# gmBirzeit University

Faculty of Engineering and Technology

Department of Electrical and Computer Engineering

Communication Systems ENEE 339

Midterm Exam

# Instructors: Dr. Wael Hashlamoun, Dr. Mohammad Jubran Date: April 23, 2017

**Problem 1: 25 Points**

The Fourier transform G(f) of a signal g(t) is given as:

$G\left(f\right)=\left\{2A -W\leq f\leq W A W\leq \left|f\right|\leq 2W 0 \left|f\right|>2W \right\}$

1. Find the absolute bandwidth of g(t)
2. Find the energy in g(t).
3. If g(t) is passed through an ideal low pass filter with bandwidth 3W/2, find the energy in the signal at the filter output.
4. Use the table of Fourier transform pairs at the end of the exam to find g(t).

**Problem 2: 25 Points**

The message sign$ m\left(t\right)=2coscos \left(2π40t\right) +4 cos(2π80t)$alalong with the carrier signal$c\left(t\right)=4coscos \left(2π1000t\right) $ are applied to a modulator that generates the double sideband suppressed carrier signals(t)

1. Find the average power of m(t).
2. Find the time-domain expression of the modulated signal s(t).
3. Find the bandwidth of the transmitted signal in Hz.
4. Draw the block diagram of the demodulator used to recover m(t) from s(t) without distortion specifying the details of each block

**Problem 3: 25 Points**

The message $m\left(t\right)=0.3coscos \left(2π500t\right) $is applied to a normal amplitude modulator with a sensitivity ka= 0.2/V and a carrier$c\left(t\right)=10coscos \left(2π10000t\right) $to produce the signal$s\left(t\right)=A\_{c}coscos \left(2πf\_{c}t\right)(1+k\_{a}m(t)) $

1. Find the modulation index.
2. Find the average power in the carrier and in each of the sidebands.
3. Find the power efficiency

**Problem 4: 25 Points**

Consider the FM signal $s\left(t\right)=10cos⁡[2π(10000)t+1.2sin2π\left(200\right)t]$

1. Find the instantaneous frequency of $s\left(t\right)$
2. Find the peak frequency deviation of $s\left(t\right)$.
3. Find the 90% power bandwidth of $s\left(t\right)$.

Good Luckzxzzzzz