COMPUTER NETWORK (CS-303)

TUTORIAL 4

U19CS012 [BHAGYA VINOD RANA]

Q.1.> Calculate checksum at sender send and verify checksum at receiver end for given 4 inputs of 8 bits each

10101010 - 1st

10011001 - 2nd

11100010 - 3rd

00100100 - 4th

Note: Calculate checksum of 8 bits and for finding checksum add all 4 inputs in one steps at sender end 4 input & checksum in one steps at receiver.

Ans 1.> At Sender's End:-

Adding all 4 inputs in one step

(1) (10) (1) (1) (1) (1)

```
       10101010
       10011001
       11100010
       00100100
carry ---------
 (10)  01001001
   ↳ +       10
       --------
       01001011
```

∴ Checksum = 10110100 [1's complement]

PROCEDURE (1) Break the original message in to 'k' number of blocks with 'n' bits in each block

(2) Sum all the 'K' data blocks

(3) Add the carry to the sum, if any.

(4) Do 1's complement to the sum ⇒ Get Checksum

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At Receiver End:

PROCEDURE ① Collect all the data blocks including the checksum
② Sum all the data blocks and checksum
③ If result is all 1's → ACCEPT, else REJECT.

```
  (1) (10) (1) (1) (1) (1)
   1  0  1  1  0  1  0  0      { checksum }
   1  0  1  0  1  0  1  0
   1  1  1  0  0  0  1  0
   1  0  0  1  1  0  0  1
   0  0  1  0  0  1  0  0
carry (10) 1  1  1  1  1  1  0  1
                          1  0
   1  1  1  1  1  1  1  1      } All 1's
```

Since all 1's ~~are~~,
Therefore, Checksum verified at Receiver's end.

2.) Station A --- (9 packets) --- Station B using sliding window (window size = 3) in Go-Back-N protocol.

-) All packets are available for transmission
-) Every 5th packet that A transmits is lost but no ACK from B is ever lost.

Find out total frames required to be send by A to ensure all packets are received properly by B.

Ans 2) Since, Go-Back-N error control strategy is used, all packets after a lost packets are sent again.

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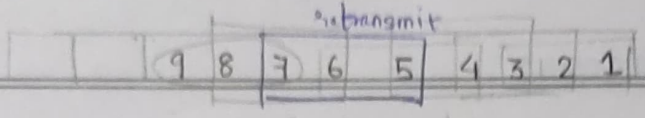

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Sender | Receiver | Window size = 3

① ✓ 1
② ✓ 2 → 1
③ ✓ 3 → 2
④ ✓ (window slides) 4 → 3
⑤ ✓ (window slides) 5 → 4
⑥ ✓ 6 → {5th packet lost}
⑦ ✓ 7 → ✗ {6, 7 discarded from buffer}

[Timeout for 5]

Buffer emptied

⑧ → 5, 6, 7 ✓ 5 → 5
⑨ ✓ 6 → 6
⑩ ✗ 7 → ✗ {7th packet lost}
⑪ ✓ 8 → ✗ 8, 9 → discarded from buffer
⑫ ✓ 9 → ✗ 9

[Timeout for 7]

⑬ ✓ 7 → 7
⑭ ✓ 8 → 8
⑮ ✗ 9 → ✗

[Timeout for 9]

