**An-Najah National University**

**جامعة النجاح الوطنية**

**كلية الهندسة**

**قسم الهندسة الكهربائية**

**Faculty of Engineering**

**Department of Electrical Engineering**

**Electrical Engineering Department**

**Principle of communications (69322)**

**First exam**

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| **Instructor Name: Falah Mohammed** | **Student name:** |
| **Academic Year:2011/2012** | **Registration number:** |
| **Semester: spring** | **Serial number:** |
| **Credit Hours: 3** | **Section** |
| **Date: Monday, October 22, 2012** | **Total exam marks 20** |
| **Exam Duration:50 minutes** | **Exam weight 20** |

*Exam Notes:*

1. Close Books & Notes.
2. Read each problem carefully before attempting to solve it.
3. Write all work on this exam paper.

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| **Question** | **Marks** | **ILO’s** | **ILO’s %** | **Question grade** | **Required time** |
| **Q1** | **8** | **2** | **100%,** |  | 15 minutes |
| **Q2** | **6** | **1** | **100%** |  | 15 minutes |
| **Q3** | **6** | **2** | **100%** |  | 20 minutes |
| **Student grade** |  | 50 minutes |

Good Luck

1. (ILOs 2) 8 pts

An AM modulator has an output of $ϕ\_{AM}\left(t\right)=100cos4000πt+10cos3600πt+10cos4400πt$.

1. Find the modulation index of the AM modulated signal
2. Determine the power of the AM modulated signal
3. Sketch the resulting line spectrum
4. Determine the bandwidth required for the transmission of this AM signal
5. How much is the carrier amplitude that is required to obtain an efficiency of 20%?

1. (ILOs 1) 6 pts

A given message signal has the magnitude spectrum as shown in Figure 1. If this signal is multiplied by a cosine carrier whose carrier frequency is $f\_{c}$

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Figure

1. What is the minimum frequency of the carrier that can be used?
2. Sketch the resulting magnitude spectrum
3. Can this signal be demodulated by using an envelope detector?
4. Sketch the block diagram of the synchronous detector
5. (ILOs 2) 6 pts

A communication system operates at frequencies between 450 and 950 kHz with a channel bandwidth of 20 kHz. A super-heterodyne receiver is used with IF frequency equals to 235 kHz.

1. Draw a block diagram for the super-heterodyne receiver
2. Suggest the range of frequencies for the local oscillator
3. Determine the range of the image frequencies
4. Suggest a new IF frequency to remove the unwanted image frequencies