كلية التقنية الالكترونية
College of Electronic Technology - Tripoli

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Department of Communications Engineering

Final Exam: Fall Semester — **7th Semester**
Subject: Wireless Communication System — **Examination Time: 120 Minutes**
Date: 4th of March 2020 — **Examiner: Dr. Masoud Eddaghel**

Q.1/ [4 marks]

1. Draw the block diagram of wireless communication system?
2. What is the function of each transmitter stages?

Q.2/ [8 marks] Explain

1. Free-space pathloss model.
2. Okumura model.
3. Narrowband system.
4. Wideband system.

Q.3/ [10 marks] Users require high data rate, which leads to exploit high order modulation levels (M) such as MFSK, MASK and MQAM modulation schemes.

1. What is main advantage of MFSK scheme compared with MASK and MQAM schemes?
2. What is main disadvantage of MFSK compared with MASK and MQAM schemes?
3. What is main advantage of MQAM scheme compared with MFSK scheme?
4. What is main disadvantage of MASK scheme compared with MQAM scheme?
5. If the system has limitation in BW (relatively low BW), and it needs to provides high data rate, which modulation scheme should be used?

Q.4/ [26 marks] A wireless system with a carrier frequency, fc = 1800 MHz and based on MIMO system contains of **2** transmit antennas and **3** receive antennas. This system works in faded channel.

1. Draw the block diagram of this system.
2. Draw the schematic diagram of this system.
3. Find the received equations r_i of this system.

4. Find out the channel matrix H and H^H.
5. Find $H^H H$.
6. Find estimated received signals $s^{\wedge}$.
7. Identify this practical wireless system.
8. Determine the distance (cm / m) between transmitted antennas.
9. Identify the expected physical size of this transmitter.
10. If the SNR = 20 dB & channel gains coefficients $|h_{11}|^2$=0.9, $|h_{12}|^2$=1.5, $|h_{13}|^2$=1.2, $|h_{21}|^2$=1, $|h_{22}|^2$=2 and $|h_{23}|^2$=1, find the normalized capacity of this system.
11. If the BW = 10KH. Find the maximum possible data rate.
12. Find all possible modulation levels (M) which can be used in this system?
13. What is the diversity gain of this system?

Q.5/ [12 marks] Nominate at least one practical wireless network based on:

1. FDM system.
2. TDM system.
3. CDM system
4. OFDM system.
5. The channel is modelled as AWGN channel.
6. The channel is modelled as frequency selective channel.

Good Luck