U18C0081

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CLASS :- B TECH 3RD YEAR,
COMPUTER ENGINEERING.

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Computer Networks
Section 2
End Semester Examination

Ans 1:
Given, a sampled low pass signal with a bandwidth of 200 kHz using 1024 levels of quantization.

a) Given,
Sample Rate = 2 x 200 = 400 kHz.
$f_s = 400$ kHz
$n_b = \log_2 1024$.

No. of bits/level = 10 bits/sample ($\log_2 1024$).

Bit rate = $f_s \times n_b$ = 400 kHz x 10 = 4 Mbps.

b) Signal to noise ratio is given by,
$SNR_{db} = 6.02 n_b + 1.76$
$= 6.02 \times 10 + 1.76$
$= 61.96$ dB

c) The PCM bandwidth is given by,
$B_{min} = B_{analog} \times n_b$
$= 200$ kHz x 10
$= 2$ MHz

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Ans 2: Given the generator polynomial is x^3+1.

Here,
Generator polynomial = 1001.

a) Message = $x^7+x^5+x^0$ = 10100001

Now, using long division:-

```
1001 | 10100001000   (Adding 3 zeroes)
       1001 ↓↓
       -----
       001100
         1001 ↓
         ----
         01010
          1001
          ----
           1110
           1001
           ----
            1110
            1001
            ----
             0111
```

Hence, the remainder is 111 = x^2+x+1

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b) Given, a bitstream after transmission = 1001110

Appending 3 zeroes at the end of bit stream as our generator is of degree 3.

Now, using long division,

```
          10001100
       ------------
1001 | 1001110 1000
       1001
       ----
        0001
        0000
        ----
         0011
         0000
         ----
          0110
          0000
          ----
           1101
           1001
           ----
            1000
            1001
            ----
              10
            0000
            ----
              0100
              0000
              ----
               100   (Remainder)
```

Hence, Actual frame transmitted:

```
  1001110 1000
-        100
-------------
  1001110 1100   (modulo 2)
```

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c) Now ~~suppo~~ given third bit from left is inverted,

Then, Bitstream : 101111011000

Using, long division,

```
          10101000
1001 | 1 0 1 1 1 1 0 1 1 0 0 0
     ⊕ 1 0 0 1 ↓
       -------
         1 0 1
     ⊕   0 0 0 0
         -------
           1 0 1 1
     ⊕     1 0 0 1
           -------
             1 0 0 1
     ⊕       1 0 0 1
             -------
               0 0 0 1
     ⊕         0 0 0 0
               -------
                 0 0 1 0
     ⊕           0 0 0 0
                 -------
                   0 1 0 0
     ⊕             0 0 0 0
                   -------
                     1 0 0 → Error.
```

Had the received frame been error free, we would have got a remainder of 0.

Hence, error is detected.

