Enrollment No. _____

THE CHARUTAR VIDYA MANDAL UNIVERSITY
BE – SEMESTER - 5 INTERNAL EXAMINATION – SEPTEMBER 2022
102044501 – COMPUTER NETWORKS - SOLUTION

Date: 14th September, 2022 **Time: 11:15 AM to 12:30 PM** **Maximum Marks: 40**

Q. 1 (A) Answer the following. **[08]**

(i) Define the term: Local Area Network.

Answer:

A computer network that links devices within a building or group of adjacent buildings, especially one with a radius of less than 1 km. A LAN is normally exclusive to an organization, such as a school, office, association etc.

Correct Definition -> 01 Mark

(ii) List out task of Transport Layer.

Answer:

Service - Point Addressing, Segmentation and Reassembly, Connection Control, Flow Control, Error Control

List with 4 to 5 tasks -> 01 Mark

(iii) What is the limitation of Mesh Topology?

Answer:

- Overall cost of this network is way too high as compared to other network topologies.
- Set-up and maintenance of this topology is very difficult.
- Administration of the network is tough.

At least one limitation -> 01 Mark

(iv) What is Byte Stuffing?

Answer:

Byte stuffing is the process of adding one extra byte, whenever there is a flag or escape character in the date.

Correct Definition -> 01 Mark

(v) Define the term: Forward Error Correction.

Answer:

Forward error correction is an error correction technique to detect and correct a limited number of errors in transmitted data without the need for retransmission.

Correct Definition -> 01 Mark

(vi) What is the difference between error detection and error correction?

Answer:

Error detection is determining whether the data is corrupted or not during the transmission; Error correction goes beyond detection and try to correct the specific bit(s) affected due to the transmission error.

Correct Difference -> 01 Mark

(vii) Differentiate CSMA/CD and CSMA/CA.

Answer:

CSMA/CD is used in wired LANs and CSMA/CA used in wireless LANs and other types of wireless networks. CSMA/CD will not take steps to prevent collision until it is taken place whilst CSMA/CA will take actions in advance to avoid the collision.

Correct Difference -> 01 Mark

(viii) What do you mean by Random Access Protocol?

Answer:

In Random Access Protocols, there is no station that is superior to another station, and none is assigned control over the other. It simply means that there is no station that

permits another station to send. At each instance, a station that has data to send uses a procedure defined by the protocol to decide on whether or not to send.

Correct Definition -> 01 Mark

Note: 0.5 Mark can be given for partially correct answers

Q. 2 (A) Draw the layered architecture of OSI reference model. List out and explain the tasks performed by data link layer. [05]

Answer:

Layered architecture of OSI reference model:

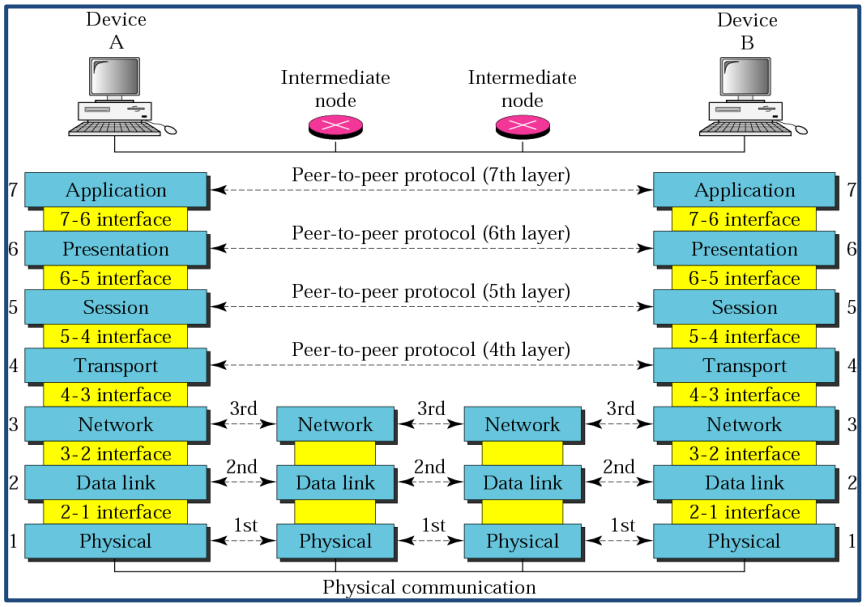


Diagram → 01 Mark

Tasks performed by Data Link Layer:

- Framing
- Physical Addressing
- Flow Control
- Error Control
- Access Control

List and correct explanation of each task in brief → 04 Marks

Total = 05 Marks

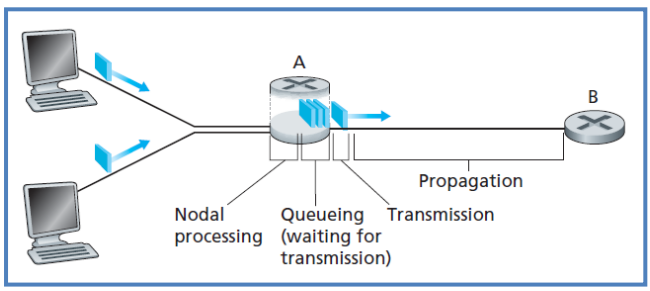
(B) List out and explain different types of delay with respect to Packet Switching Network. [05]

Answer:

Following are the various types of delays that incurred during packet transmission with packet switched networks;

1. Processing Delay
2. Queuing Delay
3. Transmission Delay
4. Propagation Delay

Correct list → 01 Mark



1. **Processing Delay:**
   Time required to examine the packet's header and determine where to direct the packet. Typically, on the order of microseconds or less.

2. **Queuing Delay:**
   The packet experiences a queuing delay as it waits to be transmitted onto the link, depend on the number of earlier-arriving packets that are queued and waiting for transmission onto the link. It is in the order of microseconds to milliseconds.

3. **Transmission Delay:**
   Amount of time required to push all the packet's bits into the link. Typically, on the order of microseconds to milliseconds in practice. If length of the packet is L bits, Transmission rate of the link is R bits/sec than transmission delay is L/R.

4. **Propagation Delay:**
   The propagation delay is the distance between two routers divided by the propagation speed. That is, the propagation delay is d/s, where d is the distance and s is the propagation speed of the link. Propagation delays are on the order of milliseconds.

If we let d_{proc}, d_{queue}, d_{trans}, and d_{prop} denote the processing, queuing, transmission, and propagation delays, then the total nodal delay is given by;

