CSE320

Assignment No. ~~2~~ 3

Name : Md. Abdullah-Al-Rafi

Student ID : 22101685

Section : 16

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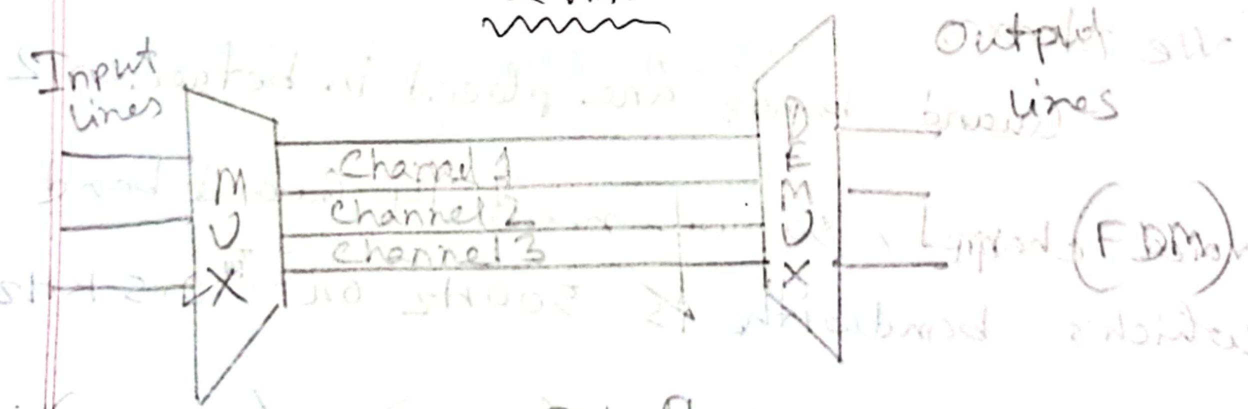
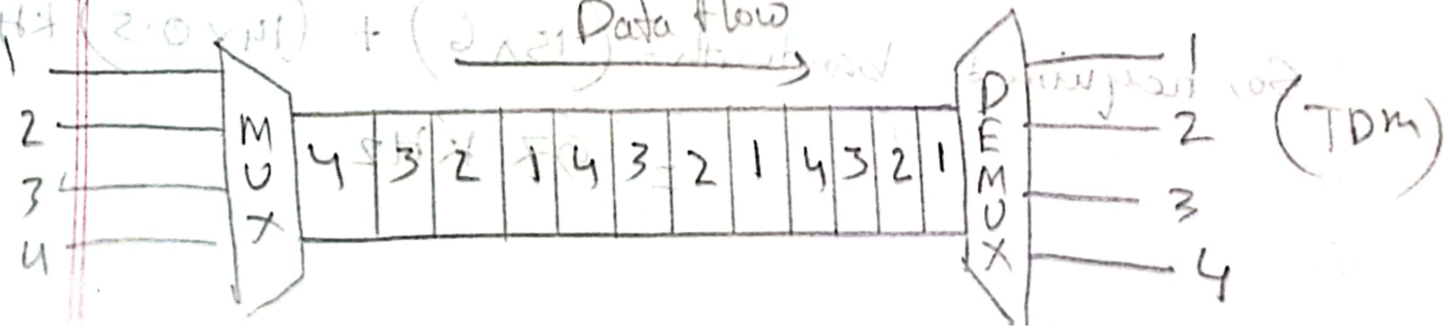
1.Ans

A guard band is a narrow frequency range that separates two ranges of wider frequency. Guard bands are used in frequency Division Multiplexing. Guard bands creates separation, reducing crosstalk and maintaining signal quality. They also mitigate fading effects and simplify receiver design by providing clear channel boundaries. These are the reasons, why guard bands are used in FDM.

2.Ans





FDM	TDM
Signals are allocated separate frequency based	Signals are allocated separate time slots
Signals are transmitted simultaneously	Signals take turns in a sequential manner
Each signals requires a dedicated frequency band	Each signal requires a dedicated time slot

Ans.3

Here, voice channel number = 15

Bandwith ~~per~~ for each channel = 6 KHz

We know,

Guard bands are placed in between 2 voice channel, so we need 14 Guard band which's bandwith is 500Hz or 0.5 KHz

So, required bandwith = $(15 \times 6) + (14 \times 0.5)$ kHz

$= 97$ KHz

4.Ans

Statistical TDM is more efficient than a synchronous TDM multiplexer, because of these following reasons,

Statistical TDM

* Dynamically allocates time slots based on actual data demand
* Avoids wasting slots.
* Efficiently utilizes available bandwith

Whereas Synchronous TDM

* Uses fixed time slots regardless of data demand
* May result in inefficient bandwith usage.

