ECE 363 Spring 2026 Assignment 3 Solutions

Q:1   for a 1 km cable the one-way propagation time is

$$1 \text{km} / 200,000 \text{ km/s} = 5 \mu \text{sec}$$

so $2\tau = 10 \mu \text{sec}$

for CSMA/CD to work it must be impossible to transmit an entire frame in this interval

at 1Gbps all frames shorter than 10,000 bits can be completely transmitted in under 10 μsec

thus the minimum frame size is

10,000 bits or 1250 bytes

Q.2   the minimum Ethernet frame size is

64 bytes

since the header fields and checksum
occupy 18 bytes and the packet length
is 60 bytes   the total frame size is

60 + 18 = 78 bytes

which exceeds the minimum

so no padding is needed

Q.3   a frame contains 512 bits

the bit error rate is $p = 10^{-7}$

the probability that all 512 are received correctly is

$$(1-p)^{512} = .9999488$$

so the fraction damaged is about

$$5 \times 10^{-5}$$

the number of frames per second is

$$\frac{11 \times 10^{6}}{512} = 21484$$

$$21484 \times 5 \times 10^{-5} \approx 1 \text{ damaged frame}$$
per second

Q 4   802.11 a LAN

           SIFS 16 μsec
           CTS 40 μsec
           Data 252 μsec
           Ack 40 μsec

RTS   Duration field

SIFS + CTS + SIFS + Data + SIFS + Ack

   = 16 + 40 + 16 + 252 + 16 + 40 = 380 μsec
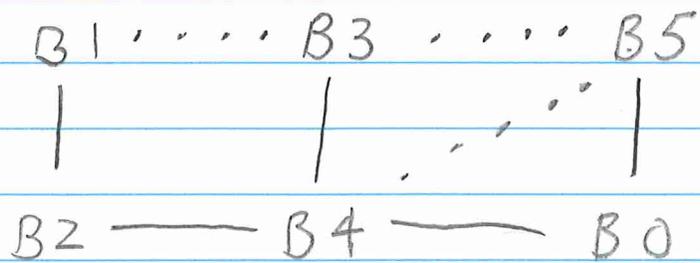
CTS   Duration field

   SIFS + Data + SIFS + Ack

   16 + 252 + 16 + 40 = 324 μsec

Q.5   B on port 4
        D on port 1
        F on port 2
        6 on port 3

Q.6   all transmissions except

        C sends a frame to B

        will cause a broadcast

Q7

B1 · · · · B3 · · · · B5

B2 —— B4 —— B0

other solutions are possible due to ties