American University of Beirut
DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING
EECE 350 – Computer Networks
Spring 2015

HOMEWORK 1
Due Friday February 6 in class.

Problem 1 [15 points]
Let XY be the last two digits of your ID number. Find the RFC with number 6601+XY (i.e., if your ID number is 2014 12345, the RFC number is 6601 + 45 = 6646. If your ID number ends in 98, use RFC 6601). Answer the following questions:

a) [5] What is the title of the RFC?
b) [5] Who is (are) the author(s) of the RFC?
c) [5] When was the RFC published?

Problem 2 [35 pts]

Consider the Roman imperial postal service, in service 2 millennia ago. Imperial messages were communicated through couriers who traveled from one station to the other, relaying written and sometimes encrypted messages to fresh couriers at each. Each courier in turn rode towards the next station along the way to the destination, and brought back the reply to be delivered back to Rome. This system was used to communicate quickly with far away provinces, sometimes through hostile territory.

[5 points per layer] Compare this system to the 7-layer ISO OSI architecture, providing the equivalent of each OSI layer in the Roman network. One sentence per layer!

Problem 3 [20 pts]

Suppose users share a 1 Mbps link. Also suppose each user requires 100 kbps when transmitting, but each user transmits only X percent of the time, where X = 10 + (last two digits of your ID number)/20. For example, if your ID number is 2014 12345, X = 10 + 45/20 = 12.25.

a) [5] When circuit switching is used, how many users can be supported?
b) [5] For the remainder of this problem, suppose packet switching is used. Find the probability that a given user is transmitting.
c) [5] Suppose there are 36 users. Find the probability that at any given time, exactly n users are transmitting simultaneously. (Hint: use the binomial distribution.)
d) [5] Find the probability that there are 11 or more users transmitting simultaneously. How many users can be supported when packet switching is used?

Problem 4 [30 points]

Find the time at which a receiver completely receives a 1,000,000-Byte file in the following cases, assuming a symmetrical round-trip-time (RTT) of 50 msec from sender to receiver and back, and a packet size of X Bytes to which a header of 64 Bytes is added. Right after t = 0, assume that one RTT is needed for signaling between sender and receiver before data transfer can begin. The link bitrate is 5 Mbps.
X = 1500 + (last two digits of your ID number)×5.
For example, if your ID number is 2014 12345, X = 1500 + 45×5 = 1725.

a) [10] Data packets can be sent continuously back-to-back.
b) [10] A data packet can only be sent after receiving a response for the previous one (assume the response is very small and therefore its transmission time is negligible).
c) [10] Up to **10** packets can be sent per RTT.