Digital Communication: UE20EC254

IV Sem ECE, PESU: Jan-May 2022

Project 1: Pulse shaping with Nyquist pulses

In this project, you need to generate and plot the time response and the frequency response for pulse shaping with raised cosine and triangular spectra.

Steps:

1. Set $R_b = 100$ Hz and $T_{max} = 10T_b$. You can use $Tr = 0.001$ as the time resolution for plotting $p(t)$.
2. Generate the pulse $p(t)$ corresponding to the raised cosine spectrum

$$p(t) = \begin{cases} \frac{\text{sinc}(R_b t)\cos(\pi\alpha R_b t)}{1-4\alpha^2 {R_b}^2 t^2} & -T_{max} \leq t \leq T_{max} \\ 0 & \text{elsewhere} \end{cases}$$

3. Find $P(f)$. Plot $p(t)$ and $P(f)$ for $\alpha = 0$, $\alpha = 0.5$ and $\alpha = 1$. Note the bandwidth in each case.
4. Repeat with $3T_b$. Note the effect of truncating $p(t)$ on $P(f)$ as α varies.
5. Repeat with $p(t) = \text{sinc}^2(R_b t)$. Note the effect of truncating $p(t)$ on $P(f)$ in this case too.
6. Plot $p(t)$ and $P(f)$ for the following cases:
   - Raised cosine pulse shaping with $\alpha = 0$ and $T_{max} = 10T_b$
   - Raised cosine pulse shaping with $\alpha = 0$ and $T_{max} = 3T_b$
   - Raised cosine pulse shaping with $\alpha = 0.5$ and $T_{max} = 10T_b$
   - Raised cosine pulse shaping with $\alpha = 0.5$ and $T_{max} = 3T_b$
   - Raised cosine pulse shaping with $\alpha = 1$ and $T_{max} = 10T_b$
   - Raised cosine pulse shaping with $\alpha = 1$ and $T_{max} = 3T_b$
   - $sinc^2$ pulse shaping with $T_{max} = 10T_b$
   - $sinc^2$ pulse shaping with $T_{max} = 3T_b$