American International University- Bangladesh (AIUB)
Faculty of Engineering

Course Name:	Data Communication		**Course Code:**	COE 3201
Semester:	Fall 2023		**Term:**	Final
Total Marks:	30		**Submission Date:**	23-11-2023
			Assignment:	02/OBE

Course Outcome Mapping with Questions

Item	COs	POIs	K	P	A	Marks	Obtained Marks
Q1	CO4	P.f.2.C6	K7	P1, P3, P7		30	
					Total:	**30**	

Student Information:

Student Name:	MD. SHAHRIAR PARVEZ SHAMIM	**Student ID:**	21-44998-2
Section:	I	**Department:**	CSE

Marking Rubrics (to be filled by Faculty):

Problem	Excellent [15]	Proficient [12]	Good [10]	Acceptable [7]	Unacceptable [5]	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							
Comment						Total marks (30)	

Use your ID (ID = AB-CDEFG-H)

(For example: If B=1, C=2 and E=1, BCE= 121)

1. A voice channel occupies a bandwidth of BCE kHz. Three voice channels are multiplexed together using FDM (Frequency Division Multiplexing).

(a) Propose the minimum required Bandwidth for the setup mentioned above.

(b) Design the configuration of multiplexing and demultiplexing process as an illustration using the above voice channels, bandwidth and the guard bands with proper labeling (choose carrier frequency range of your preference according to the Bandwidth).

Answer to the question no. 1

[a] ID: 21-44998-2 According to ID, BCE = 149
 A B C D E F G H

So A voice channel occupies a bandwidth of 149 KHz.
Three voice channels are multiplexed together using
FDM. Assuming there is a need for a guard band
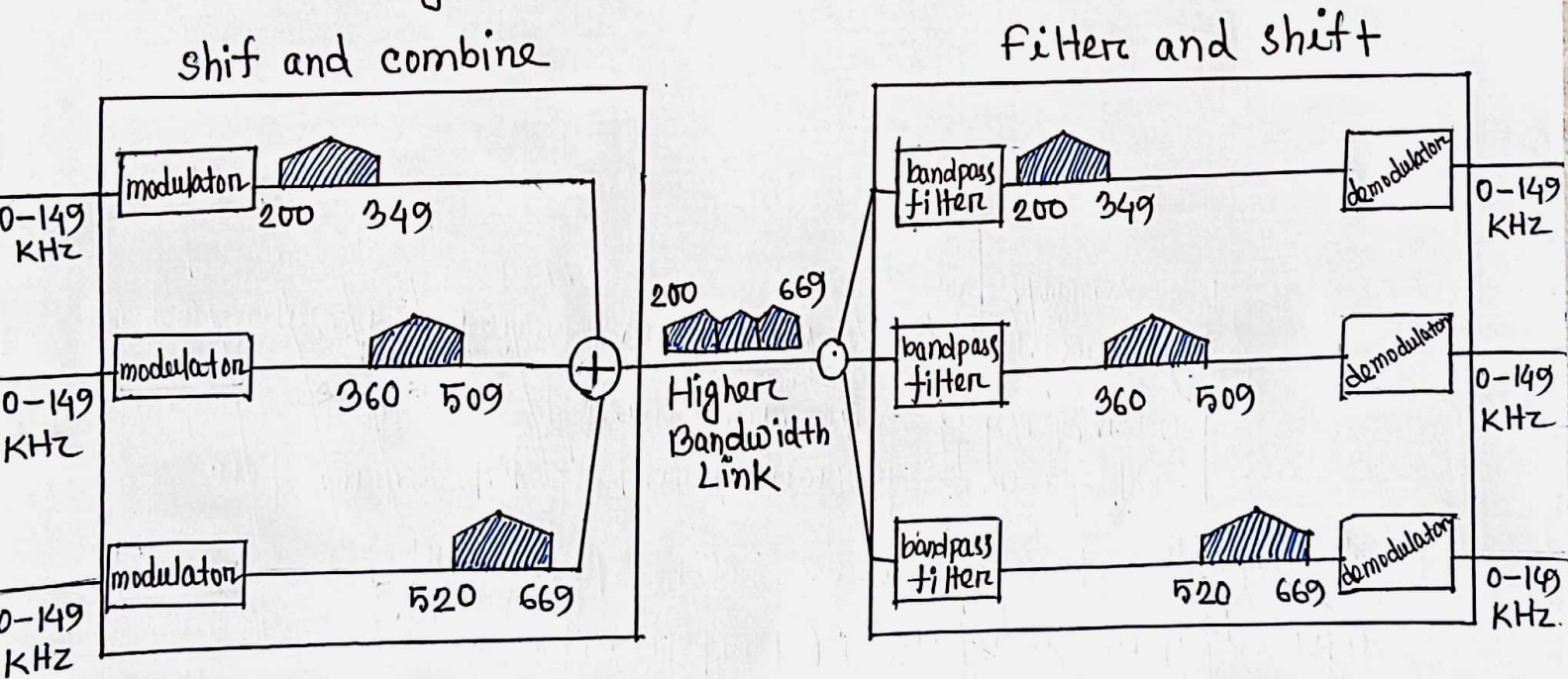of 10 KHz to prevent interference.

For three channels, we need at least two guard bands.

Minimum bandwidth required:

$$3 \times 149 + 2 \times 10 = 467 \text{ KHz}$$

[b] FDM configuration :— (guard band 10 KHz)

shif and combine   filter and shift

Here, each channel occupies 149 KHz bandwidth. Modulator assign
an unique carrier frequency to each channel before transmission
(for three channel, two guard bands are added here). After multiplex,
bandpass filter selectively filter out unwanted frequencies, allowing
only a specific band of frequencies to pass through. Then
demodulator extracts the original information from a modulated
carrier signal. This is the process of FDM.