Assignment 3

Due on 2020-10-14, 23:59 IST.

Task 1: In the context of the DSB-SC modulation scheme, discuss the carrier phase offset and its implications on the received signal. Explain how the phase offset can be compensated for in the receiver.

Task 2: A signal $\text{s}(t)$ is transmitted using DSB-SC modulation. The baseband representation of the signal is $\text{s}(t) = A \cos(2\pi ft - \theta)$. Derive the expression for the received signal $\text{r}(t)$ and explain how the phase offset $\theta$ can be estimated from the received signal.

Task 3: Consider a DSB-SC system with a carrier frequency $f_c$. If the transmitted signal is $\text{s}(t) = A \cos(2\pi ft - \theta)$, derive the expression for the received signal $\text{r}(t)$ when a phase offset $\Delta\theta$ is introduced.

Task 4: In a DSB-SC system, if the transmitted signal is $\text{s}(t) = A \cos(2\pi ft - \theta)$ and the received signal is $\text{r}(t) = A \cos(2\pi ft - \theta + \Delta\theta)$, derive the expression for the recovered signal $\hat{\text{s}}(t)$ after demodulation. Explain how the phase offset $\Delta\theta$ can be estimated from the recovered signal.

Task 5: A DSB-SC system transmits a signal $\text{s}(t) = A \cos(2\pi ft - \theta)$ with a phase offset $\Delta\theta$. The received signal is $\text{r}(t) = A \cos(2\pi ft - \theta + \Delta\theta)$. Derive the expression for the recovered signal $\hat{\text{s}}(t)$ after demodulation and explain how the phase offset $\Delta\theta$ can be estimated from the recovered signal.