
Source 2 requires (H+E) = (1+1) = 2 Mbps

Source 3 requires (D+E) = (7+1) = 8 Mbps

Source 4 requires (G+H) = (4+1) = 5 Mbps

Source 5 requires (C+D) = (4+7) = 11 Mbps

Source 6 requires (E+F) = (1+5) = 6 Mbps



(a)

The multilevel multiplexing and the pulse stuffing data rate management are used here for multiplexing.

(b)

The data rate of each source is 16 Mbps

(c)

The duration of each character in each source is

16×10^6 bit can transmit in = 1s

$\therefore$ 1 " " " " $\frac{1}{16 \times 10^6}$ s

$= 6.25 \times 10^{-8}$ s

$= 0.0625$ μs

(d)

0.0625 μs need to transmit 1 frame

$\therefore$ 1s " " " $\frac{1}{0.0625 \times 10^{-6}}$ frame/s

$= 16000000$ frame/s

(e)

The duration of each frame duration = input duration

$\therefore$ Frame duration = T = 0.0625 μs

(f)

The number of bits in each frame is 3 bits.

(g)

0.0625 μs need to transmit 3 bit

$\therefore$ 1 s " " " $\frac{3}{0.0625 \times 10^{-6}}$ bit/s

$= 48000000$ bps

$\therefore$ The data rate of the link is 48000000 bps

THE END