PRACTICE PROBLEMS BASED ON STOP AND WAIT PROTOCOL-

Problem-01:

If the bandwidth of the line is 1.5 Mbps, RTT is 45 msec and packet size is 1 KB, then find the link utilization in stop and wait.

Problem-02:

A channel has a bit rate of 4 Kbps and one way propagation delay of 20 msec. The channel uses stop and wait protocol. The transmission time of the acknowledgement frame is negligible. To get a channel efficiency of at least 50%, the minimum frame size should be-

A. 80 bytes
B. 80 bits
C. 160 bytes
D. 160 bits

Problem-03:

What is the throughput achievable in stop and wait protocol by a maximum packet size of 1000 bytes and network span of 10 km.

Assume the speed of light in cable is 70% of the speed of light in vaccum.

Problem-04:

If the packet size is 1 KB and propagation time is 15 msec, the channel capacity is 10^9 b/sec, then. Find the transmission time and utilization of sender in stop and wait protocol.

Problem-05:

Consider a MAN with average source and destination 20 Km apart and one way delay of 100 μsec. At what data rate does the round trip delay equals the transmission delay for a 1 KB packet?

Problem-06:

Consider two hosts X and Y connected by a single direct link of rate 10^6 bits/sec. The distance between the two hosts is 10,000 km and the propagation speed along the link is 2×10^8 m/sec. Host X sends a file of 50,000 bytes as one large message to host Y continuously. Let the transmission and propagation delays be p milliseconds and q milliseconds respectively.

Problem-07:

The values of parameters for the stop and wait ARQ protocol are as given below-

- Bit rate of the transmission channel = 1 Mbps
- Propagation delay from sender to receiver = 0.75 ms
- Time to process a frame = 0.25 ms
- Number of bytes in the information frame = 1980
- Number of bytes in the acknowledge frame = 20
- Number of overhead bytes in the information frame = 20

Assume that there are no transmission errors. Then the transmission efficiency (in %) of the stop and wait ARQ protocol for the above parameters is _____ . (correct to 2 decimal places)

Problem-08:

A sender uses the stop and wait ARQ protocol for reliable transmission of frames. Frames are of size 1000 bytes and the transmission rate at the sender is 80 Kbps. Size of an acknowledgement is 100 bytes and the transmission rate at the receiver is 8 Kbps. The one way propagation delay is 100 msec.

Assuming no frame is lost, the sender throughput is _____ bytes/sec.

Problem-09:

Using stop and wait protocol, sender wants to transmit 10 data packets to the receiver. Out of these 10 data packets, every 4th data packet is lost. How many packets sender will have to send in total?

Sliding window protocol

Problem-01:

A 3000 km long trunk operates at 1.536 Mbps and is used to transmit 64 byte frames and uses sliding window protocol. If the propagation speed is 6 μsec / km, how many bits should the sequence number field be?

Problem-02:

Compute approximate optimal window size when packet size is 53 bytes, RTT is 60 msec and bottleneck bandwidth is 155 Mbps.

Problem-03:

A sliding window protocol is designed for a 1 Mbps point to point link to the moon which has a one way latency (delay) of 1.25 sec. Assuming that each frame carries 1 KB of data, what is the minimum number of bits needed for the sequence number?

Problem-04:

Host A is sending data to host B over a full duplex link. A and B are using the sliding window protocol for flow control. The send and receive window sizes are 5 packets each. Data packets (sent only from A to B) are all 1000 bytes long and the transmission time for such a packet is 50 μs. Acknowledgement packets (sent only from B to A) are very small and require negligible transmission time. The propagation delay over the link is 200 μs. What is the maximum achievable throughput in this communication?

A. 7.69×10^6 Bps
B. 11.11×10^6 Bps
C. 12.33×10^6 Bps
D. 15.00×10^6 Bps

Problem-05:

Station A uses 32 byte packets to transmit messages to station B using a sliding window protocol. The round trip delay between A and B is 80 msec and the bottleneck bandwidth on the path between A and B is 128 Kbps. What is the optimal window size that A should use?

