CARLETON UNIVERSITY

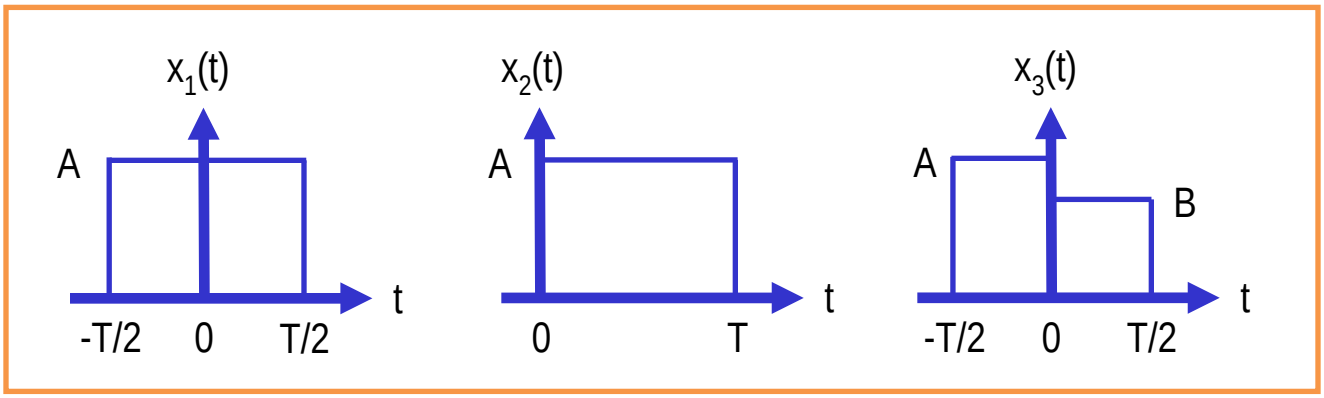
Department of Systems and Computer Engineering

SYSC 4600 **Digital Communications** **Fall 2016**

Assignment 2 H. Yanikomeroglu

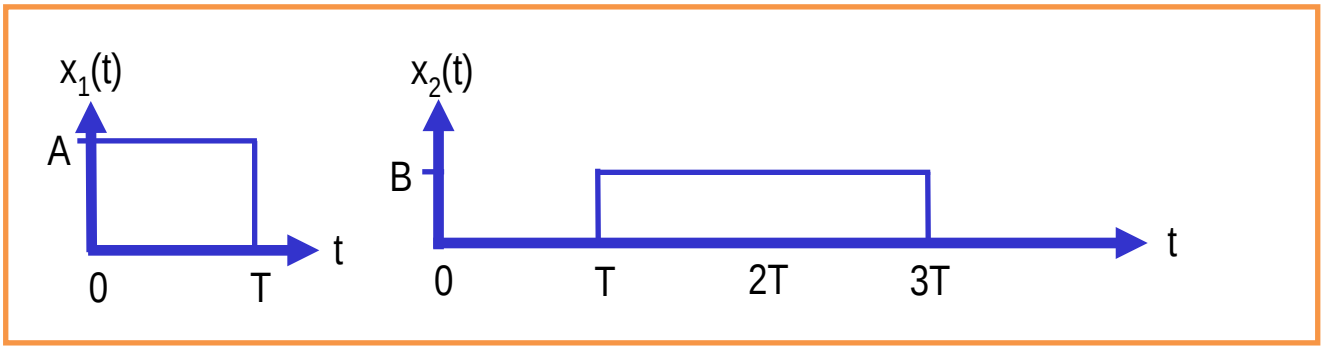
Posted on: **Tuesday, 20 September 2016**
Due on : **Will not be collected (for studying purposes only)**

Q1. Fourier Transforms



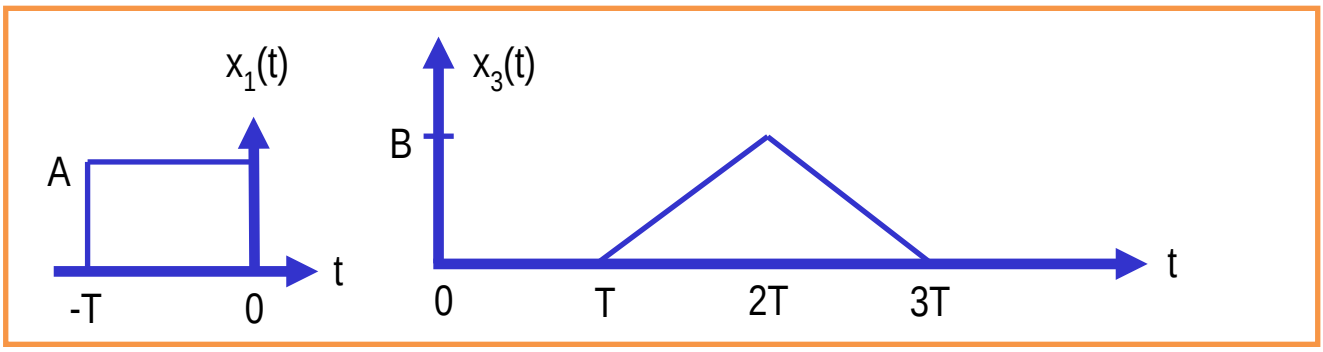
- Find and sketch $X_1(f)$.
- Find and sketch $X_2(f)$.
- Find and sketch $X_3(f)$.

Q2. Convolution



- Sketch $x_1(t)*x_2(t)$.
- Sketch $x_2(t)*x_1(t)$.

Q3. Convolution, Energy



- If $x_1(t)*x_2(t) = x_3(t)$, sketch $x_2(t)$.
- Find the energy of $x_1(t)$.
- Find the energy of $x_3(t)$.

Q4. Probability

X is a uniform random variable in the range [0, 4].

- Find m_1 (first moment = mean).
- Find m_2 (second moment = mean square).
- Find σ_X (standard deviation).

Q5. BER Calculation in a 2-Path Wireless Channel

A large file composed of 0`s and 1`s is to be transmitted through a wireless channel. Binary 1 is represented by the rectangular function *x(t)* with amplitude *A* and duration [0, *T*]; binary 0 is represented by *-x(t)*.

Consider a wireless channel modelled as an LTI (linear, time-invariant) system with an impulse response $h(t) = a\delta(t) + a\delta(t-T)$, where *a* is a constant and *T* is the bit duration.

Assume that there is no background noise. Find the probability of bit error at the output of the receiver detector.

Q6. Sinusoidals

- Sketch $\cos(2\pi f_c t - \pi/4)$.