Homework 2 Solution

1. In CSMA/CD, after the fifth collision, the value of K lies within the range {0, 1, 2, …, 2^5-1} and this value may be anything within this range. So, the probability that a node choose K=10 is
   $1/2^5-1 = 1/32 = 0.03125$ *Answer.*
   Now, we know the delay is K.512 bit times.
   For a 10 Mbps Ethernet link 512 bit times = $512 / 10x10^6 = 51.2$ μs.
   So, the delay is = 10 x 51.2 μs [where K=10]
   = 512 μs *Answer*.

3. Given that the CSMA/CD network is running 100 Mbps over a 1-km cable with no repeaters.

   The signal speed in the cable is 400000 km/sec.

   a. i. End-to-End propagation delay = cable length / signal speed in the cable
   = 1 km / 400000 s = 2.5 μs *Answer*

   ii. Worst-case collision detection time, t is equal to 2 x 2.5 μs that is 5 μs *Answer*

   iii. Minimum frame size:

   We know that t = L/R [Where t = 5 μs, R = 100 Mbps]

   So, minimum frame size, $L = t \times R = 5 \times 10^{-6} \times 100 \times 10^6 = 500$ bits *Answer.*

   b. If we increase the bandwidth from 100 Mbps to 1 Gbps, the End-to-End propagation delay and Worst-case collision detection time will be unchanged. However, in the case of 100 Mbps and 1 Gbps the minimum frame sizes will be 5 x 100 = 500 bits and 5 x 1000 = 5000 bits respectively.