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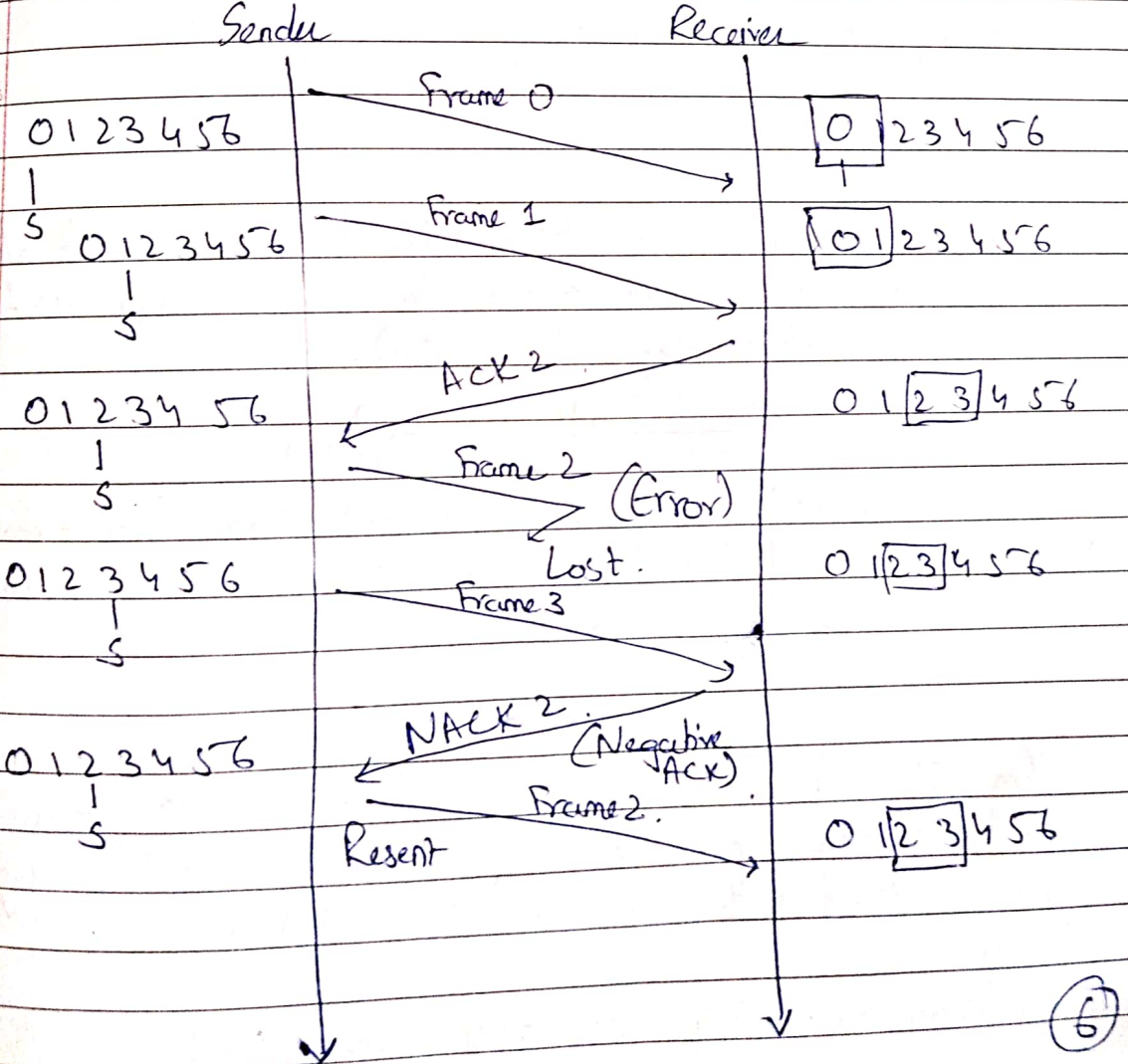
Ans 3:- The Selective Repeat Protocol is identical to the Go Back N protocol, except the buffers are used and Receiver and sender, each maintain a window of some specific size.

Also,
Window size should be less than or equal to half of sequence number in SRP.
This is done to avoid packets being incorrectly recognized.

Size of Sender's Window = Size of Receiver's Window $\geq \frac{1}{2} \times 2^m$.



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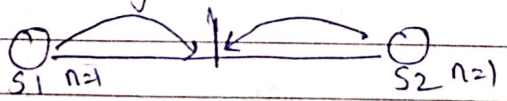
Ans:- Back off algorithm is used for collision resolution in which random access MAC protocols (CSMA/CD) is used.

This algorithm generally is used in ethernet to schedule retransmissions after collisions.

If collision takes place between 2 stations, they may restart transmission as soon as they can after collision. This will lead to an infinite chain of collisions.

To avoid such a situation, Back off algorithm is used. (Binary Back off Algorithm)

Suppose two connections S1 and S2 transmitting data at same time, then collision occurs. So collision number $n = 1$.
Now, both pick an integer from (0,1).



→ When both choose $K = 0$, they will transmit again. Same happens when $K = 1$

→ If S1 chooses $K = 1$ & S2 chooses $K = 0$, then S2 transmits and S1 waits, and vice versa.

When S1 wins case 1, and transmits its packet, S2 transmits its packet 2. Hence collision occurs. And this is resolved using above method with $n = 2$ and $K = (0, 1, 2, 3)$.
Hence,
collision probability decreases exponentially.

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Case 1:-
The probability of S1 winning = 1/4.
Probability of S2 winning = 1/4

Probability of collision = 1/2.

Case 2:-
The probability of S1 winning : 5/8 (S1 won first)

Probability of S2 winning = 1/8

Probability of collision = 1/4.

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Ans 5: • Distributed Coordination Function is a fundamental MAC technique of the IEEE 802.11 based WLAN standard.
• DCF employs a carrier sense multiple access with collision avoidance (CSMA/CA) with binary exponential backoff algorithm.