A. 20
B. 40
C. 160
D. 320

Go Back N Protocol

Problem-01:

A 20 Kbps satellite link has a propagation delay of 400 ms. The transmitter employs the "go back n ARQ" scheme with n set to 10.

Assuming that each frame is 100 bytes long, what is the maximum data rate possible?

A. 5 Kbps
B. 10 Kbps
C. 15 Kbps
D. 20 Kbps

Problem-02:

Consider the Go back N protocol with a sender's window size of 'n'. Suppose that at time 't', the next inorder packet the receiver is expecting has a sequence number of 'K'. Assume that the medium does not reorder messages.

Answer the following questions-

What are the possible sets of sequence numbers inside the sender's window at time 't'. Assume the sender has already received the ACKs.

A. [K-1, K+n-1]
B. [K, K+n-1]
C. [K, K+n]
D. [K+n, K-1]

Part-02:

If acknowledgements are still on their way to sender, what are all possible values of the ACK field in the messages currently propagating back to the sender at a time 't'?

A. [K-n, K-1]
B. [K-1, K-n]
C. [K, K-n]
D. [K-n, K+1]

Station A needs to send a message consisting of 9 packets to station B using a sliding window (window size 3) and go back n error control strategy. All packets are ready and immediately available for transmission.

Problem-03:

If every 5th packet that A transmits gets lost (but no ACKs from B ever get lost), then what is the number of packets that A will transmit for sending the message to B?

A. 12
B. 14
C. 16
D. 18

Problem-04:

In Go back 4, if every 6th packet that is being transmitted is lost and if total number of packets to be sent is 10, then how many transmissions will be required?

Problem-05:

A 1 Mbps satellite link connects two ground stations. The altitude of the satellite is 36504 km and speed of the signal is 3×10^8 m/sec. What should be the packet size for a channel utilization of 25% for a satellite link using go back 127 sliding window protocol?

A. 120 bytes
B. 60 bytes
C. 240 bytes
D. 90 bytes

Problem-06:

Consider a network connecting two systems located 8000 km apart. The bandwidth of the network is 500×10^6 bits per second. The propagation speed of the media is 4×10^6 meters per second. It is needed to design a Go back N sliding window protocol for this network. The average packet size is 10^7 bits. The network is to be used to its full capacity.

Assume that processing delays at nodes are negligible. Then, the minimum size in bits of the sequence number field has to be _____ ?

Selective Repeat Protocol

Problem-01:

The maximum window size for data transmission using the selective repeat protocol with n bit frame sequence numbers is-

A. 2^n
B. 2^{n-1}
C. 2^n-1
D. 2^{n-2}

Problem-02:

In SR protocol, suppose frames through 0 to 4 have been transmitted. Now, imagine that 0 times out, 5 (a new frame) is transmitted, 1 times out, 2 times out and 6 (another new frame) is transmitted.

At this point, what will be the outstanding packets in sender's window?

A. 341526
B. 3405126
C. 0123456
D. 654321

Problem-03:

The selective repeat protocol is similar to Go back N except in the following way-

Frame Formats are similar in both the protocols

A. The sender has a window defining maximum number of outstanding frames in both the protocols
B. Both uses piggybacked acknowledgements where possible and does not acknowledge every frame explicitly.
C. Both uses piggyback approach that acknowledges the most recently received frame

Problem-04:

Consider a 128×10^3 bits/sec satellited communication link with one way propagation delay of 150 msec. Selective Retransmission (repeat) protocol is used on this link to send data with a frame size of 1 KB. Neglect the transmission time of acknowledgement. The minimum number of bits required for the sequence number field to achieve 100% utilization is _____ .

PRACTICE PROBLEMS BASED ON FLOW CONTROL PROTOCOLS-

Problem-01:

In what protocols is it possible for the sender to receive an acknowledgement for a packet that falls outside its current window?