⑯ ✓ 9 → 9

Ans. ∴ 16 packets have been transmitted from sender's side

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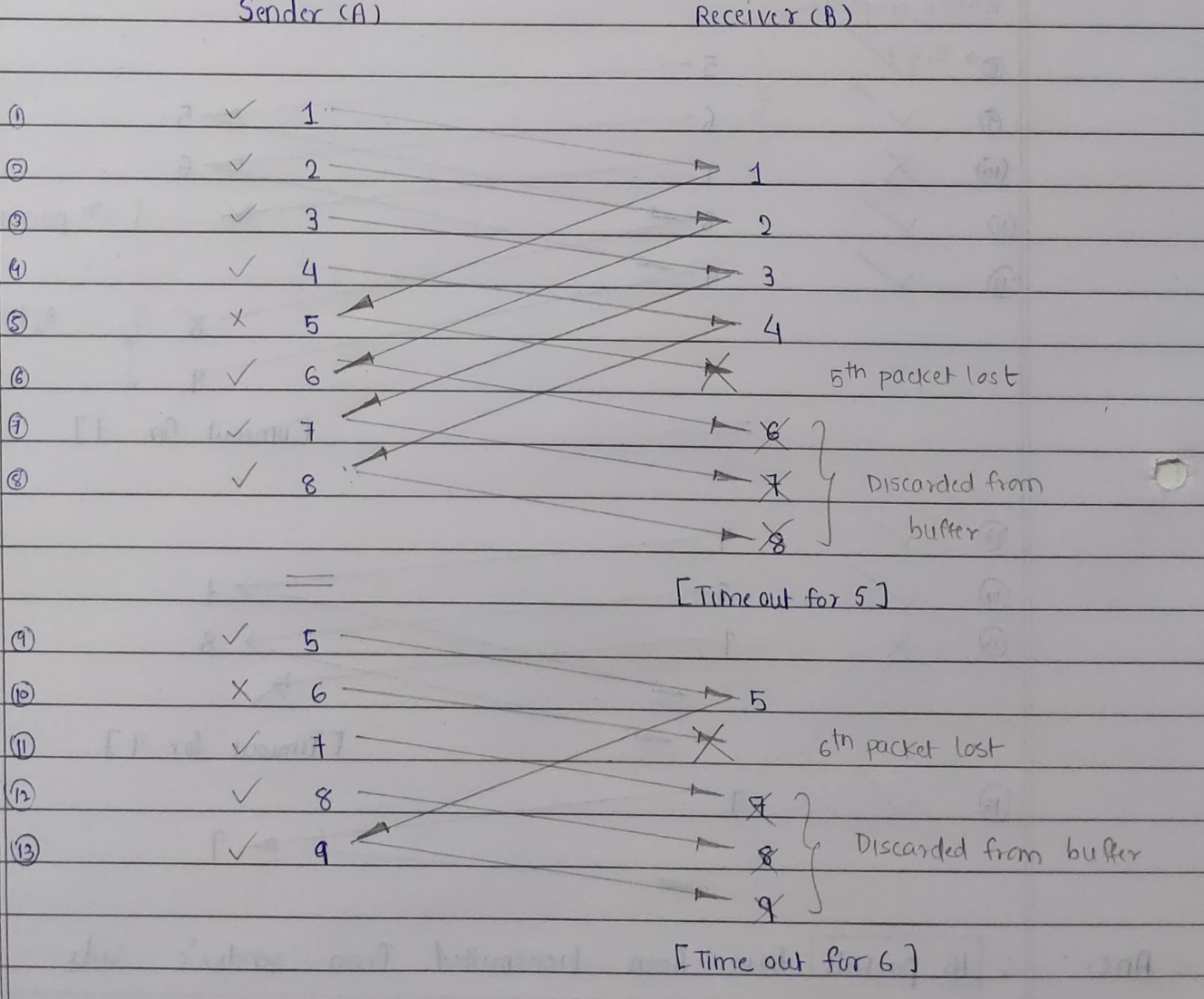
Q 3.7 Station A --- (10 packets) --> station B using sliding window. (window size = 4) in Go-Back-N protocol.

-) All packets are available for transmission
-) Every 5th packet that A transmits is lost but no Ack from B is every lost

Find out total Frames required to be send by A to ensure all 10 packets are received properly by B.

