1. A building running CSMA-CD protocol has a bandwidth of 512 Mbps and a distance of 2 kilometres, and then the minimum data size is determined in order to detect a collision. Assume that the signal speed is 2,00,000 km/s

(A) 1000 bytes
(B) 1250 bytes
(C) 1280 bytes
(D) 1024 bytes

Answer: Option C
Explanation :

Bandwidth B = 512 Mbps = $512*10^6$ bits/sec
Distance d = 2 km
Speed of signal V = 2,00,000 km/s = $2 * 10^5$ km/s

For CSMA – CD, to detect a collision, Ttrans >= 2 *Tprop

Propagation delay Tprop = Distance/Speed of signal
= 2 km / ($2*10^5$ km/sec)
= 10^{-5} sec
Transmission delay Ttrans = Size of data / Bandwidth
= L / ($512*10^6$ bits/sec)
Since, Ttrans >= 2*Tprop

L = $2 * 10^{-5}$ sec * $512 * 10^6$ bits/sec = 10240 bits = 1280 bytes

2. Calculate the latency (from the first bit sent to the last bit received) of a 10-Mbps Ethernet with a single store-and-forward switch in the path and a packet size of 5000 bits. Assume that each link introduces a propagation delay of 10 μs and that the switch begins retransmitting immediately after it has finished receiving the packet.

A. 0.51 ms
B. 10.02 ms
C. 1.02ms
D. 5.1ms

Answer: Option C

Explanation:

Each line has a Tt = L/B = 5000 bits / 10 Mbps = $5*10^{-4}$s.
Tp =$10*10^{-6}$ s = 10^{-5}s.
There are 2 links, so the latency is 2*Tt + 2*Tp = $1.02*10^{-3}$s.

3. A transmission channel operates at 10 kbps bandwidth. Distance between two Stations in the channel are 2 km. Assume that the speed of propagation of a bit is 200 m/sec. What is the frame length if stop-and-wait ARQ is used with 50% efficiency?

A. **25 KB** B. 50 KB C. 100 KB D. 200 KB

Answer: Option A

Explanation:

Efficiency = 1 / (1 + 2a), where a = Tp / Tt

0.5= 1/(1+2a) => a = 1/2

Therefore, (Tp)/Tt = 1/2

=>(d/v) / (L/B) = 1/2

$L = 2\times (2\times10^3) / 200\times10\times10^3 \Rightarrow L = 25$ KB

4. Suppose a 10 Mbps microwave link exists between a geostationary satellite and its base station on Earth. The satellite takes a digital photo every minute and sends it to the base station. Assume a propagation speed of $2.4*10^8$ meters/sec. Let x denote the size of the photo. What is the minimum value of x for the microwave link to be continuously transmitting? Assume a geostationary satellite is 36,000 kilometres away from the earth's surface.

A. 6 Mbits B. 4 Mbits **C. 3 Mbits** D. 5 Mbits

Answer: Option C

Explanation:

To send continuously, the transmission time should be equal to the propagation time.

Tt = 2 * Tp

Length of packet / Bandwidth = 2 * distance / velocity

Length of packet = (2 * distance * Bandwidth) / velocity

$= (2 * 36000*10^3 * 10*10^6)/ (2.4 * 10^8)$

= 3 Mbits

5. Consider a 10-Mbps Ethernet LAN that has stations attached to a 205 km long coaxial cable. Given that the transmission speed is 2.3×10^8 m/s in a coaxial cable, find out the system's throughput and take the packet size as 128 bytes.