• Point Coordination Function is a MAC algorithm technique in 802.11 based WLANS, including WiFi.
• It resides in a point coordinator also known as Access Point (AP), to coordinate the communication within the network.

• The AP waits for PIFS duration rather than DIFS duration to grasp the channel.

The priority order for Inter frame spaces is according to Interframe duration → (highest priority at top) which is as follows:-

Reduced IFS (RIFS)
Short IFS (SIFS)
PCF IFS (PIFS)
DCF IFS (DIFS)
Arbitrid IFS (AIFS)
Extended IFS (EIFS)

IFS = Inter Frame Spaces.

The one with shortest duration is RIFS.

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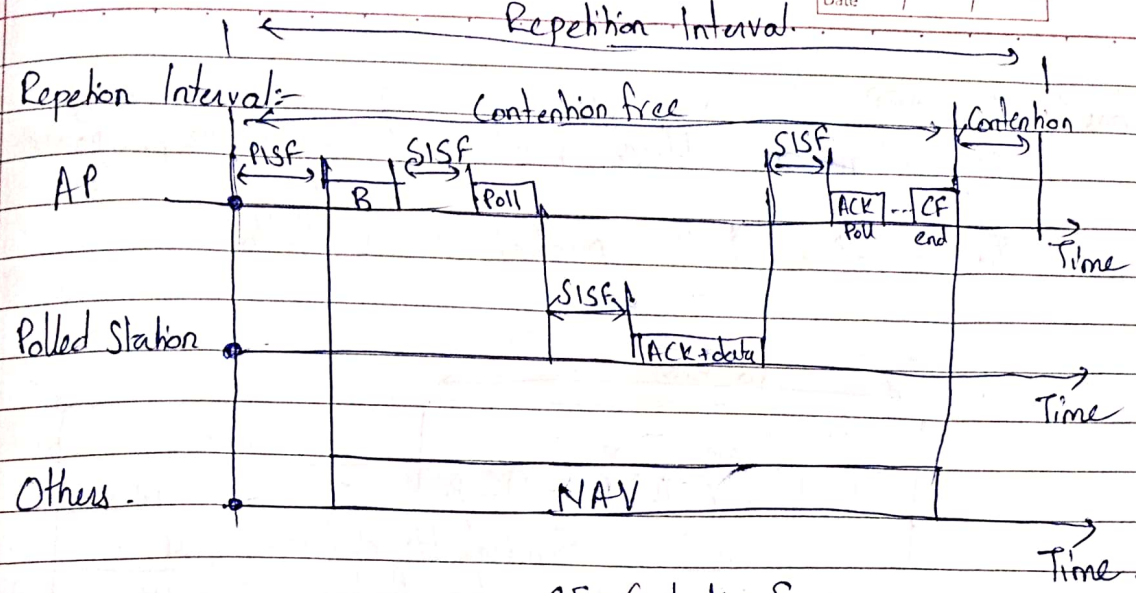


CF = Contention free

B = Beacon.

