
King Fahd University of Petroleum & Minerals

Department of Electrical Engineering EE577 Wireless and Personal Communications

Quiz Number 2 (April 29, 2006)

Time 20 minutes

Student name

ID#

Question 1

A binary baseband digital communication system uses different pulse shapes for binary 0 and binary 1. These are shown below.



Figure 1 Pulse shapes for Binary

(a) Draw matched filters for binary 0 and binary 1

Matched filter for binary 0

Matched filter for binary 1

(b) Draw the receiver block diagram indicating the types of filters used.

(c) If the energy of the two pulses is the same, does the pulse shape make any difference to the error rate?

Question 2

In a coherent PSK receiver, the phase recovery circuit was accidentally disabled. What will be the impact on the errors? Circle the appropriate answer.

- (a) No impact on the BER (b) A reduction in BER (c) An increase in BER

Question 3

It is said that the transmission bandwidth is reduced if we convert the binary signaling to M-ary format. This increases the data rate but with a cost. What should we do in order to achieve the same bit error rate in the two cases?

- (a) Increase the signal power (b) Decrease the signal power (c) do nothing

Question 4

Which of the following digital modulation schemes have constant envelope?

- a. ASK
- b. FSK
- c. MSK
- d. $\pi/4$ -QPSK
- e. GMSK (3dB bandwidth and bit duration $BT=0.5$)
- f. QPSK (The roll-off factor of a raise-cosine shaping filter=0.5)
- g. All of the above

Question 5

Explain essential differences between FDMA, TDMA, and CDMA in the following aspects:

(i) System capacity

(ii) Level of security

Question 6

(a) The analog cellular systems are designed for a signal to interference ratio of 18 dB, while the digital cellular system require S/I of 14 dB. If the base stations of the two systems use the same transmit power, which system will use smaller channel reuse distance.? Defend your answer.

(b) What is the impact of the channel reuse factor on the system capacity?

Question 7

(a) It is said that FDM and TDM systems have hard capacity limits while CDMA is known to have a soft capacity limit. Explain why.

(b) In a digital cellular system using DS-CDMA transmission system, the nominal capacity is say 40 users. However, because of some emergency a hot spot developed and the number of simultaneous users increased to 45. What was the impact of this increased number on the quality of service to all users?

Question 8

Explain the terms and essential differences between the following terms used in Multiple Access systems: (a) Modulation efficiency, (b) spectral efficiency, (c) bandwidth efficiency, and (d) frame efficiency.