A. Stop and Wait
B. Selective Repeat
C. Go back N
D. All of the above

Problem-02:

In a wireless link, the probability of packet error is 0.2. A stop and wait protocol is used to transfer data across the link. The channel condition is assumed to be independent from transmission to transmission. What is the average number of transmission attempts required to transfer 100 packets?

A. 100
B. 125
C. 150
D. 200

Problem-03:

Compute the fraction of the bandwidth that is wasted on overhead (headers and retransmissions) for a protocol on a heavily loaded 50 Kbps satellite channel with data frames consisting of 40 bits header and 3960 data bits. Assume that the signal propagation time from the earth to the satellite is 270 msec. ACK frames never occur. NAK frames are 40 bits. The error rate for data frames is 1% and the error rate for NAK frames is negligible.

A. 1.21 %
B. 2.12 %
C. 1.99 %
D. 1.71 %

Problem-04:

Consider 1 Mbps error free line. The maximum frame size is 1000 bits. New packets are generated about 1 sec apart. The time out interval is 10 msec. If the ack timer is eliminated. How many times the average message be transmitted?

A. Only once
B. Twice
C. Thrice
D. Can't say

Problem-05:

What is the effect on line utilization if we increase the number of frames for a constant message size?

A. Lower line efficiency
B. Higher line efficiency
C. No change in line efficiency
D. No relation between line efficiency and frame size

Error Detection and correction

Consider the data unit to be transmitted is 10010001 and even parity is used. What code word is transmitted to receiver end.

Problem-01:

A bit stream 1101011011 is transmitted using the standard CRC method. The generator polynomial is x^4+x+1. What is the actual bit string transmitted?

Problem-02:

A bit stream 10011101 is transmitted using the standard CRC method. The generator polynomial is x^3+1.

1. What is the actual bit string transmitted?

2. Suppose the third bit from the left is inverted during transmission. How will receiver detect this error?

PRACTICE PROBLEMS BASED ON CSMA / CD AND BACK OFF ALGORITHM-

Problem-01:

After the k^{th} consecutive collision, each colliding station waits for a random time chosen from the interval-

A. (0 to 2^k) x RTT
B. (0 to 2^k-1) x RTT
C. (0 to 2^k-1) x Maximum Propagation delay
D. (0 to 2^{k-1}) x Maximum Propagation delay

Problem-02:

In a CSMA / CD network running at 1 Gbps over 1 km cable with no repeaters, the signal speed in the cable is 200000 km/sec. What is minimum frame size?

Problem-03:

A 2 km long broadcast LAN has 10^7 bps bandwidth and uses CSMA / CD. The signal travels along the wire at 2 x 10^8 m/sec. What is the minimum packet size that can be used on this network?

A. 50 B
B. 100 B
C. 200 B
D. None of the above

Problem-04:

A and B are the only two stations on Ethernet. Each has a steady queue of frames to send. Both A and B attempts to transmit a frame, collide and A wins first back off race. At the end of this successful transmission by A, both A and B attempt to transmit and collide. The probability that A wins the second back off race is ___ .

A. 0.5
B. 0.625
C. 0.75
D. 1.0

Problem-05:

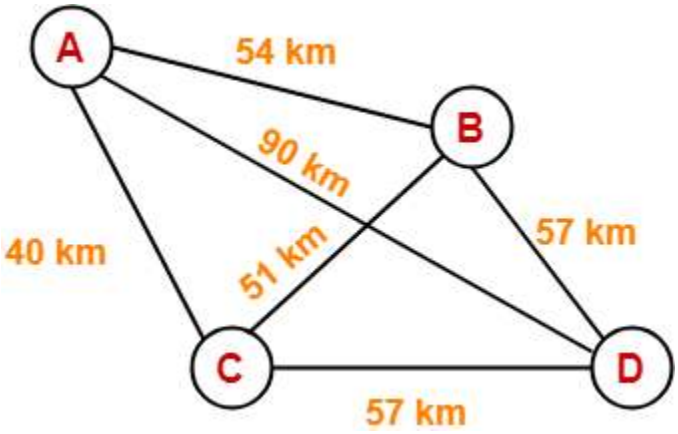
Suppose nodes A and B are on same 10 Mbps Ethernet segment and the propagation delay between two nodes is 225 bit times. Suppose A and B send frames at t=0, the frames collide then at what time, they finish transmitting a jam signal. Assume a 48 bit jam signal.