$$d_{nodal} = d_{proc} + d_{queue} + d_{trans} + d_{prop}$$

Correct explanation of each in brief → 04 Marks

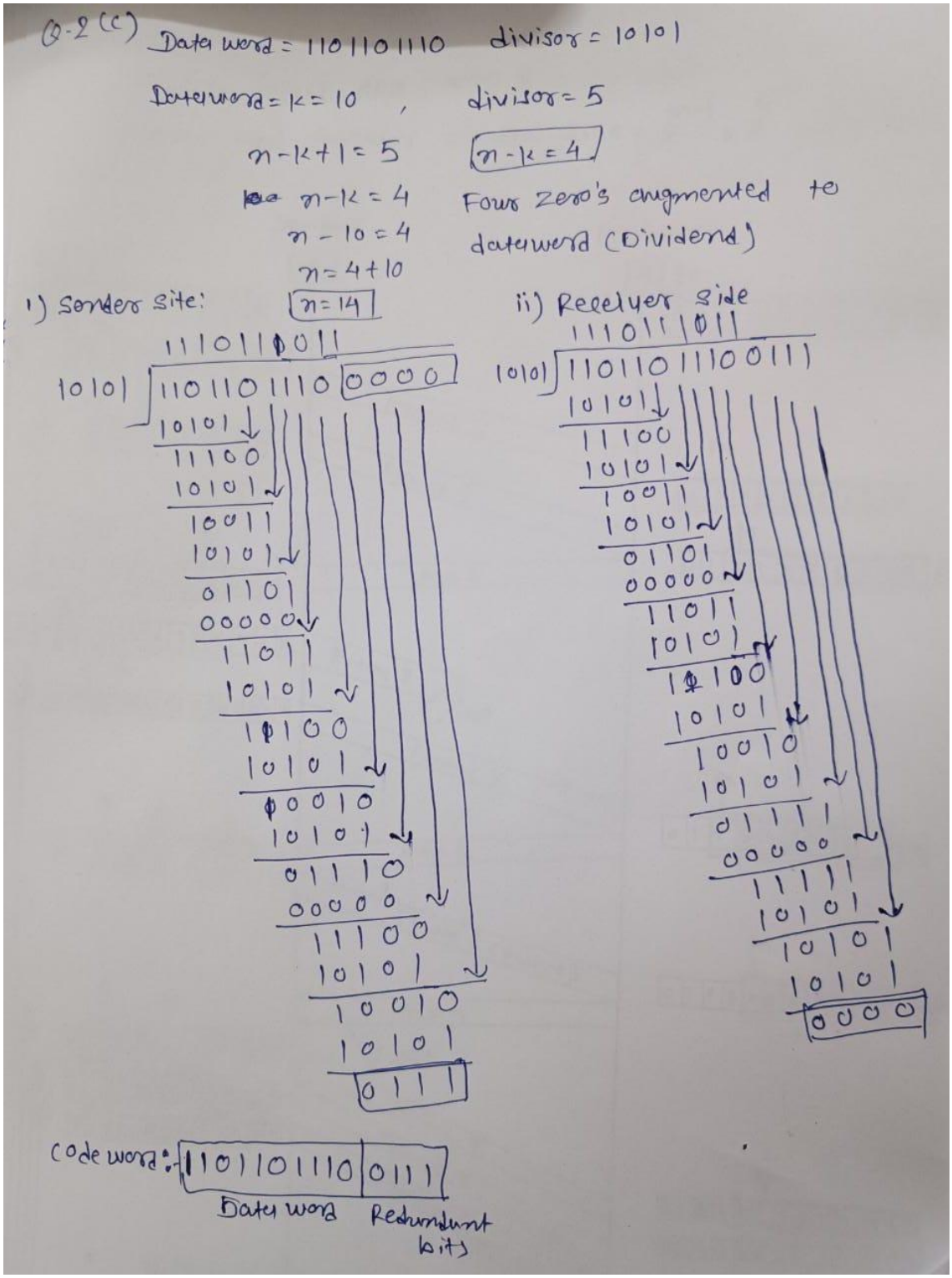
Total = 05 Marks

(C) Given the data word 1101101110 and the divisor 10101; [06]

I. Show the generation of code word at the sender site (Using binary Division).

II. Show the generation of data word at receiver site (assuming no errors).

Answer:



For correct calculation at each side → 03 Marks

Total = 06 Marks

OR

(C) Draw the Sender and Receiver side-sliding window for the system using Selective Repeat ARQ for the following cases with m=4; [06]