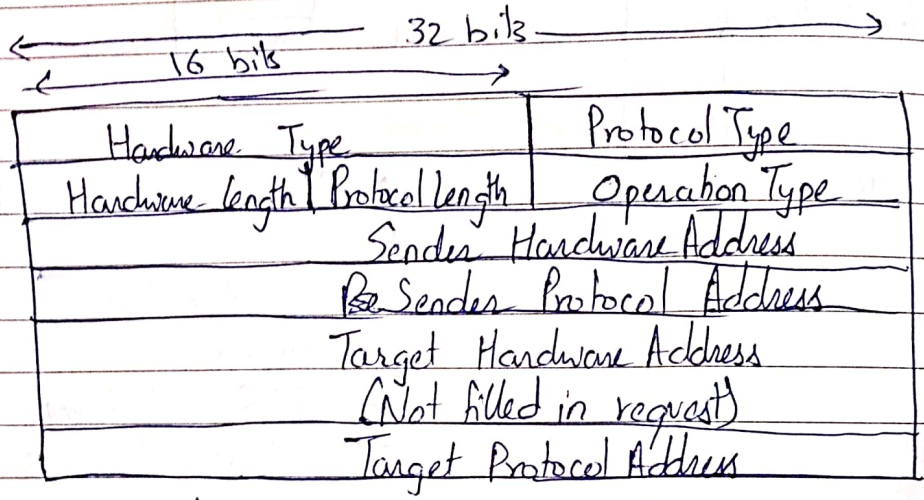
PISF = PCF Interframe Spaces

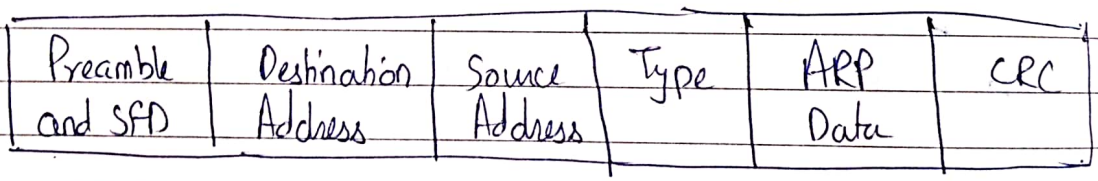
SISF = Short Interframe Spaces.

ACK = Acknowledgement.

Ans 6) The ARP packet is encapsulated using a simple message format containing one address resolution request or response.

The structure of the packet is as follows:-





8 bytes 6 bytes 6 bytes 2 bytes 4 bytes.

Ans

Some of the ways in which ARP is used:-

- A host has a packet to send to another host on the same network.
- A host wants to send a packet to another host on another network.
- A router receives a packet to be sent to a host on another network. It must first be delivered to appropriate router.

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- A router receives a packet to be sent to a host on the same network.

Proxy ARP is ~~required which~~ uses a Proxy device on a given network that answers ARP queries for an IP address that is not on a network.
Hence, some of its necessities are:

- to join a broadcast LAN with serial links.
- Taking multiple addresses in a LAN.
- Mobile IP
- Firewall configuration.
- Transparent ~~subway~~ subnet gateweying

Ans 7:

- Header length field is eliminated in IPv6 because the length of header is fixed in this version.
- The service type field is eliminated in IPv6. The priority and flow label fields together take over the function of the service type field.
- The total length field in eliminated in IPv6 and replaced by Payload length field.
- The Identification, flag and offset fields are eliminated from the base header in IPv6. They are included in the fragmentation extension header.
- The TTL field is called Hop limit.
- The protocol field is replaced by next header field.
- The header checksum is eliminated because checksum is provided by upper level protocols.

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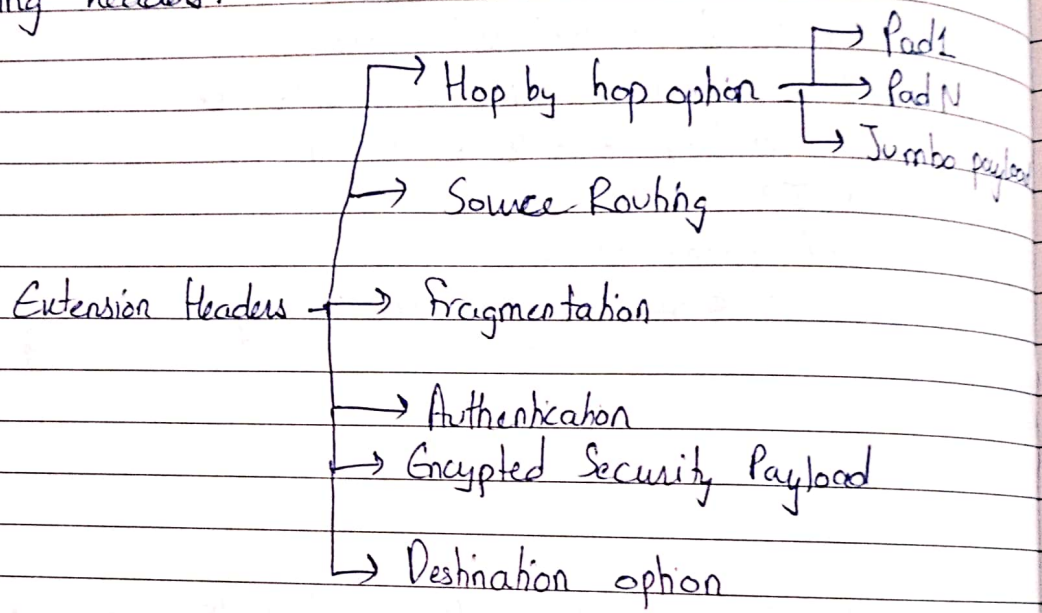
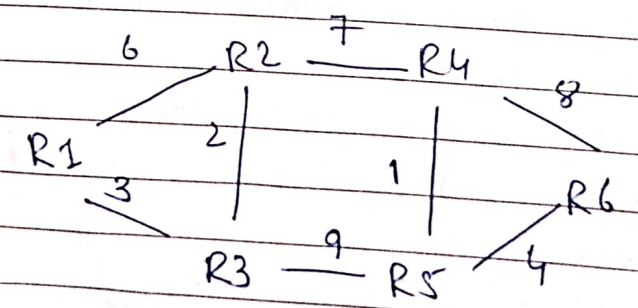
- The option fields in IPv4 are implemented as extension headers in IPv6.

