كلية التقنية الالكترونية

College of Electronic Technology - Tripoli

Department of Communication Engineering

Final Exam: Spring Semester — **7th Semester**

Subject Wireless Communication System — **Examiner: Dr. Masoud Eddaghel**

Date: 26th of July 2018 — **Examination time: 120 Minutes**

Q.1/ [8 marks] Explain

a) MIMO system.
b) Alamouti STC Technique.
c) Narrowband channel.
d) Wideband channel.

Q.2/ [24 marks] For a BFSK, 8ASK and 16QAM modulation schemes, operating with an information bit rate 1024 *kbps*.

a) Draw the BASK modulator and coherent mutilator.
b) Find the symbol rate (baud) for all schemes.
c) Find the BW for all schemes.
d) Find the BW efficiency for all schemes.
e) Which modulation scheme is not recommended to use in wireless communications? Why?
f) Draw the constellation points for all schemes.
g) If the channel BW=10kHz, find the Nyquist capacity for all modulation schemes.
h) Find SNR, which is needed for each modulation scheme.

Q.3/ [14 marks] A MIMO system contains of 2 transmit antennas and 5 receive antennas.

a) Draw the block diagram of this system.
b) Draw the schematic diagram of this system over flat fading channel.
c) Find the received equations r.
d) Find out the channel matrix H and H^{H}.
e) Find $H^{H}H$.

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f) Find estimated received signals.

g) What is the diversity gain of this system?

Q.4/[14 marks] A 4G wireless communication system based on an OFDM system with 1024 subcarriers uses IDFT/DFT algorithm and exploits 16QAM modulation scheme.

a) Draw the simple block diagram of this OFDM system (Transceiver).

b) Why OFDM chosen as multiple access in 4G wireless communication systems?

c) What is the function of cyclic prefix in OFDM system?

d) What is the condition of cyclic prefix?

e) Find the number of arithmetic operations, which are needed in this system.

f) What is the main disadvantage of this system?

g) Find the maximum bit rate of this system.

Good luck

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Date: 8th of February 2018 — **Examination time: 120 Minutes**

Q1/ [6 marks]

a) Draw the block diagram of digital communication system.
b) What are the challenges of wireless communication system?
c) Defined the diversity and what its goal?
d) What are the performance evaluation criteria of wireless system?
e) What is the BER reference of wireless system?
f) What is the function of Matched filter?

Q.2/ [8 marks] For an 8PSK and BFSK schemes, operating with an information bit rate 64 *khps*.

a) Draw the BFSK modulator.
b) Find the symbol rate (baud) for both schemes.
c) Find the BW for both schemes.
d) Find the BW efficiency for both schemes.
e) Which scheme has efficient BW?
f) Draw the constellation points for both schemes.
g) Which scheme has higher BER?
h) Which scheme has higher data rate?

Q3/ [22 marks] A practical wireless system operating with carrier frequency, fc= 900 MHz. This system exploiting SIMO scheme with one transmit antenna and four receive antennas. Assuming the system is working in faded channel.

a) Draw the schematic diagram of this SIMO system.
b) Find the received equations r.
c) Find out the channel matrix H and H^H.
d) Find HHH.
e) Find estimated received signal.
f) Determine the distance (cm / m) between receive antennas.
g) Identify the expected physical size of this receiver.
h) What is the main disadvantage of this system? Where is it use?
i) If the SNR = 20 dB & channel gains =1, find the normalized capacity of this system.
j) If the BW = 4KH. Find the maximum possible data rate.
k) How many signalling levels (M) are required for a modulation scheme?

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Q4/ [20 marks] A MIMO system contains of two transmit antennas and four receive antennas.

a) Draw the block diagram of this system.
b) Draw the schematic diagram of this system over flat fading channel.
c) Find the received equations r.

d) Find out the channel matrix H and HH.

e) Find HHH.

f) Find estimated received signal.
g) What is the diversity gain of this system?
h) If the SNR = 20 dB & channel gains =1, find the normalized capacity of this system.
i) If the BW = 4KH. Find the maximum possible data rate.
j) How many signalling levels (M) are required for a modulation scheme?

Q5/ [4 marks]

a) Draw the block diagram of coded SISO-OFDM system.
b) What are the advantages of OFDM system?

Good luck