Chapter 18
solutions

1] $\frac{5}{.002} = 2500$ channels

likewise,

$\frac{5}{.003} = 1667$ channels

3] $\frac{2048 \text{ channels}}{25 \times 10^{-6} s} = 81.92$ MHz

4) 4096 channels $= 2^{12}$

so we need 12 stages

6] a) $\tau = \frac{N}{\nu} + B$

$N = 300$ $B = 2.5\ \mu s$ ν = frequency

$\tau = \frac{300}{80 \times 10^6} + 2.5 \times 10^{-6} = 6.25\ \mu s$

b) $\tau = \frac{220}{80 \times 10^6} + 2.5 \times 10^{-6} = 5.25\ \mu s$

r_{obs} for non-paralyzable systems

$r_{obs} = \frac{r_{true}}{r_{true}\tau + 1}$ $\tau(r_{obs})$ = fractional dead time

6) b) $5.25 \times 10^{-6}\,s \left(\frac{4872}{s}\right) \Rightarrow 2.58\%$

$5.25 \times 10^{-6}\,s \left(\frac{48721}{s}\right) \Rightarrow 25.58\%$

c) Actual = dead + live

$(1 - .02558)$ Actual = live

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$$\text{Actual} = \frac{600}{1 - .02558} = 615.8 \text{ secs}$$

$$\text{Actual} = \frac{600}{1 - .2558} = 806.2 \text{ secs}$$

9) For a Poisson statistical process

$$\delta n_1 = \sigma_1 = \sqrt{n_1} = \sqrt{300} = 17.32$$

for each channel

$$n_R = n_1 - n_2$$

$$\delta n_R = \sqrt{\sigma_1^2 + \sigma_2^2} = \sqrt{600}$$

Expected Deviation in a typical channel = **24.49**