

**Faculty of Engineering and Technology**

**Department of Electrical and Computer Engineering**

Communication Systems ENEE 339

Instructor: Dr. Wael Hashlamoun

Midterm Exam

First Semester 2017-2018

Date: Wednesday 29/11/2017 Time: 75 minutes

Name: Student #:

**Opening Remarks:**

* Calculators are allowed, but mobile phones, books, notes, formula sheets, and other aids are not allowed.
* You are required to show all your work and provide the necessary explanations everywhere to get full credit.

**Problem 1: 25 Points**

The Fourier transform of a signal g(t) is given by:

1. Find the absolute bandwidth of g(t)
2. Find the equivalent rectangular bandwidth of g(t).
3. Use the time-bandwidth relationship to find the equivalent effective time duration of g(t)
4. The signal is passed through an ideal low pass filter with bandwidth W, find the filter output.

**Problem 2: 25 Points**

The message signal along with the carrier signal are applied to an upper single sideband modulator to generate the modulated signal s(t):

1. Find the average power of m(t).
2. Find the bandwidth of m(t)
3. Find the time-domain expression of the modulated signal s(t).
4. Explain how m(t) can be recovered from s(t) without distortion. Use a block diagram to illustrate your method.

**Problem 3: 25 Points**

The Fourier transform of a message m(t) is given as:

This message is applied to a double sideband modulator along with the carrier to produce the modulated signal

1. Find the message m(t).
2. Find the time-domain representation of s(t)
3. Find and sketch , the Fourier transform of .
4. Find the transmission bandwidth
5. If is applied to an ideal envelope detector, find its output.

**Problem 4: 25 Points**

Consider the FM signal . The FM modulator sensitivity is . The modulated signal is passed through an ideal bandpass filter with bandwidth 500 Hz centered at the carrier frequency Hz to produce the signal

1. Find the instantaneous frequency of
2. Find the message m(t)
3. Find the peak frequency deviation of .
4. Find the filter output
5. Find the fraction of the power contained in to that in .

Good Luck