Problem-06:

Suppose nodes A and B are attached to opposite ends of the cable with propagation delay of 12.5 ms. Both nodes attempt to transmit at t=0. Frames collide and after first collision, A draws k=0 and B draws k=1 in the exponential back off protocol. Ignore the jam signal. At what time (in seconds), is A's packet completely delivered at B if bandwidth of the link is 10 Mbps and packet size is 1000 bits.

Problem-07:

The network consists of 4 hosts distributed as shown below-



Assume this network uses CSMA / CD and signal travels with a speed of 3×10^5 km/sec. If sender sends at 1 Mbps, what could be the minimum size of the packet?

A. 600 bits
B. 400 bits
C. 6000 bits
D. 1500 bits

Ethernet in Networking | Practice Problems

Problem-01:

Which of the following characteristic is most basic to LAN?

A. Bit rate
B. Delay x Bandwidth Product
C. Geographical distance
D. Cost

Problem-02:

On an Ethernet LAN when a collision is detected, the sending station-

A. continues to send the transmission
B. temporarily quits the transmission
C. notifies the destination of an error
D. permanently quits the transmission

Problem-03:

Ethernet implements _____ service for its operation.

A. connection oriented
B. connection less
C. Both A and B
D. Either A or B

Problem-04:

The collision domain of Fast Ethernet is limited to _____ meters.

A. 2.5
B. 25
C. 250
D. 2500

Problem-05:

The efficiency of Ethernet-

A. increases when propagation delay and transmission delay are low
B. increases when propagation delay and transmission delay are high
C. increases when propagation delay is low and transmission delay is high
D. increases when propagation delay is high and transmission delay is low

Problem-06:

What is the baud rate of the standard 10 Mbps 802.3 LAN?

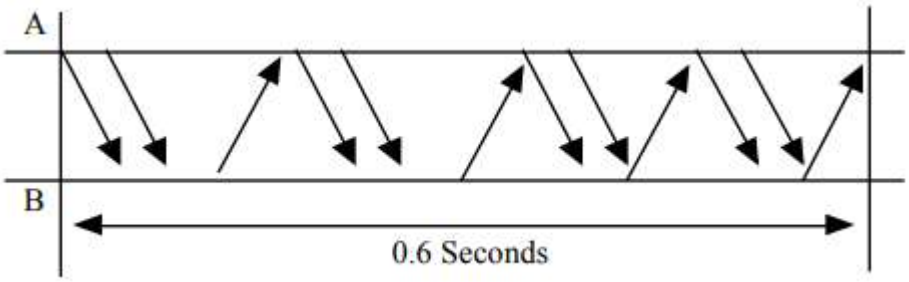
A. 20 mega baud
B. 10 mega baud
C. 25 mega baud
D. 40 mega baud

Problem-07:

Consider a 10 Mbps Ethernet LAN that has stations attached to a 2.5 km long coaxial cable. Given that the transmission speed is 2.3×10^8 m/sec, the packet size is 128 bytes out of which 30 bytes are overhead, find the effective transmission rate and maximum rate at which the network can send data.

Problem-08:

The following frame transition diagram shows an exchange of Ethernet frames between two computers, A and B connected via a 10BT Hub. Each frame sent by computer A contains 1500 B of Ethernet payload data, while each frame sent by computer B contains 40 B of Ethernet payload data. Calculate the average utilization of the media during this exchange.



A. 10%
B. 1.7%
C. 20%
D. 15.2%