

Assignment 4

Due Wednesday, May 13. Show your work. Submit your assignment using the appropriate dropbox on the course web site. Assignments submitted after the solutions are made available will be given a mark of zero.

Question 1

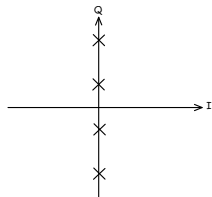
An RF channel has a bandwidth of 5 MHz. What is the maximum allowable bandwidth of a baseband modulating signal if we want to ensure the bandwidth of the modulated signal does not exceed the channel bandwidth? Assume QAM modulation is being used.

Question 2

What would be the phase and magnitude of the carrier if a 16-QAM 802.11 WLAN symbol with bit values 1011 (ls to ms bit order) was being transmitted? Assume the maximum amplitude of this signal is $\sqrt{18}$.

Question 3

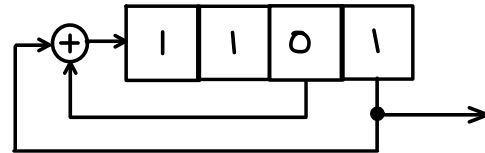
(a) How many bits per symbol can be transmitted using the following constellation:



(b) Assign Gray-coded bit values to each of the four possible symbols.

Question 4

The following diagram shows a ML PRBS generator. The squares represent the shift register flip-flops (FFs) whose contents are shifted to the right once per bit. The XOR gate computes the new value of the leftmost FF. The ML sequence is the sequence of values in the rightmost FF.



- (a) What is the length of ML sequence generated?
 (b) The current output, as shown is 1. What is the value of the next output? The one after that? Compute the values of the next four output bits (a total of 5 starting with the current output of '1'). Show the successive values of the shift registers.

Question 5

A system uses TDMA to share a channel between users. Each user transmits a block of 200 bits every 20 ms at a rate of 350 kb/s. There is a 20 μ s guard time between each time slot. How many users can this system accommodate? Round your answer down to the nearest whole number.

Question 6

Which of the types of ARQ that we studied in this course gives the best performance, regardless of complexity or cost?

Question 7

Write out the contents of an IP header for a packet with a payload length of 512 bytes (decimal). Assume the following: IPv4, no Options field, an Identification field value of 0x1000, no fragmentation (flags and offset of 0), a TTL of 16 (decimal), the ICMP protocol, source address of 1.1.1.1 and destination address of 2.2.2.2.

Give your answer as 20 hexadecimal byte values, identify the field name for each set of bytes within the header. You must calculate the correct value for the header checksum.