The above features are the differences in IPv4 and IPv6 packet headers and how IPv6 compensated for the missing headers.



Ans 8;- Given, Routers connected to each other and each one of them uses Distance Vector Routing table,



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a) We can find shortest distance for all nodes:

R1 - R3 - R2	(R1 to R2)
R1 - R3	(R1 to R3)
R1 - R2 - R4	(R1 to R4)
R1 - R3 - R5	(R1 to R5)
R1 - R5 - R6	(R1 to R6)
R2 - R3	(R2 to R3)
R2 - R4	(R2 to R4)
R2 - R4 - R5	(R2 to R5)
R2 - R5 - R6	(R2 to R6)
R3 - R2 - R4	(R3 to R4)
R3 - R5	(R3 to R5)
R3 - R5 - R6	(R3 to R6)
R4 - R5	(R4 to R5)
R4 - R6	(R4 to R6)
R5 - R6	(R5 to R6)

Hence, two links are never used.
These are: R1 - R2 and R4 - R6.

b) The 3 node instability for R1, R2 and R3 is handled by DVR protocol in a way that R1 - R3 - R2 route is used for connecting R1 and R2 and link R1 - R2 is ignored, using the minimum distance criteria.
Since R1 - R3 - R2 is 5 units, it is preferred over R1 - R2.

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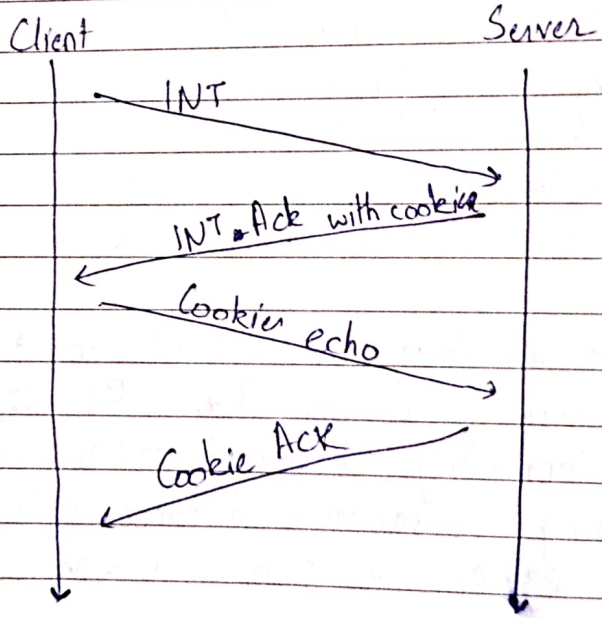
Ans 9:- SCTP (Stream Control Transmission Protocol) is more reliable than TCP and UDP because it is message oriented and combines the best features of both TCP and UDP.

- An association in ~~SCP~~ SCTP can involve multiple streams.
- SCTP association allows multiple IP addresses for each end.
- In SCTP, a data chunk is numbered using a TSN.
- TCP has segments whereas SCTP has packets.

Association in SCTP is done ~~in the SCTP~~ using four way handshaking.



