CARLETON UNIVERSITY

Department of Systems and Computer Engineering

SYSC 4600 – Digital Communications – Quiz 2 – Fall 2016

Professor H. Yanikomeroglu **13 October 2016** **100 pts, 20 mins**

Name: **Student #:** **E-mail:**

Power Spectral Density (PSD): Consider a binary signaling scheme in which the transmitted signal is in the following form:

$$x(t) = \sum_{k=-\infty}^{\infty} a_k h_{TX}(t - kT - T_o).$$

In the above, $\{a_k\}$ is a sequence of equally-likely and uncorrelated -1's & 1's, T is the bit duration, T_o is a random phase, and $h_{TX}(t)$ is a rectangular pulse such that $h_{TX}(t) = A$, when $0 \le t < T$, and $h_{TX}(t) = 0$, otherwise.

It is shown in the lectures that the PSD of such a signaling scheme can be given as

$$S_X(f) = \frac{1}{T}\left|H_{TX}(f)\right|^2.$$

a) Sketch the transmitted signal for the following sequence: ..., -1, 1, 1, -1, ...
b) Sketch $S_X(f)$.
c) Write the expression for $S_X(f)$.

Assume that the rate in this transmission scheme is R = 1 Mbits/sec, and that the channel is an ideal low-pass filter with BW = 3 MHz.

d) Sketch PSD at the output of the channel, $S_Y(f)$.
e) Sketch (approximately) the received signal for the transmitted sequence ..., -1, 1, 1, -1, ... (ignore the noise).