Synchronization bit in TDM is necessary for

* Frame alignment
* Data alignment
* Clock recovery
* Error detection.

These ensures proper multiplexing and demultiplexing.

5. Ans

a)

Here, we know each frame ~~consists~~ contains $6 \times 2 = 12$ characters.

So, size of each frame $= 12 \times 8$
$= 96$ bits

b)

~~Frame rate =~~

Here, input slot duration $= \frac{2}{60 \times 10^6}$

$= 33.33$ ns

$=$ frame duration

Here,

33.33 ns $\Rightarrow$

33×10^{-9} s ——— 1 frame

$\therefore$ 1s ——— $\frac{1}{33 \times 10^{-9}}$

$= 30.3 \times 10^6$ ~~frame~~ fps

(Ans)

c

frame duration = 33.33 ns (Ans.)
= (input slot duration)

d

Output data rate = 30 × 96 [frame rate × frame size]
= 2.88 Gbps (Ans.)

e

input bit duration = $\frac{1}{60 \times 10^{6}}$ s
= 16.67 ns (Ans.)

f

Output bit duration = $\frac{16.67}{6}$
= 2.78 ns (Ans.)

g

Output slot duration = $\frac{33.33}{6}$
= 5.55 ns. (Ans.)

6. Ans

a

Frame size in bits = $6 \times (8+4)$ bits

$= 72$ bits (Ans.)

b

Lets assume, we have only 6 input lines. Each of this frame needs to carry 1 character from each of these lines. So, the frame rate is 500 ~~frae~~ frame/s (Ans.)

c

Frame duration = $\frac{1}{\text{frame rate}} = \frac{1}{500}$

$= 2$ ms (Ans.)

d

Output data rate = ~~(500 × 72)~~ (500×72)

$= 36$ Kbps (Ans)

7. Ans

a) Here, We need to add extra bits to the second source to make both rates = 190 Kbps [Pulse stuffing], Now we have 2 source of each consisting 190 Kbps.

Here the frame carries 1 bit from each source. So the frame size in bits = 1+1 = 2 bits

(Ans.)

b) Input slot duration $= \frac{1}{190 \times 10^3}$ s

$= 5.26$ ms

Input slot duration = frame duration.

5.26×10^{-6} s;

5.26 ms —— 1 frame

$\therefore$ 1s —— $\frac{1}{5.26 \times 10^{-6}}$

= 190000 fps

(Ans.)

c)

We know,

Input bit/slot duration = ~~Output~~ frame duration

here,

Input bit/slot duration = $\frac{1}{190 \times 10^3}$ s

$= 5.26 \times 10^{-6}$ s

$\therefore$ ~~Output~~ $\therefore$ Frame duration $= 5.26 \times 10^{-6}$ s

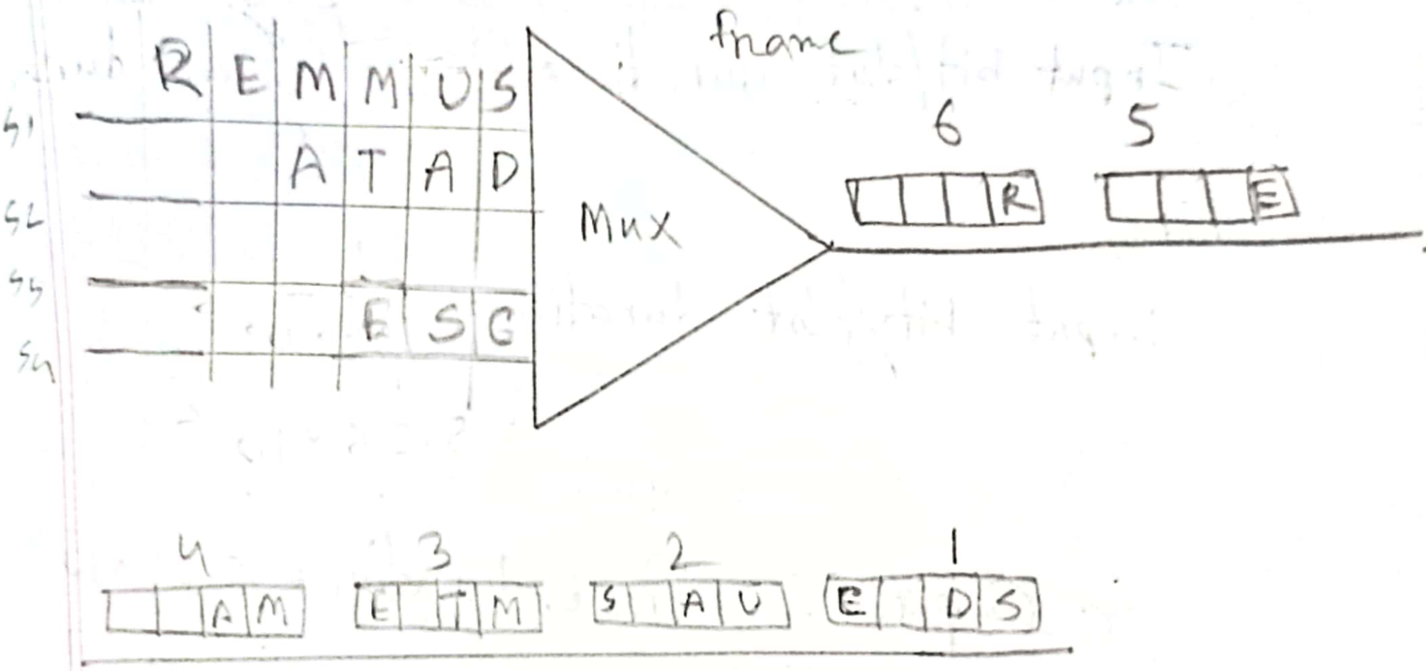
(Ans.)

