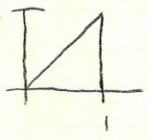
2.1

$f(t) = t \quad 0 \le t \le 1$



$$F(t) = \frac{1}{2\pi}\int_0^1 t e^{-int}\,dt \qquad u = t \quad dv = e^{-int}dt$$

$$du = dt \quad v = \frac{e^{-int}}{-in}$$

$$= \frac{1}{2\pi}\left[-\frac{te^{-int}}{in}\Big|_0^1 - \int_0^1 \frac{e^{-int}}{-in}\,dt\right] = \frac{1}{2\pi}\left[-\frac{te^{-int}}{in} + \frac{e^{-int}}{n^2}\right]_{t=0}^{t=1}$$

$$= \frac{1}{2\pi}\left[\left(\frac{-e^{-in}}{in} + \frac{e^{-in}}{n^2}\right) - \left(\frac{0}{in} + \frac{e^0}{n^2}\right)\right] = \frac{1}{2\pi}\left[\frac{ie^{-in}}{n} + \frac{e^{-in}-1}{n^2}\right]$$

2.2

Max data Rate $= \underbrace{2B}_{1000} \log_2 V$ bit/sec $=$ 1 k b/s

(V: binary = 2)

Max BPS $= B\log_2(1+S/N) = 1000\log(1+30) =$ 4.95 kbps

2.3

MBPS $= 2B\log_2 V$ $\quad B = 6M$, $V = 4$ $\quad = 2\cdot 6M \log_2 4 =$ 24 MBPS

2.4

$B\log_2(1+\frac{S}{N}) = 3k\log_2(21) =$ 13.18 KBPS

2.5

T1 $\rightarrow$ 1.544 MBPS $= 50k\log_2(1+\frac{S}{N})$

$\frac{S}{N} = 2^{\frac{1.544M}{50K}} - 1 =$ 7.456 SNR

2.9

The Nyquist theorem applies to all signal processing regardless of cable type.

2.10

$\lambda = c/f \qquad f = c/\lambda = 2.998\,M/0.01 =$ 299.8 MHz

$= 2.998M/5 =$ 599.6 KHz

2.15

$B = 2BW \log_2 V$ $\quad \frac{B}{2\log_2 V} = BW$

NRZ- $BW = \frac{B}{2\log_2 2}$ ← $V=2$, binary levels

MLT-3- $BW = \frac{B}{2\log_2 3}$ ← $V=3$, trinary levels

Manch- $BW = \frac{1}{2}\frac{B}{2\log_2 2}$ $V=2$, binary levels, $\frac{1}{2}$ compared to others because it switches twices as fast.

2.22

QPSK- $V=4$ $\log_2 sps = bps$ $= 1200 \cdot 2 = \underline{2400 \text{ bps}}$

2.23

$\log_2 V = 4$ data bits

1200 baud · data bits = bps = $\underline{4800 \text{ bps}}$

2.25

channels

$4600 \times 10 = 40{,}000 \text{ Hz} > \underline{43{,}600 \text{ Hz}}$

$400 \times 9 = 3600 \text{ Hz}$

↑ # guards