CS118 Homework 1

Prithvi Kannan UID: 405110096

Problem 1

a. $100 Mbps/10 Mbps = 10 users$

b. 25 %

c. $P(x = n) = \binom{100}{n} * 0.25^n * (1 - 0.25)^{100-n}$

d. $P(x \geq 21) = \sum_{n=21}^{100} \binom{100}{n} * 0.25^n * (1 - 0.25)^{100-n}$

Problem 2

a. There is no delay for the first packet. The 2nd packet has L/R, followed by packets of delay 2L/R, 3L/R, and so on.

$$\overline{delay} = \frac{L+2L+3L+...+(N-1)L}{R}$$

$$\overline{delay} = \frac{L(1+2+3+...+(N-1))}{R}$$

$$\overline{delay} = \frac{L(N-1)}{2R}$$

b. The answer is the same as part a. Each transmission takes $\frac{LN}{R}$ time so the buffer will be empty when N packets arrive.

Problem 3

$$delay = time_{toll} + time_{travel}$$

a. 5 cars in caravan

$$time_{toll} = 5cars * 3booths * 12seconds = 3mins$$

$$time_{travel} = 2 * \frac{50km/h}{100km} = 60mins$$

$$time_{total} = 63mins$$

b. 8 cars in caravan

$$time_{toll} = 8cars * 3booths * 12seconds = 4.8mins$$

$$time_{travel} = 2 * \frac{50km/h}{100km} = 60mins$$

$$time_{total} = 64.8mins$$

Problem 4

$$time_{processing} = \frac{1s}{64Kbps} * \frac{8bit}{1byte} * 56bytes = 0.007sec$$

$$time_{trans} = \frac{1s}{2Mbps} * \frac{8bit}{1byte} * 56bytes = 0.00022sec$$

$$time_{prop} = 0.01sec$$

$$time_{total} = 0.007 + 0.00022 + 0.01 = 0.017sec$$

Problem 5

$$time_{link} = 50TB * \frac{8*10^{12}b}{TB} * \frac{1s}{2Gbps} = 56 hours$$

$$time_{overnight} = 24 hours$$

Overnight delivery is the preferred option since it is much faster.