d) Data rate = frame rate × no of connection

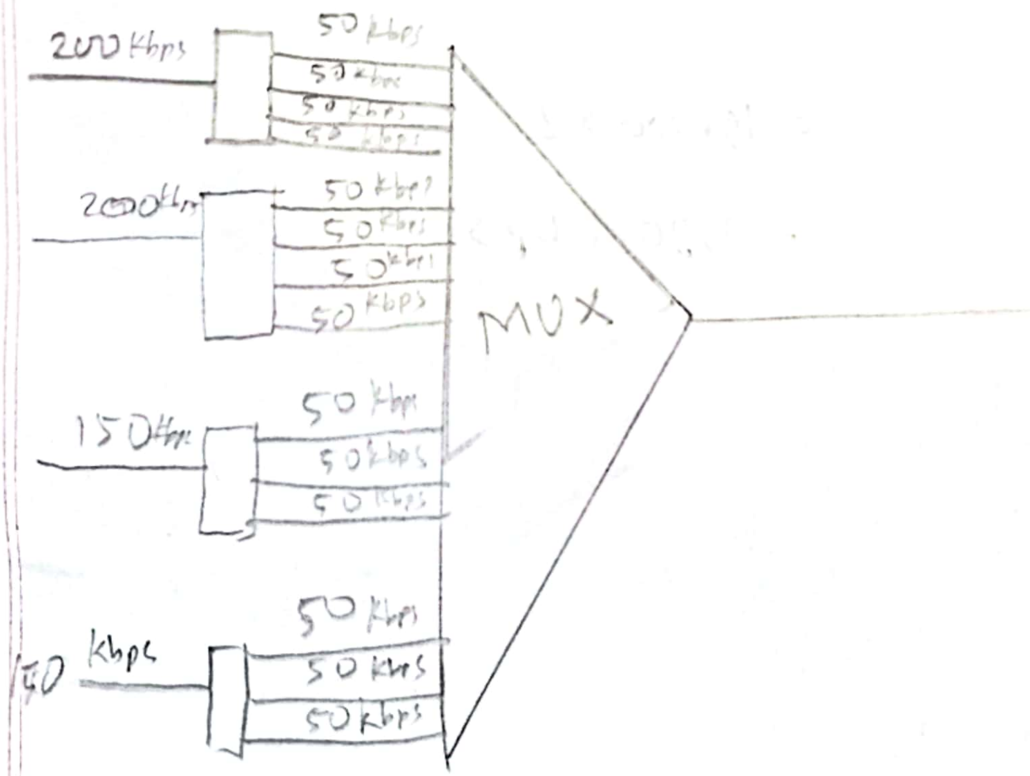
$= 190000 \times 2$

$= 380$ kbps

8. Ans


R E M M U S
A T A D
E S G
S1
S2
S3
S4
Mux
frame
6
5
R
E
4
3
2
1
A M
E T M
S A U
E D S

9. Ans


200 Kbps
50 Kbps
50 Kbps
50 Kbps
50 Kbps
200 Kbps
50 Kbps
50 Kbps
50 Kbps
50 Kbps
150 Kbps
50 Kbps
50 Kbps
50 Kbps
150 Kbps
50 Kbps
50 Kbps
50 Kbps
MUX

a

Here the frame carries 4 bits from each of the 1st 2 source and 3 bits from each of the 2nd 2 source

Here frame size $= 4 \times 2 + 3 \times 2 = 14$ bits

(Ans.)

b

~~Here, each frame carries 4 bit from~~

Frame rate $= \frac{200000}{4} = \frac{150000}{3} = 50{,}000$ fps

(Ans.)

c

Frame duration $= \frac{1}{50000} = 20\ \mu s$

(Ans.)

d

Output data rate $= 50000 \times 14$

$= 700$ kbps (Ans.)

e

Input bit duration $= \frac{1}{50000}$

$= 20\ \mu s$ (Ans.)

