Problem 6.2

Show that for positive frequencies, the area under the normalized raised-cosine curve of $P(f)/(\sqrt{E}/2B_0)$ versus f/B_0 is equal to unity for all values of the roll-off factor in the range $0 < \alpha \leq 1$. A similar statement holds for negative frequencies.

Solution

For $\alpha = 0$,the normalized raised-cosine curve reduces to the idealized Nyquist channel, for which the area under this curve for the frequencies is immediately seen to be unity. For nonzero values of α in the range $0 < \alpha < 1$, the raised-cosine curve is odd-symmetric about the value $P(f)/(\sqrt{E}2B_0) = 0.5$. Consequently, the area under this normalized curve remains equal to unity for positive frequencies.