

# Solutions on Selected Problems in Chapter 3

P. 3.1: bit length = propagation speed.  $\frac{1}{BW}$

a)  $\frac{2 \times 10^8 \frac{m}{sec}}{10 \times 10^6 \frac{bits}{sec}} = 20 \frac{meters}{Bit}$

b)  $\frac{2 \times 10^8 \frac{m}{sec}}{100 \times 10^6 \frac{bits}{sec}} = 2 \frac{meters}{Bit}$

c)  $\frac{2 \times 10^8 \frac{m}{sec}}{10^9 \frac{bits}{sec}} = 0.2 \frac{meters}{Bit}$

P. 3.6:  $500 \times 1 \mu m = 500 \mu m$

P. 3.7: a)  $\frac{1 bit}{0.001 sec} = 1000 bps$

b)  $\frac{1 bit}{0.002 sec} = \frac{1000}{2} bps = 500 bps$

c)  $\frac{10 bit}{20 \times 10^{-6} sec} = \frac{10^6}{2} bps = 500000 bps$

P. 3.8:  $\frac{10^6 bits}{5 \times 10^3 \frac{bits}{sec}} = 200 sec$

P. 3.11:  $\frac{8 bits}{16 \times 10^{-9} sec} = 5 \times 10^8 bps$

P. 3.12: a)  $\frac{10 bits}{1000 bps} = 0.01 sec$

b)  $\frac{8 bits}{1000 \frac{bits}{sec}} = 0.008 sec$

c)  $\frac{100000 \times 8 bits}{1000 \frac{bits}{sec}} = 800 sec$

P. 3.15. a)  $\frac{3000000 \times 8 \text{ bits}}{56000 \frac{\text{bits}}{\text{sec}}} = 428 \text{ sec}$

b)  $\frac{3000000 \times 8 \text{ bits}}{1000000 \frac{\text{bits}}{\text{sec}}} = 24 \text{ sec}$

P. 3.16. a)  $2 \times 10^{-3} \frac{\text{sec}}{\text{sec}} \times 10^6 \frac{\text{bits}}{\text{sec}} = 2000 \text{ bits}$

b)  $2 \times 10^{-3} \frac{\text{sec}}{\text{sec}} \times 10^7 \frac{\text{bits}}{\text{sec}} = 20000 \text{ bits}$

c)  $2 \times 10^{-3} \frac{\text{sec}}{\text{sec}} \times 10^8 \frac{\text{bits}}{\text{sec}} = 200000 \text{ bits}$

P. 3.32:  $\frac{10^6 \times 8 \text{ bits}}{2 \times 10^5 \frac{\text{bits}}{\text{sec}}} = 40 \text{ sec}$

P. 3.33

Total queuing time =  $10 \times 2 \mu\text{s} = 20 \mu\text{s} = 0.00002 \text{ sec}$

Total processing time =  $10 \times 1 \mu\text{s} = 10 \mu\text{s} = 0.00001 \text{ sec}$

Transmission time =  $\frac{5 \times 10^6 \text{ bits}}{5 \times 10^6 \frac{\text{bits}}{\text{sec}}} = 1 \text{ sec}$

Propagation time =  $\frac{2000 \times 10^3 \text{ m}}{2 \times 10^8 \frac{\text{m}}{\text{sec}}} = 0.01 \text{ sec}$

Latency =  $1 + 0.01 + 0.00002 + 0.00001 = 1.01003 \text{ sec}$

The dominant part is Transmission time, it is a huge packet.