Q.1) Max Marks: 1

Consider the binary codeword 001100, 101101, 010101, 101010. The maximum number of bit errors that can be detected by the code using the hamming distance is P . What is the value of P?

A 0

B 1 Correct Option

Solution: (B)

Ans b
To detect d errors the minimum Hamming distance should be d +1.
001100 and 101101 have a hamming distance of 2 because of two bits change.
001100 and 010101 have a hamming distance of 3
001100 and 101010 have a hamming distance of 3
101101 and 010101 have a hamming distance of 3
101101 and 101010 have a hamming distance of 3
010101 and 101010 have a hamming distance of 6
The minimum Hamming distance we found is = 2
=> d +1 = 2 ,
d= 1

C 2

D 3

Q.2) Max Marks: 1

You have 10 users plugged into a hub running 10Mbps half-duplex. There is a server connected to the switch running 10Mbps half-duplex as well. How much bandwidth does each host have to the server?

A 1 Mbps

B 5 Mbps

C 10 Mbps Correct Option

Solution: (C)
Ans C
Explanation: 10mbps, because hub can't? divide bandwidth as per port.
A hub is a lot like a repeater. Any data sent out 1 port is repeated on the other ports.

D 0.9 Mbps

Q.3) Max Marks: 1

In selective repeat protocol, we are sending 10,000 packets in which every 100th packet is lost. How many retransmissions will be there?

A 10199

B 101 Correct Option

Solution: (B)

Ans b
Sol: In selective repeat ARQ we only send the lost packet
For sending packet 0,1,2,3.....100 100* = 101 transmissions takes place.
So For 100 packets = 101 transmissions
For 10000 packets = 10100 transmissions.
Retransmissions will be = 10100 -10000= 100
For 100 retransmission there will be = 1 retransmission
Total retransmission= 101

C 10100

D 100

Q.4) Max Marks: 1

Two computers exchange messages over a link and agree to use a CRC with the generator x^3 +1 to detect errors. One computer wishes to send the message 1001100100001. What remainder should it append to the message?

A R =000

B R =0100

C R =100

D R =001 Correct Option

Solution: (D)

Ans d

Explanation: x^3 +1 = 1001

1001100100001 => XOR
1001
.....
X000100100001
0000
.....
X00100100001
0000
.....
X0100100001
0000
.....
X100100001
1001
.....
X00000001
0000
.....
X0000001
0000
.....
X000001
0000
.....
X00001
0000
.....
x0001
0000
.....
x001

Hence remainder is 001 which will append with message.

Q.5) Max Marks: 1

A link has a bit error rate of 10^{-9}. If bit errors are independent of each other, what is the probability that 1 million bit file will be transferred over the link without error?

A 0.3679 ≈ e-1

B 0.5

C 0.999 Correct Option

Solution: (C)

Ans d

Sol: Probability of having error = bit error rate = 1/10^9= 1 bit error can take place in 10^9 bits.

For , 1 million bits= 1000000/10^9 = .001 probability of having error.

Probability of not having error = 1 - 0.001 = 0.999

D < 0.001

Q.6) Max Marks: 1

Frames of 1000 bits are set over a 1 Mbps channel using a geostationary satellite whose propagation time from the earth is 270 msec. The headers are very sort. Three- bit sequence numbers are used. What is the maximum achievable channel utilization for stop and wait protocol. [correct upto two places of decimals]

A 0.3 %

B 0.18 % Correct Option

Solution: (B)

Ans b

Sol: In stop and wait only one frame is transmitted in round trip time.

Transmission time = data size / BW= 1000 bits / 1 Mbps = 1 m sec

Pt= 270 msec

Ws = 1 (stop and wait)

A = tp/ tt = 270m sec / 1 m sec= 270

efficiency= WS / 1+2a

= 1 / (1 + 2 x 270) => 1 / 541 = 0.18 %

C **1 %**

D **0.6 %**

Q.7) Max Marks: 1

A 1000 byte message is sent over the network using a protocol stack with HTTP, SSL, TCP, IP, and WiFi. Each protocol header is 20 bytes long. What percentage of the network bandwidth "on the wire" is spent carrying protocol headers? [Write your answer correct up to two places of decimal.