		10	9	8	7	6	5	4	3	2	1



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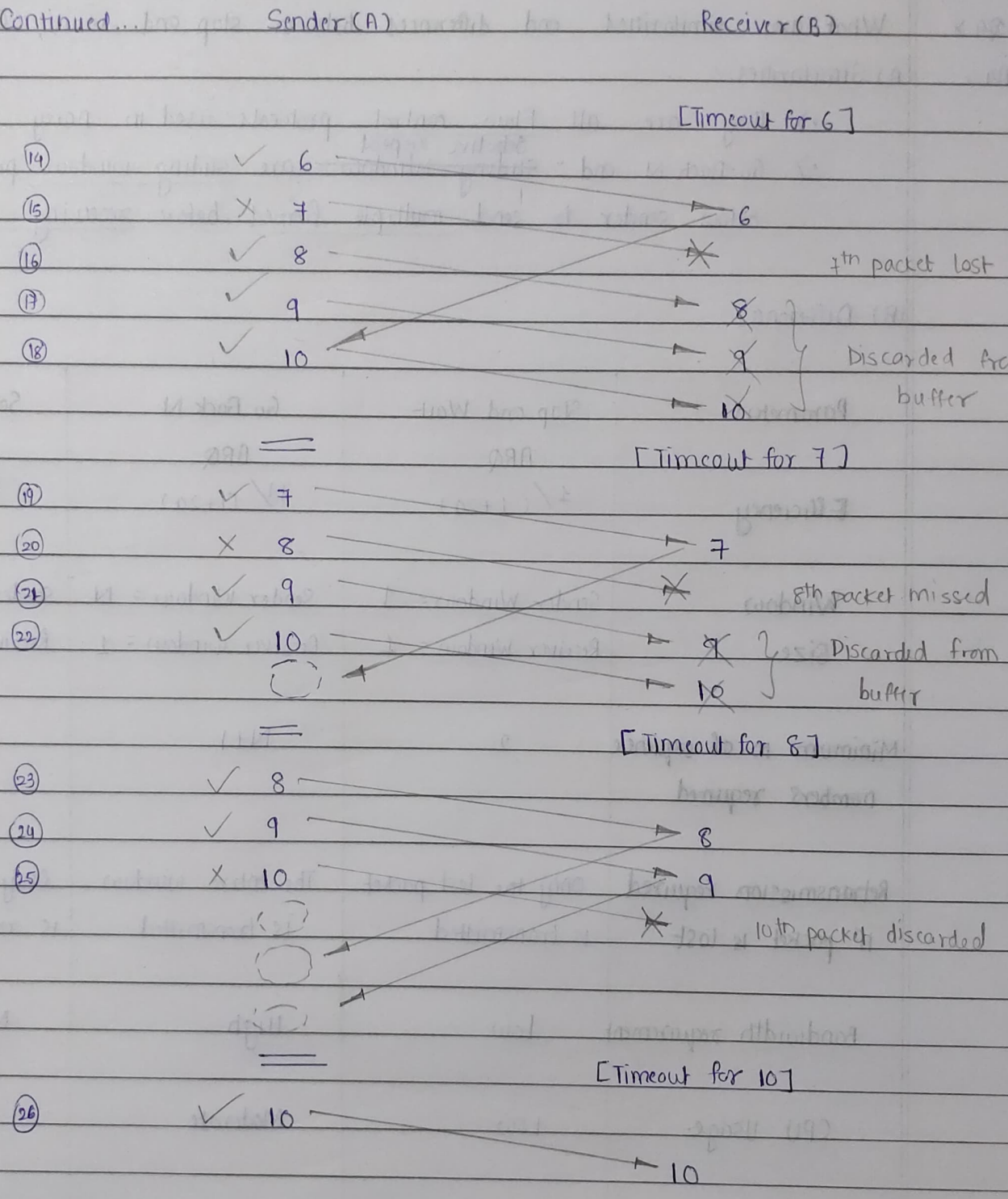

Ans: 26 Frames are required to be sent by A to ensure all 10 packets (have been transmitted from Sender) reach receiver (B).

U19CS012 & Selective Repeat Protocol.

Q4.) What are similarities and differences between stop and wait, Go-Back-N,

A4.) (A) Similarities:

- They are all Flow control protocols used in noisy channel
- Go-Back-N and ~~sliding window~~ Selective Repeat are sliding window protocols that allow sender to send multiple frames before receiving acknowledgements.

(B) Differences.

Parameters	Stop and Wait ARQ	Go Back N ARQ	Selective Repeat
Efficiency	$1/(1+2a)$	$N/(1+2a)$	$N/(1+2a)$
Window Size	Sender Window = 1 Receiver Window = 1	Sender Window = N Receiver window = 1	Sender Window = N Receiver window = N
Minimum no. of sequence numbers required	2	N+1	2*N
Retransmission required if packet is lost	Only the lost packet is transmitted	The entire window is transmitted	Only the lost packet is re-transmitted
Bandwidth requirement	Low	High	Moderate
CPU Usage	Low	Moderate	High
Level of difficulty in implementation	Low	Moderate	Complex
Acknowledgements	Individual	Cumulative	Independent
Types of transmission	Half duplex	Full duplex	Full duplex