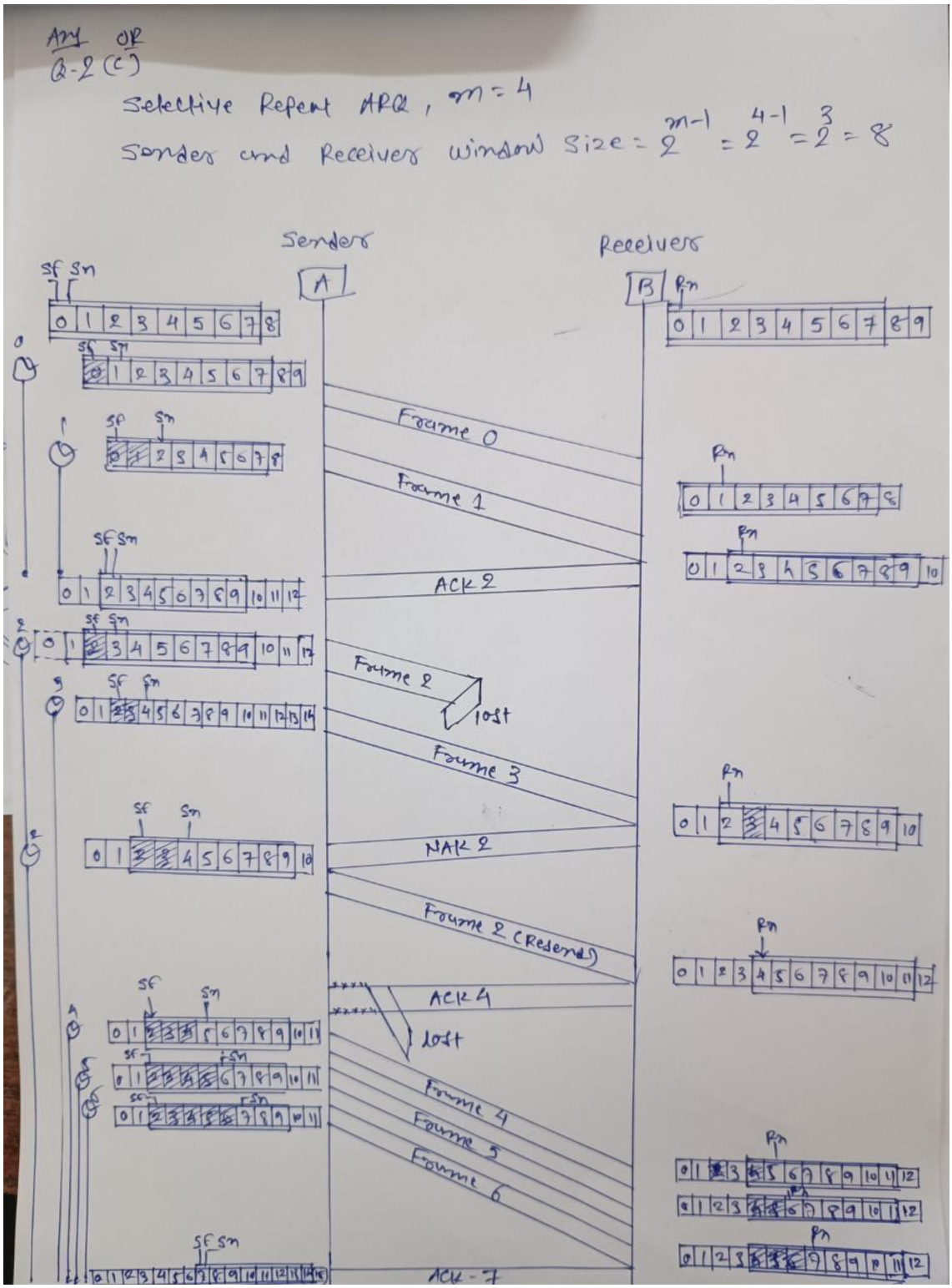
I. Frame 0, 1 sent and acknowledge.

II. Frame 2, 3 sent and frame 2 lost.

III. Frame 4, 5 and 6 sent and ACK 4 lost.

Note: Show Timers, RTO, if necessary.

Answer:



For correct timing diagram of each case → 02 Marks

Total = 06 Marks

Q. 3 (A) Explain different types of ALOHA protocol with Diagram. [05]

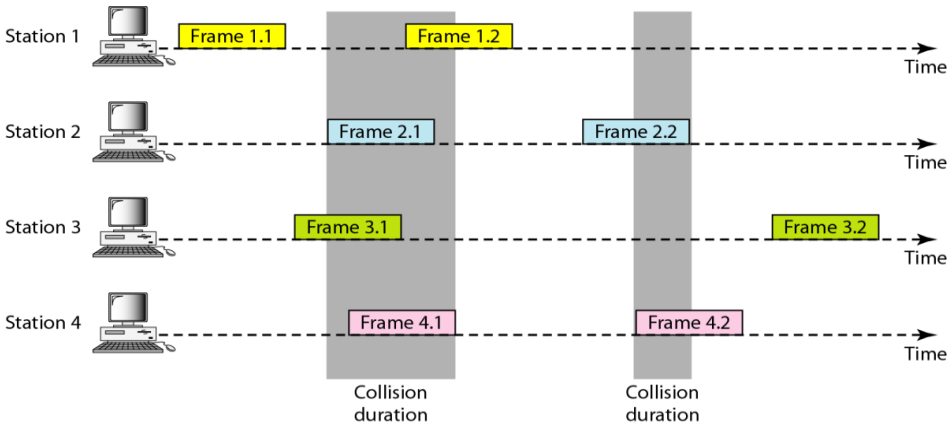
Answer:

1. **Pure ALOHA:**

   Answer:

   - In pure Aloha, each station transmits data to a channel without checking whether the channel is idle or not.
   - The chance of collision is there, and the data frame may lost.

