KING FAHD UNIVERSITY OF PETROLEUM & MINERALS
COLLEGE OF COMPUTER SCIENCES & ENGINEERING

COMPUTER ENGINEERING DEPARTMENT

COE-342 – Data and Computer Communication
October 7th, 2002 – Assignment
(Due Date: October 21th, 2002)

1) We want to implement a packet-voice transmission. To do this we build an electronic board that groups bits arriving at 64 kbps into packets of 48 bytes. The packets are sent over a 230 km transmission line to a second board. The second board converts the packets into a 64 kbps bit stream. We assume that the packets are transmitted as soon as they are formed and that the second board converts each packet back into the bit stream as soon as it is fully received. The propagation time along the transmission line is 1 ms. What is the delay faced by the bit stream between the input of the first board and the output of the second board?

2) To transmit packets with virtual-circuit transport, we set up a virtual-circuit and then we transmit the packets. The network is lightly loaded, and our packets do not face any queueing delay at intermediate switching nodes. The virtual-circuit setup time is 400 ms. The packet travel over a path that goes through ten nodes, and the links transmit at 56 kbps. Each packet has 400 bits of data, a header of 5 bytes to indicate the virtual-circuit number and the packet sequence number, and a trailer of 2 bytes that contains bits used for error detection. When we use datagram transport (connectionless mode) no virtual-circuit is setup, but each packet needs a header of 10 bytes instead of 5 bytes to indicate the full destination address and source address, in addition to the packet sequence number. These packets also have to have the 2-bytes trailer. Assume datagrams also happen to follow the same path through ten nodes. How long does it take to transmit N packets using virtual-circuit transport and when using datagram transport? For what value of N is it faster to use virtual circuit transport?

3) Consider the half-wave rectified cosine signal shown in the figure:

    a. Write a mathematical expression for s(t)

    b. Compute the Fourier series expansion for s(t)

    c. Find the total power of s(t)

    d. How many terms of the Fourier expansion should be included such that 95% of total power is present in the truncated series? Plot the line spectrum for the truncated series

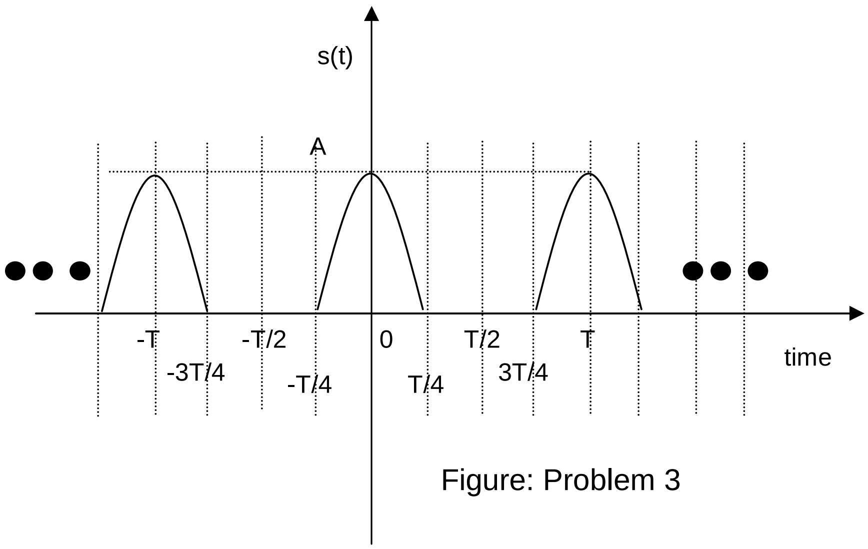

Figure: Problem 3

4) Consider the pulse shape depicted in the corresponding figure:
   a. Write the mathematical expression for p(t)
   b. Compute the Fourier transform, P(f), for this function
   c. Plot the function P(f)
   d. (For bonus marks) Explain the relation between P(f) and the Fourier series expansion obtained in the previous problem

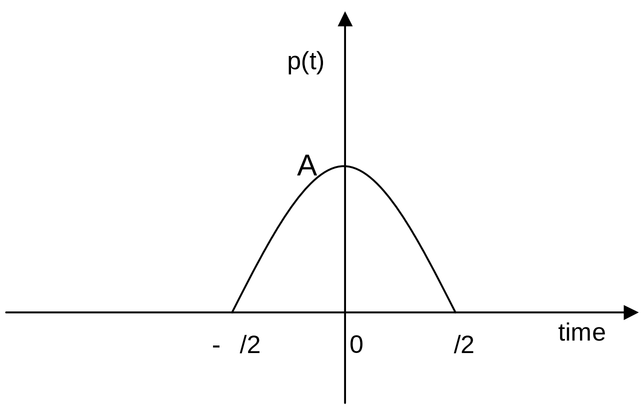

Figure: Problem 4

5) Problem 3.11 (page 99 of text)
6) Problem 3.14 (page 100 of text)
7) Problem 3.18 (page 100 of text)