SIT202 Computer Networks

Assignment 2

This assignment is worth 15% of your final unit grade.

Due on September 9, 2015 (9:00 am)

Total: 54 points

This assignment is designed to test your understanding of computer networks through problem solving, literature study, simple analysis, and problem solving.

IMPORTANT:

Assignment Rules and Submission Policy

- This assignment is an individual assignment. Discussions are encouraged but **copying/plagiarism is not permitted and will be penalized according to university and faculty guidelines**.
- It should be completed in its entirety (i.e., all questions must be attempted.)
- **This assignment is marked based on the assignment and rubric requirements.**
- You are allowed to **use up to nine typed pages** to write your ass2 assignment (including references). All margins must be no less than 2 centimeters; a **Times New Roman 12 point font** and only **black color** can be used. Oversized assignments will be penalized.
- The submission date for the assignment is Wednesday, September 9, 2015 (9:00 am).
- Assignment solution must be well referenced. References must be listed at the end of the assignment and referred to in the assignment text.
- Hard-copy and e-mail submissions are not acceptable and will not be marked.

Note #1: Students who do not submit by the due date will have their mark reduced. The faculty rule states:

Work submitted late without documented approval of the Unit Chair will be penalized. Assignments that are submitted after the submission date will be subject to a mark penalty equal to 10% of the marks per day of the marks available for the piece of work, up to and including three days after the published due date. Assignments submitted more than three days after the published submission date will not be marked.

Note #2: All workings must be shown for all mathematic/numerical problems.

ASSIGNMENT TASKS

Task 1

Suppose you wish to close a bank branch and introduce a teller machine. Your company has won the tender to develop an application-level protocol to be used between an automatic teller machine and a bank's centralized computer. There are the following requirements that must be satisfied:

- Your protocol should allow a user's card and password to be verified, the account balance (which is maintained at the centralized computer) to be queried, and an account withdrawal to be made.
- Your protocol entities should be able to handle the all-to-common case in which there is not enough money in the account to cover the withdrawal.

Your tasks are as follows:

a) **2 marks:** Specify your protocol by listing the messages exchanged and the action taken by the automatic teller machine or the bank's centralized computer on transmission and receipt of messages.

b) **5 marks:** Draw a figure that shows the operation of your protocol for the case of simple withdrawal with no errors, using a time diagram.

c) **2 marks:** Explicitly state the assumptions made by your protocol about the underlying end-to-end transport service.

Task 2

3 marks: Define, compare and contrast TCP and UDP.

Task 3

2 marks: Consider a TCP connection between Host A and Host B. Suppose that the TCP segments travelling from Host A to Host B have source port number *x* and destination port number *y*. What are the source and destination port numbers for the segments travelling from Host B to Host A.

Task 4

Suppose Host A sends two TCP segments back to back to Host B over a TCP connection. The first segment has sequence number 90; the second has sequence number 110.

a) **1 mark:** Describe the operation of sending TCP segments, paying attention to the use of sequence and acknowledgement numbers.

b) **1 mark:** How much data is in the first segment?

c) **2 marks:** Suppose that the first segment is lost but the second segment arrives at B. In the acknowledgement that Host B sends to Host A, what will be the acknowledgement number?

Task 5

UDP and TCP use 1's complement for their checksums to detect errors. These checksums exploit 8-bit summands (i.e., 8-bit words in computing the checksum). The receiver received three 8-bit bytes: 01010101, 01110000, 01001100. There are the following problems to be solved:

a) **2 marks:** What is the 1's complement of the sum of these 8-bit bytes? Show all work.

b) **2 marks:** Why it is that your protocol takes the 1's complement of the sum; that is, why not just use the sum?

c) **2 marks:** With the 1's compliment scheme, how does the receiver detect errors?

d) **2 marks:** Is it possible that a one-bit error will go undetected?

e) **2 marks:** How about a two-bit error?

Task 6

Sliding window protocols are used to provide flow control.

a) **2 marks:** Describe causes of network flooding and define flow control.

b) **3 marks:** Draw the Finite State Machine (FSM) of a protocol that provides sliding window flow control in a reliable network.

c) **3 marks:** Draw a time diagram that shows the protocol behaviour in time. Assume that the window size is n.

Task 7

Congestion of a network is a serious communication problem

a) **1 mark:** Describe the causes of congestion in networks.

b) **2 marks:** Present the basic idea of TCP congestion control.

c) **2 marks:** Demonstrate that the TCP congestion control approach is fair.

Task 8

Network consist of functions, services and protocols, which can be further categorised through the use of the OSI reference model.

a) **2 Mark:** Define, compare, and contrast the concepts of a function, service, and protocol

b) **2 Marks:** List and briefly explain the services provided by the network layer of the Internet taking into consideration the scope of the transport layer protocol services.

Task 9

3 Marks: Do routers have IP addresses? If so, how many?

Task 10

3 Marks: Compare and contrast the LS algorithm with DV routing algorithm.

Task 11

3 Marks: List and briefly characterize routing protocols used in the Internet.