A. 2.1Mbps B. 1.1Mbps **C. 0.19Mbps** D. 1.20Mbps

Answer: Option C

Explanation:
In ethernet lan, efficiency=1/(1+6.44a)
a = Propagation time / Transmission time
Propagation time = distance/velocity = 205km/($2.3*10^8$m/sec) = $0.8*10^{-3}$sec

Transmission time=L/B =128 bytes/10Mbps = $0.1*10^{-3}$sec
Efficiency= $1/(1+6.44(0.8*10^{-3}/0.1*10^{-3}))$ =0.019
Throughput = Efficiency*BW = 0.019*10Mbps =0.19Mbps

6. A user in Ireland, connected to the internet via a 100 Mbps connection, retrieves a 250 KB web page from a server in London, where the page references three images of 500 KB each. Assume that the one-way propagation delay is 75 ms and that the user's access link is the bandwidth bottleneck for this connection. Then, approximately how long does it take for the page (including images) to appear on the user's screen?((for this part, you should ignore queueing delays and transmission delays at other links in the network))
Assume all the objects are requested in a single request.

A. 150 ms   B. 290 ms   C. 140 ms   **D. 215 ms**

Answer: Option D

Explanation :

Total data = 250 + 500 + 500 + 500 = 1750 KB

Total time = Response transmission time(Tres) + Propagation time(Tp).

Tres = L/B = $1750*8*10^3/100*10^6 = 140*10^{-3}$ sec
Tp = $75 * 10^{-3}$ Sec

⇒ $140*10^{-3}$ sec + $75 * 10^{-3}$ Sec = 215 ms

7. A channel has a data rate of 4 kbps and a propagation delay of 20 ms. What should be the frame size for stop-and-wait protocol to give an efficiency of at least 50%?

A. **20 bytes**   B. 10 bytes   C. 120 bytes   D. 40 bytes

Answer: Option A
Explanation:

Bw = 4 kbps, Tp = 20ms, Efficiency = 50%
Efficiency = 1/(1+2a)

0.5 = 1/1+2a
a = 0.5
Tp/Tt = 0.5
10 ms = 0.5*L / B
10 ms*4kpbs = 0.5 L
L=20 bytes

8. Consider a 100 Mbps ethernet with a maximum distance of 400 meters. What is the smallest packet length for which you can achieve an efficiency of 80%? Assume velocity is equal to the speed of light.

A. 2022 bits **B. 3200 bits** C. 1520 bits D. None

Answer: Option B

Explanation:

Given B = 100 Mbps, D = 400 meters, V = 3 * 10^8 m/s

⇒ T propagation = D/V = (4/3)*10^{-6} sec

⇒ T transmission = L/B = L/10^8 sec

⇒ a = T propagation / T transmission = (4/3)*10^{-6} / (L/10^8) =

⇒ Efficiency = 1/(1+2a) = 80/100, where a = T propagation / T transmission

⇒ L / (L + 800) = ⅘

⇒ L = 3200 bits

9. Consider two hosts, A and B, connected by a single link of Bandwidth 512 Mbps.

Suppose that a distance of m meters separates both hosts, and the propagation speed along the link is 2*10^9 meters/sec. Host A is to send a packet of size 1kb to Host B. What will be the distance m so that the propagation delay is equal to the transmission delay?

(A) 4 km (B) 3 km (C) 5 km (D) 2 km

Answer: Option A
Explanation

Given in, Transmission delay = Propagation delay
According to formula
L/B=m/V
m=(L/B)*V=(1024/512*10^6)*2*10^9

93. If the transmission time is 1 ms and the propagation time is 1.5 ms, what is the efficiency of stop and wait protocol?
(A) 0.25 (B) 0.05 (C) 0.30 (D) 0.50

Answer: Option A
Explanation:

Efficiency formula is 1/1+2a, a=Tp/Tt

1/1 + 2*1.5 =1/4=0.25

10. If the packet size is 5000 bits, the rate of the channel is four kbps, and the distance between hosts is 20 km. The speed of propagation over the transmission media is 200 m/s. Calculate the link utilisation for stop and wait flow control mechanism.
(A) 0.61 (B) 0.63 **(C) 0.62** (D) 0.64

Answer: Option C
Explanation

Tt=5000/4*10^3=5/4 Sec Tp=20*10^3/200=100 sec

Now Link utilisation = 1/1+2a { a=Tp/Tt =(100/5)*4=80}

=1/1+2*80=1/161=0.62