

Name: KEY

Sec. 1

- 1) Data at a rate of 5 kbits/s is to be transmitted over a leased line of bandwidth 4 kHz using Nyquist criterion pulses. Determine the maximum value of roll-off factor r that can be used.

$$B = \frac{R}{2} + r \frac{R}{2}$$

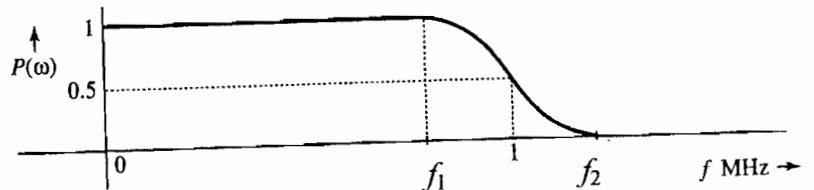
$$4 \cancel{\text{kHz}} = \frac{5 \cancel{\text{kbps}}}{2} + r \frac{5 \cancel{\text{kbps}}}{2}$$

$$8 = 5 + 5r$$

$$3 = 5r$$

$$r = \frac{3}{5} = 0.6$$

- 2) A pulse $p(t)$ whose spectrum $P(\omega)$ is shown in the figure satisfies the Nyquist criterion. If $f_1=0.9$ MHz and $f_2=1.1$ MHz, determine :
- the roll-off factor.
 - the maximum rate at which binary data can be transmitted by this pulse using the Nyquist criterion.



a)
$$r = \frac{\omega_x}{B_{\text{min}}} = \frac{1.1 - 1}{1} = 0.1$$

b)
$$B = \frac{R}{2} + r \frac{R}{2} \Rightarrow R = \frac{2B}{(1+r)}$$

$$R = \frac{2(1\text{M})}{1.1} = \frac{2\text{M}}{1.1} = 1.818 \text{ M } \frac{\text{bit}}{\text{sec}}$$