Correct Answer

Solution: (9.09)
Ans 10
Sol: For every protocol, we are adding 20 bytes.
We have 5 protocols, total header size = nH= 5 x 20 =100 bytes.
Total message size = M + nH = 1100
We are wasting 100 bytes with data size 1100bytes= 100/ 1100= 0.0909 = 9.09 %

Q.8) Max Marks: 1

For what purpose preamble is used in the ethernet frame format 802.3?

A **To indicate the starting of the frame to the receiver**

B **For providing ICMP error control in the frame**

C **To synchronize the receiver clocks of the devices in network** Correct Option

Solution: (C)
Ans c
Explanation: The preamble consists of a 56-bit (seven-byte) pattern of alternating 1 and 0 bits, allowing devices on the network to easily synchronize their receiver clocks, providing bit-level synchronization. It is followed by the SFD to provide byte-level synchronization and to mark a new incoming frame.

D **None of the above**

Q.9) Max Marks: 1

A link has a transmission speed of 500 × 10^6 bpsec. Assume acknowledgment has negligible transmission delay, and it's one way propagation delay is 2 sec. Also assumes that the processing delays at nodes are also negligible. If data packet size is 10^7 bits, then the efficiency of Go-Back-7 protocol is _____ (in %) [Correct upto two places of decimals].

Correct Answer

Solution: (3.48)

Ans 3.48
Explanation: Tp = 2 sec

Tt = Packet Size / Bw
= 10^7 bits / 500 * 10^6 bits per sec
= 0.02 sec

a= Tp/Tt = 2 / 0.02 = 100

Efficiency = W / 1+2a
= 7 / (1 + 2 * 100)
= 0.0348
= 0.0348 * 100
= 3.48%

Q.10) Max Marks: 1

A 1500 byte packet is sent from your home to a server. It is first sent over a 6 Mbps cable link. Once it has been received completely, it is then sent over a 100 Mbps ISP link. The propagation delay of the cable link is 1 ms and the propagation delay of the ISP link is 10 ms. How long in millisec does it take for the packet to reach the server ? [correct upto two places of decimal.]

Correct Answer

Solution: (13.12)

Ans 13.12

Sol: Total delay to reach server= Tt (Cable link) + PT cable link + Tt(ISP link) + PT(ISP link)

Tt (Cable link) = 1500 * 8 bits / 6 Mbps = 2 ms

PT (Cable link)= 1 ms

TT(ISP link) = 1500 * 8 bits / 100 Mbps = 0.12 ms

Pt(ISP link) =10 ms

Total delay = 2 + 1 + 0.12 + 10 = 13.12 ms

Q.11) Max Marks: 2

In a CSMA/CD network we require TRANSMISSION >2 PROPAGATION because:

A. PROP is the round-trip time from a source to the destination and back again. Therefore, it must be at least twice the one way propagation delay

B. Otherwise, the signal would degrade too much along the wire making it difficult to detect collisions

C. The sender needs to unambiguously determine that a packet encountered a collision before it finishes transmitting the packet — Correct Option

Solution: (C)
Ans C
Explanation: To capture a channel or to determine collision it will take 2 propagation time. After 2 propagation time sender will ensure that there is no collision. So before finish transmitting the packet the sender should determine the collision.