- When any station transmits the data frame, it waits for receiver's acknowledgment. The station waits for a random amount of time, called the backoff time and if the acknowledgment is not received then the station may assume the frame has been lost or destroyed. Therefore, it retransmit the frame until it is successfully transmitted.
- The throughput for pure ALOHA is- S=G*e^-2G

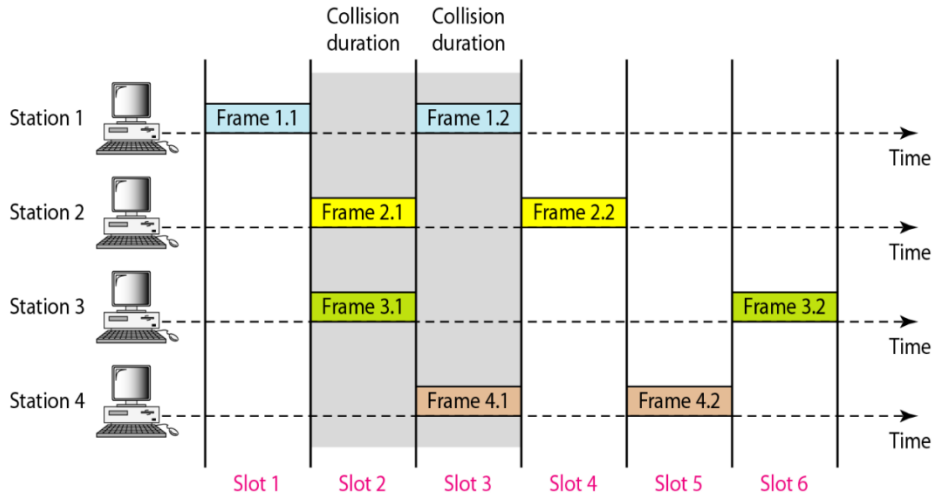


Explanation of Pure ALOHA with diagram → 2.5 Marks

2. Slotted ALOHA:

Answer:

- Time of the shared channel is divided into discrete time intervals called Slots. The communicating station agree upon the slot boundaries.
- Any station can send only one frame at each slot.
- Also, the station cannot transmit at any time whenever a frame is available. They should wait for the beginning of the next slot.
- However, there still can be collisions. If more than one frame transmits at the beginning of slot, collision occur. The collision duration is 1 slot.
- If a station misses out the allowed time, it must wait for the next slot. This reduces the probability of collision.
- The throughput for Slotted ALOHA is- S=G*e^-G



Explanation of Slotted ALOHA with diagram → 2.5 Marks

Total = 05 Marks

(B) List out different types of Guided Media. Explain any two in brief. **[05]**

Answer:

- Twisted pair cable
- Co-axial cable
- Fiber-optic cable

Correct List → 1 Mark
Correct explanation of any two → 4 Marks
Total = 05 Marks

(C) What is Limited Contention Protocol? Explain Adaptive Tree Walk Protocol with Example. **[06]**

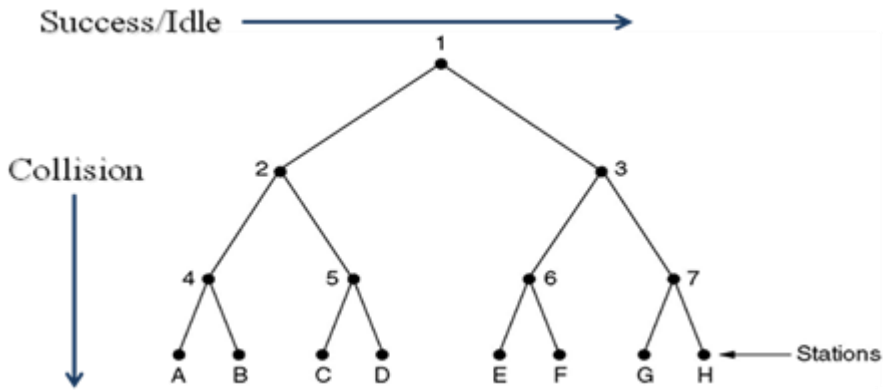
Answer:

Under condition of low load, Contention based protocols are preferable due to its low delay. As the load increases, Contention creates more overhead.

Under condition of low load, Collision free protocols have higher delay. As the load increases, Performance of Collision free protocol increases.

