Department of Computer Science, Virtual University of Pakistan

CS716: Advanced Computer Networks

Assignment 1 **MS(CS), Spring 2015** **Maximum Points: 50**

Due Date: Thursday, 28th May 2015

Instructions

The purpose of this assignment is to give you hands on practice. It is expected that students will solve the assignments themselves. Following rules will apply during the evaluation of assignment.

- Cheating from any source will result in zero marks in the assignment.
- Any student found cheating in any of the two assignments submitted will be awarded "F" grade in the course.
- No assignment after due date will be accepted

Question No. 1 (16 Points)

Calculate the total time required to transfer a 1000-KB file in the following cases, assuming an RTT of 100 ms, a packet size of 1 KB and an initial 2 × RTT of "handshaking" before data is sent.

a) The bandwidth is 1.5 Mbps, and data packets can be sent continuously.

b) The bandwidth is 1.5 Mbps, but after we finish sending each data packet we must wait one RTT before sending the next.

c) The bandwidth is "infinite," meaning that we take transmit time to be zero, and up to 20 packets can be sent per RTT.

d) The bandwidth is infinite, and during the first RTT we can send one packet (2^{1-1}), during the second RTT we can send two packets (2^{2-1}), during the third we can send four (2^{3-1}), and so on.

Question No. 2 (16 Points)

Suppose a 100-Mbps point-to-point link is being set up between Earth and a new lunar colony. The distance from the moon to Earth is approximately 385,000 km, and data travels over the link at the speed of light—3×10^8 m/s.

a) Calculate the minimum RTT for the link.

b) Using the RTT as the delay, calculate the delay × bandwidth product for the link.

c) What is the significance of the delay × bandwidth product computed in (b)?

d) A camera on the lunar base takes pictures of Earth and saves them in digital format to disk. Suppose Mission Control on Earth wishes to download the most current image, which is 25 MB. What is the minimum

amount of time that will elapse between when the request for the data goes out and the transfer is finished?

Question No. 3 (10 Points)

Suppose a host has a 1-MB file that is to be sent to another host. The file takes 1 second of CPU time to compress 50%, or 2 seconds to compress 60%.

a) Calculate the bandwidth at which each compression option takes the same total compression + transmission time.

b) Explain why latency does not affect your answer.

Question No. 4 (8 Points)

a) Show the 4B/5B encoding, and the resulting NRZI signal, for the following bit sequence:
1110 0101 0000 0011

b) Assuming a framing protocol that uses bit stuffing, show the bit sequence transmitted over the link when the frame contains the following bit sequence:
1101011111010111111010111111110
Mark the stuffed bits.

GOOD LUCK ☺