Indian Institute of Space Science and Technology
AVD623 - Assignment 4
Department of Avionics

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1. Read "Synchronization" from Chapter 6 of Simon Haykin and do the following problems

   (a) Problems 6.47, 6.48, 6.49, and 6.50

2. Suppose $x(t)$ is a real valued signal for which the Fourier transform $X(f)$ exists. Then prove that $X(f) = X^*(-f)$, where $X^*(f)$ is the complex conjugate of $X(f)$.

3. Read about the Hilbert transform and show the following

   (a) Suppose $\mathcal{H}(x(t))$ is the Hilbert transform of $x(t)$, then show that $\mathcal{H}(\mathcal{H}(x(t)))$ is $-x(t)$ (1 mark).

   (b) Suppose $x(t)$ is a real valued signal. Show that $x(t)$ and its Hilbert transform $\mathcal{H}(x(t))$ are orthogonal (2 marks). Two signals $x(t)$ and $y(t)$ are orthogonal if $\int_{-\infty}^{\infty} x(t)y(t)dt = 0$.

4. Reading assignment: Complex baseband representation from Appendix 2 of Simon Haykin