Limited Contention protocols combines the best from collision free protocols and contention-based protocol. Contention at low load to provide low delay, Collision free approach at high load to improve channel efficiency.

Explanation in brief → 02 Marks



Explanation of Adaptive tree walk protocol
Including diagram, nodes arrangement, searching and traversal rules → 04 Marks

Total = 06 Marks

OR

(C) What is flow control? Explain Go-Back-N ARQ mechanism with diagram. **[06]**

Answer:

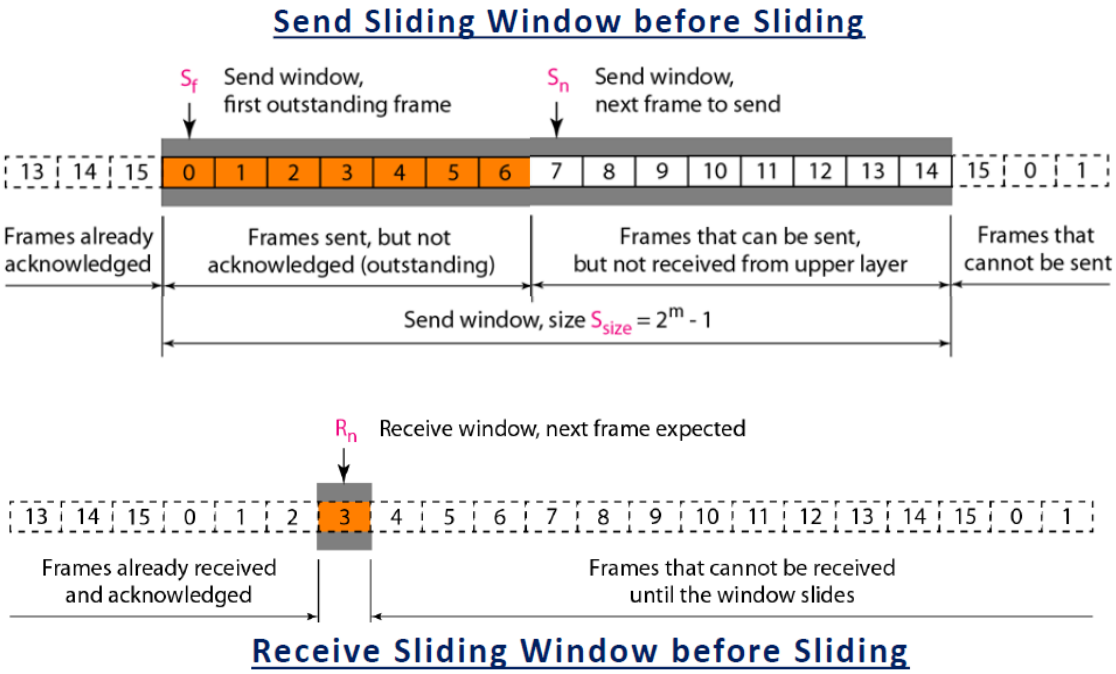
Flow control is the management of data flow between computers or devices or between nodes in a network so that the data can be handled at an efficient pace. Flow control is a technique that allows two stations working at different speeds to communicate with each other.

Correct definition of flow control → 01 Marks

- Go-Back-N protocol, also called Go-Back-N Automatic Repeat Request, is a data link layer protocol that uses a sliding window method for reliable and sequential delivery of data frames.
- It is a case of sliding window protocol having to send window size of N and receiving window size of 1.

- Go–Back–N ARQ provides for sending multiple frames before receiving the acknowledgment for the first frame. The frames are sequentially numbered and a there are finite number of frames.

Sliding Window:



- The maximum number of frames that can be sent depends upon the size of the sending window. If the acknowledgment of a frame is not received within an agreed upon time period, all frames starting from the first Outstanding frame are retransmitted.
- The size of the sending window determines the sequence number of the outbound frames. If the sequence number of the frames is an n-bit field, then the range of sequence numbers that can be assigned is 0 to 2^n-1. Consequently, the size of the sending window is 2^n-1. Thus, in order to accommodate a sending window size of 2^n-1, a n-bit sequence number is chosen.

Explanation including above mentioned key points and sending and receiving window diagram → 05 Marks