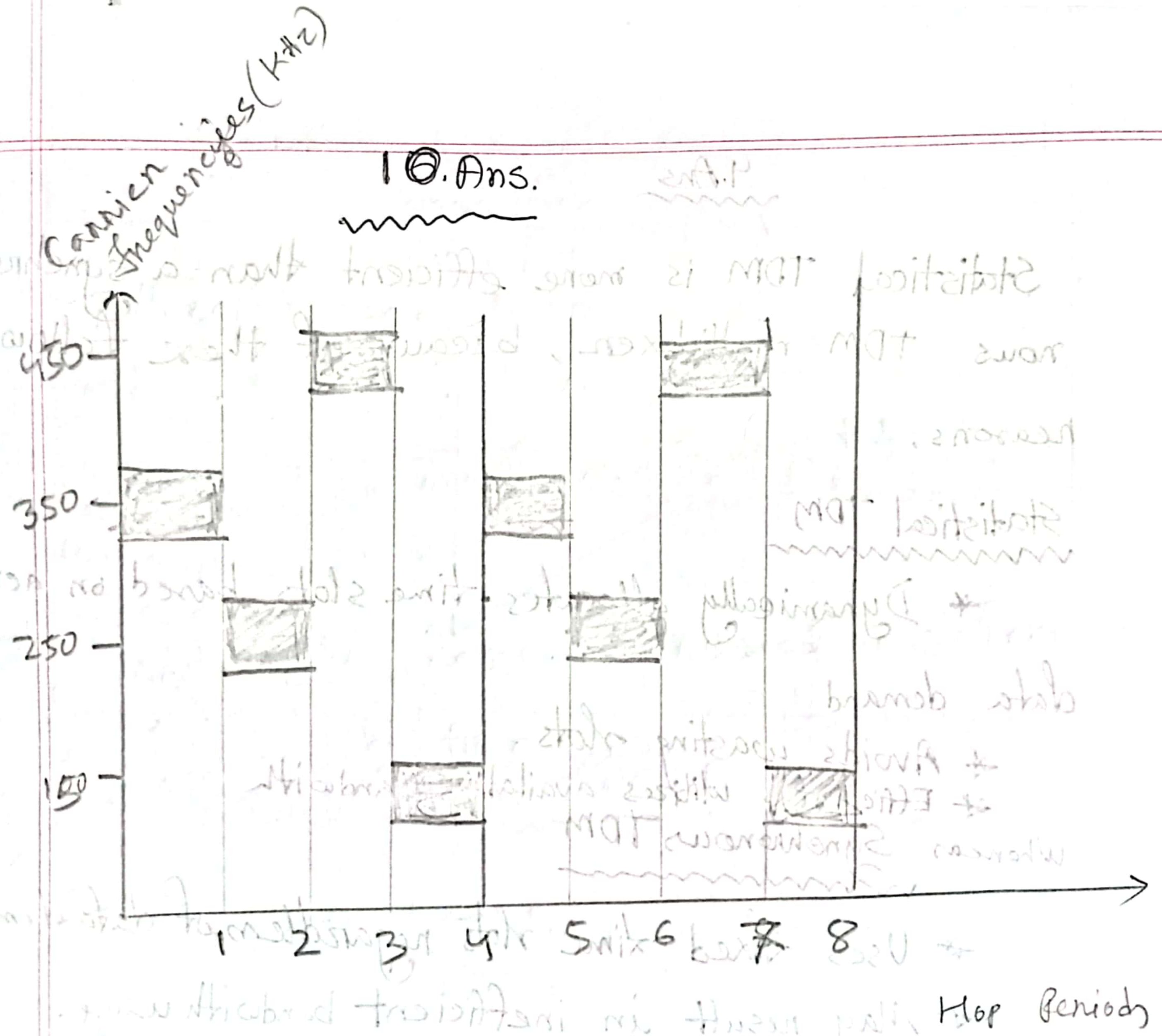
CamScanner

f

From the diagram that I've drawn before, we can see input channel number $= 14$. And here's given two synchronization bits in the output frame.

So, input channels after doing multiplexing $= 14 + 2 = 16$ (Ans.)

10. Ans.



Carrier frequencies (KHz)
450
350
250
100
1
2
3
4
5
6
7
8
Hop Periods