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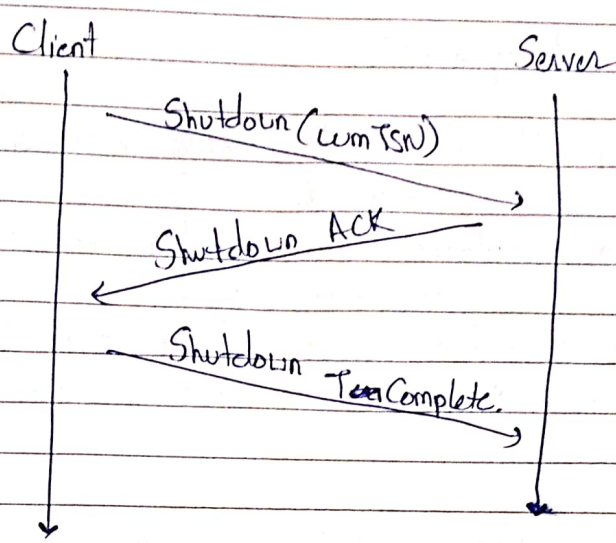
Association termination is done as follows:-



Differences b/w SCTP and TCP:-

Parameter.	SCTP	TCP
Multistreaming	✓	×
Selective ACKs	✓	✓
Multihoming	✓	×
Data transfer	More reliable	less Reliable.
Partial data transfer	✓	×

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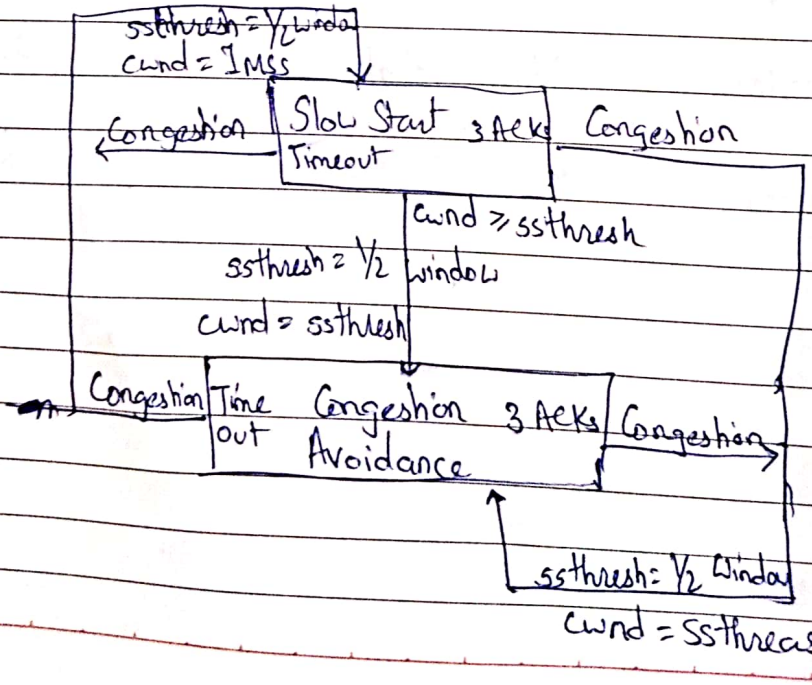
Ans 10: TCP uses a congestion window and congestion policy.

Congestion Policy in TCP:-

1. Slow Start Phase: Starts slowly increment is exponential to threshold.
2. Congestion Avoidance Phase: After ~~se~~ reaching the threshold increment is by 1.
3. Congestion Detection Phase: Sender goes back to Slow start phase or Congestion avoidance phase.

In slow start phase, the size of congestion window increases until it reaches a threshold.
In congestion avoidance phase, the size of congestion window increases additively until congestion is detected.
In congestion detection:-
→ ~~te~~ the detection is by timeout, a new slow start phase begins
→ a new congestion avoidance phase starts if detection is by three ACKs.



Ans 11:

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Ans 11) A proxy server is a server application or appliance that acts as an intermediary for requests from the clients seeking resources from server that provides it.

It acts as a gateway between a device and the internet. It provides levels of security that provides secure connections to various HTTP connections.

Hence, Proxy server is closely linked to accessing HTTP connections in an anonymous, tracking-less and secure manner.

- HTTP allows users to access HTML documents. In a similar fashion FTP allows user to access files and directories in a remote machine.
- HTTP and FTP both use TCP connections.
- While HTTP is a stateless protocol, ~~FTP is a sta~~ FTP is a stateful protocol.
- HTTP is also closely connected to ~~the~~ WWW as all the HTML documents that are accessed using HTTP are hosted on World Wide Web (WWW).
- Hence, WWW is a ~~pl~~ space where HTTP connections gather important ~~im~~ information from.
- Both were initiated in the late 1980s by Tim Berners Lee at CERN to increase efficiency of workflow.