

ENEL 573 - Assignment #3

Kyle Derby MacInnis - Oct 16, 2015
- 100539559 -

Q10

$$L_F = 4000 \text{ bit}$$

$$R = 2 \text{ Mbit/s}$$

a) (2) frame duration \rightarrow consecutive

$$P[\text{Frame arriving}] = \frac{(2G)^n e^{-2G}}{n!}$$

over 2 frames

$n = 2$ \leftarrow collision requires 2 frames.

$$T_F = \frac{L_F}{R} = \frac{4000 \text{ bit}}{2^{20} \text{ bit/s}}$$

$$= 0.0038147 \text{ sec}$$

$$= 3.81 \text{ ms}$$

$G = [\# \text{ of units of } T_F]$

$$\frac{(2(2))^2 e^{-2(2)}}{2} = \frac{16 e^{-4}}{2}$$
$$= 8 e^{-4}$$

$$P = 0.1465$$
$$= 14.65\%$$

b)

$$P_2 = 1 - P[\text{No error}]$$

$$= 1 - 4 e^{-4}$$

$$= 1 - e^{-4}$$

$$= 0.9817$$

$$= 98.17\%$$

$$P_y = 1 - P[\text{no Error}]$$

$$= 1 - 8^0 e^{-8}$$

$$= 0.999$$

$$= 99.9\%$$

c)

$$\text{Throughput} = G e^{-2G}$$

(in frames)

$$G=2 \rightarrow 2e^{-4} \rightarrow 0.0366 (3.66\%)$$

$$G=4 \rightarrow 4e^{-8} \rightarrow 0.0013 (0.13\%)$$

$$3.66\% (2 \text{ Mbits}) = 38377 \text{ Bits/sec}$$

$$0.13\% (2 \text{ Mbits}) = 1407 \text{ bits/sec}$$

Q2:

Pure Aloha:

$$\text{Throughput} = G e^{-2G}$$

$$\frac{dT_h}{dG} = e^{-2G} - 2G e^{-2G}$$

$$0 = e^{-2G} (1 - 2G)$$

$$(1 - 2G) = 0$$

$$G = 0.5$$

Stated Along α (roughly) Twice the efficiency
of regular Alpha.

$$T_n = G e^{-\alpha}$$

$$\frac{dT_n}{d\alpha} = e^{-\alpha} - G e^{-\alpha}$$

$$0 = e^{-\alpha}(1 - G)$$

$$\boxed{G = 1}$$

Q3:

$$e^{-\alpha}$$

Q4: