21. Given the maximum lifetime of a segment is 30 sec and the link capacity is 500Mbps, find the no. of bits required to avoid wrap-around during this time.

(A) 10 bits (B) 23 bits
(C) 30 bits **(D) 34 bits**

Ans: Option D
Explanation:
Given time = 30 sec, Bandwidth B = 500 Mbps
In 1 sec ------ 500 Mb
Therefore, 30 sec ----- $30 * 500 * 10^6 = 15 * 10^9$ bits
No. of bits required to avoid wrap-around = $\text{ceil}(\log_2 (15*10^9))$ bits
= ceil(33.804) bits = 34 bits

22. A 40 Mbps broadcast network that controls medium access using polling has 20 hosts, and the time required for polling the next host is 80 µsec. Whenever a node is polled, it is allowed to transmit 4000 bytes. Find the efficiency of the broadcast channel

(A) 100/9 (B) 100/11
(C) 80/7 **(D) 10/11**

Ans: Option D
Explanation

Given B = 40 Mbps
L = 4000 bytes

Trans = L / B = 4000*8 bits / $40*10^6$ bits/sec = 800 µsec

Efficiency = $\frac{Trans}{Trans + PollingTime}$

= 800 µsec / (800 + 80) µsec

= 10/11

23. Suppose ‘A’ and ‘B’ are on the same 10Mbps Ethernet segment, and the propagation delay between two nodes is 275-bit times. Suppose A and B are on two ends of the wire and try to send a frame at time t=0, and frames collide. Then, at what time (in bits) they finish transmitting a jam signal? Assume a 48-bit jam signal.

(a) 598 **(b) 323**
(c) 502 (d) 227

Solution: Option B
Explanation:

Time taken to send the jam signal is => Tp + Tt of 48-bit jam signal, i.e 48-bit times
=> (275 + 48) =323 bit times

Data Linked Type Question: Q.19 and Q.20

24. A 3000 km long trunk operates at 1.536 Mbps and is used to transmit 64-byte frames. If it uses sliding window protocol, then what are the number required sequence numbers? Assume a propagation speed of 8 microsec/ km.

(a) 63 (b) 110
(c) 123 **(d) 145**

Solution: Option D
Explanation:

Distance = 3000 km, Bandwidth = 1.536 Mbps
Packet size = 64 bytes, Propagation speed = 8 μsec / km
For 1 km, propagation delay (Tp) = 8 μsec
For 3000 km, propagation delay = 3000 x 8 μsec = 24000 μsec
Transmission delay (T_t) = Packet size / Bandwidth = 64 bytes / 1.536 Mbps
= (64 x 8 bits) / (1.536 x 10^6 bits per sec) = 333.33 μsec
Let's take the efficiency=100%
We know that, Efficiency = N ⁄ (1+2a)
1 = N / ((1+2*(24000 ⁄ 333.33)), N=145

25. What is the number of sequence bits used in the above question (Number of bits used for sequence number)?

Solution: 8
Explanation:

Bits required in sequence number field

$= \lceil \log_2(145) \rceil$

= 8 bits

26. If 'K is the maximum number of bits available in the sequence number field, then what is the maximum sender window size in GBN?

(a) 2^K -1 (b) 2^{K-1} (c) 2^K (d) 2^{K+1}

Solution: Option (a)

the formula for GBN = $2^K - 1$

27. If the Bandwidth of an Ethernet is 100Mbps, the distance of the LAN is 1Km, and the velocity of the signal in the cable is $2*10^8$ m/sec. Then what is the minimum size of a frame in this Ethernet to detect collisions?

(a) 10,000 bits **(b) 1000 bits** (c) 100 bits (d) 1000 bytes

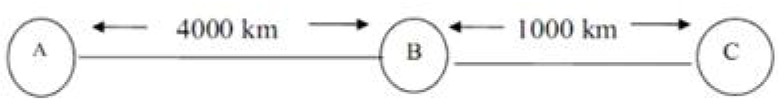
Solution: Option (b)
Explanation:

Ttrans = 2 * Tprop

=>L/ B =2* v/d

=>L=2* d/v * B =2*1000 / $2*10^8$ *100*10^6 =1000 bits

28. Consider the following figure. The data rate between A and B is 100 kbps. The propagation speed is 5μsec/km for both lines. Frames are generated at node A and sent to node C through node B and each frame is 1000 bits long. Between A and B, a sliding window protocol is used, with a window size of 3. Between B and C, stop and wait is used. Determine the minimum transmission rate required between nodes B and C so that the buffers at node B are not flooded. (ACK frames are of negligible length)



A. 100Kbps B. 125Kbps
C. 150Kbps D. 175Kbps

Answer: Option C

Explanation:
To avoid flooding buffers at B, the incoming frame count should be equal to the outgoing frame count.
A to B: Tp = 4000* 5 μsec = 20 msec
Tt per frame = 1000/(100*10^3) = 10 msec.
B to C: Tp = 1000* 5 μsec = 5 msec
Tt per frame = x = 1000/B;
A can transmit 3 frames to B and then must wait for the ack of the first frame before transmitting additional frames. The first frame takes 10 msec to transmit; the last bit of the first frame arrives at B 20 msec after it was transmitted(Tp). It will take an additional 20 msec for B's ack to return

to A. Thus, A can transmit three frames in 50 msec.
B can transmit one frame to C at a time. It takes 5 + x msec for the frame to be received at C and an additional 5 msec for C's ack to return to A. Thus, B can transmit one frame every 10 + x msec or three frames every 30 + 3x msec.
To avoid buffering: 30+3x=50; x= 6.66 msec and B = 1000/x = 150 kbps.

29. If the Packet size is 2 KB and the propagation delay is 16 ms, the channel capacity is 10^6 bps. The utilization of sender for STOP and WAIT (in percentage) is _________.

A. 33.33 B. 30.03 C. 43.33 D.23.33

Answer: Option A
Explanation:

W is the window size of the sender and a = (Propagation delay/ Transmission delay)

For STOP and WAIT protocol window size of sender = 1
Hence

$$\eta = \frac{1}{1+2a} = \frac{1}{1+2\left[\frac{16\text{ ms} \times 10^6}{2 \times 10^3 \times 8}\right]} = \frac{1}{1+2[1]} = 33.33\%$$

30. A channel has a bit rate of 10 Kbps using stop and wait protocol with 80% efficiency. What will be the propagation delay for a frame of 400 bits?

A. 2ms **B. 5ms** C. 7ms D. 10ms

Answer: Option B
Explanation:

Given bit rate 10 Kbps
10 Kb in 1 sec => transmission time for 400 bits = 40ms
Utilization = 0.8 = 40/(40+2*Tp) => Tp = 5ms