

## Sheet 3 Inter-symbol Interference

### Problem 1

A computer puts out binary data at the rate of 56 Kbps. The computer output is transmitted using a base-band binary PAM system that is designed to have a raised-cosine spectrum. Determine the transmission bandwidth required for each of the following roll-off factors:  $\alpha = 0.25, 0.5, 0.75, 1$

### Problem 2

A binary PAM wave is to be transmitted over a baseband channel with an absolute maximum bandwidth of 75 KHz. The bit duration is  $10 \mu\text{s}$ . Find a raised-cosine spectrum that satisfies these requirements.

### Problem 3

A pulse  $p(t)$  whose spectrum  $P(f)$  is shown in Fig. 1 satisfies Nyquist's criterion. If  $f_1 = 0.8 \text{ MHz}$  and  $f_2 = 1.2 \text{ MHz}$ , determine the maximum rate at which binary data can be transmitted by this pulse using Nyquist's criterion. What is the roll-off factor?

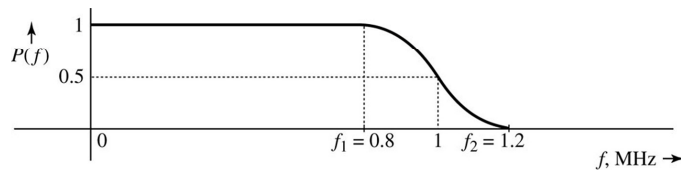


Fig. 1

### Problem 4

Binary data at a rate of 1 Mbps is to be transmitted using Nyquist criterion pulses with  $P(f)$  shown in Fig. 1, the frequencies  $f_1$  and  $f_2$  of the spectrum are adjustable. The channel available for transmission of this data has a bandwidth of 700 KHz. Determine  $f_1$ ,  $f_2$ , and the roll-off factor.