

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

COE 540 – Computer Networks
Assignment 2 – Due Date March 12th, 2012

Problem #	Maximum Mark	Mark
1	20	
2	10	
3	20	
4	10	
5	20	
6	30	
Total	110	

Problem (1) {Previous Exam Problem}:

(20 points) Consider the periodic signal $f(t) = \{10 \cos t\}^2$.

- Determine the period of the signal $f(t)$.
- Compute the Fourier Series Expansion for $f(t)$.
- Compute the total power for $f(t)$.
- Specify the Power Spectral Density Function (PSD) for $f(t)$.

Problem (2):

(10 points) A communication system operates from frequency 3 MHz to 4 MHz with an SNR value equal to 24 dB.

- Compute the maximum theoretical capacity for the system.
- If this capacity is to be achieved, what is the minimum signaling level (i.e. size of alphabets/symbols) used by the transmitter.

Problem (3):

(20 points) Suppose that x bits of user data are to be transmitted over a k -hop path in a packet switched network as a series of packets, each containing p data bits and h header bits, with $x \gg p + h$. The bit rate of the lines is b bits per second and the propagation delay is negligible. What value of p minimizes the total delay.

Problem (4):

(10 points) In the context of the material in section 2.8.2 Internet over cable, assume a cable company decides to provide Internet access over cable in a neighborhood containing 5000 houses. The company uses coaxial cable and spectrum allocation allowing 100 Mb/s downstream bandwidth per cable. To attract customers, the company decides to guarantee at least 2 Mb/s downstream bandwidth to each house at any time. Describe what the cable company needs to do to provide this guarantee.

Problem (5):

(20 points) In Figure 2-40, the user data rate for OC-3 is stated to be 148.608 Mb/s. Show how this number can be derived from the SONET OC-3 parameters. What would be the gross, SPE, and user data rates of an OC-3072 line?

Problem (6):

(30 points) It is required to design a communication link running from Dammam to Riyadh. The link parameters are as follows:

- Distance, $d = 500$ km with a propagation delay of 5 micro seconds per km
- The frame size, F , is equal to 1500 bits
- Sliding window protocol with $W = 3$.

- Plot the link utilization as a function of the link transmission rate R . Identify the transmission bit rate R^* where the link utilization is less than 100% for rates greater than R^* .
- Plot the link throughput in frames per second.
- Compute the maximum possible throughput (in frames per second) of such link for the above given parameters.
- Specify the changes in the design required to increase the maximum throughput of such a link.