D. In any network (regardless of whether we use CSMA/CD or not) the transmission time of a packet is a function of both the data rate, and speed of propagation along the wire

Q.12) Max Marks: 2

A Go-Back-3 ARQ scheme is employed on a 200 meters cable between two nodes A and B to send frames of size 10,000 bits with bit rate 1 Mbps. Headers are of 10 bytes and acknowledgements are of 10 bits. The header is considered as external overhead. The Speed of propagation of signals on the cable is 200 km/s, and the processing delay is 11ms. What will be the efficiency in percentage? [Correct up to two places of decimal]

Correct Answer

Solution: (87.50%)

Sol: Window size x (useful time/Total time)

Useful time = Tt without overhead= data size/ BW = (10000 - 80) / (1 x 10 ^6) = 9.92 ms

TT with overhead = 10 ms

TT ack = 10/10^6 = .01 ms

PT = Dist/ speed = 200m/200km/s = 1 ms

Processing time = 11 ms

=3 x [(9.92)/(Tt overhead + PT +Processing delay + TT ack + PT + Processing delay)]

=3 x [(9.92)/ (10 + 1 + 11+ 0.01 +1 +11)]= 87.50 %

Q.13) Max Marks: 2

1-km-long, 10-Mbps CSMA/CD LAN (not 802.3) has a propagation speed of 200 m/µsec. Repeaters are not allowed in this system. Data frames are 256 bits long, including 32 bits of header, checksum, and other overhead. The first bit slot after a successful transmission is reserved for the receiver to capture the channel in order to send a 32-bit acknowledgement frame. What is the effective data rate, excluding overhead, assuming that there are no collisions?

A. 4.3 Mbps

3.8 Mbps — Correct Option

B

Solution: (B)

Sol. Propagation time = L/V= 1000m/ 200* 10^8 = 5.0 mu sec

The round-trip propagation time of the cable is 10 µsec which is also the cable seizes time.

Transmission time data= datasize/BW= 25.6 mu sec

Transmission time ACK= 32 bits / BW = 3.2 mu sec

A complete transmission has six phases: 1. Transmitter seizes cable (10 µsec)

2. Transmit data (25.6 µsec)

3. Propagation time data (5.0 µsec)

4. Receiver seizes cable (10 µsec)

5. Acknowledgement transmission time (3.2 µsec)

6. Propagation time ACK (5.0 µsec) The sum of these is 58.8 µsec.

In this period of 58.8 mu sec, 224 data bits are sent, for a rate of about 3.8 Mbps.

C **5 Mbps**

D **5.7 Mbps**

Q.14) Max Marks: 2

Consider a network connecting two systems located 3000 kilometers apart. The bandwidth of the network is 100 Mbps. The propagation speed of the media is 2/3 of the speed of light in vacuum. It is needed to design selective repeat sliding window protocol for this network. The average packet size is of 10 Kb. 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 ?

Correct Answer

Solution: (10)

Ans 10

Sol: Propagation delay(Tp)= distance/ speed = 3000 Km/ 2 x 10^8 m/s = 15 m sec

Transmission delay(Tt)= datasize/ BW= 10 x 10^3 bits / 100 x 10 ^6 bps= 0.1 ms

a = Tp/ Tt= 15 / 0.1= 150

For network full capacity the efficiency should be 100 %.

Efficiency = WS/ (1 +2a)

1 = WS/(1 + 2 x 150)

WS = 301

Min number of sequence number for selective repeat = 2 x WS=602

The number of bits needed for 602 seq number = $log_2 602$ = 10 bits

Q.15) Max Marks: 2

Suppose that an 11-Mbps 802.11b LAN is transmitting 64-byte frames back-to-back over a radio channel with a bit error rate of 10−7. How many frames per second will be damaged on average? [Take the floor value of the result]

Correct Answer

Solution: (1)

Sol: A frame contains= 64 x8 = 512 bits. The bit error rate is p = 10^-7.

In 512 bits the error rate= 512 x 10^-7 = 5.15 x 10^-5

The number of frames/sec is = BW/ frame size=11 × 10^6 /512 = 21,484.375 frames

For 21484.375 frame the error rate= 21484.375 x 5.15 x10^-5 = 1.10= 1 approx

So on an average 1 frame will be damaged.

close