Name:_____ **ID:**_____

CSE 474 Computer Networks

Spring 2011 Final Exam

14.06.2011 Tuesday, Duration: 110 minutes

Q1	Q2	Q3	Q4	Q5	Q6	Q7	B	SUM
/30	/13	/10	/15	/10	/10	/12	/20	/100

Q1: Multiple Choice (2 x 15 = 30pts)

Φ which of the following is an example for unguided media?

o copper   o radio   o coax   o fiber   o HFC

Φ which HTTP header is used in conditional GET?

o If-exists   o If-modified   o If-modified-since   o Accept   o If-match

Φ a user requests a web page that consists of some text and 4 images. The browser's cache is empty and persistent HTTP is used. For this page, the client's browser:

o   sends 1 HTTP request message and receives 1 HTTP response message.
o   sends 1 HTTP request message and receives 4 HTTP response message.
o   sends 1 HTTP request message and receives 5 HTTP response message.
o   sends 4 HTTP request message and receives 4 HTTP response message.
o   sends 5 HTTP request message and receives 5 HTTP response message.

Φ which of the following applications is more time-sensitive?

o e-mail   o web-page   o voice over IP   o file transfer   o instant-messaging

Φ which of the following is correct about the flow control service in TCP?

o   The sender selects the maximum segment size (MSS).
o   The receiver increases its application data rate.
o   The sender does not overflow the receiver's buffer by transmitting too many segments.
o   The receiver increases its buffer size.

Φ longest prefix matching is used:

o   in routers to know on which link interface to forward packets
o   in classless addressing to use the address space more efficiently than in classful addressing.
o   by NAT to increase the available address space in home networks.
o   to assign subnet masks
o   None of the above.

Φ if an institution needs 300 different IP addresses without using NAT, which of the following subnet masks best fit?

o /8   o /9   o /23   o /24   o /25

Φ which of the following is false for Virtual circuits?

o Complexity is inside the network.
o For a virtual circuit, VC number can be changed on each link.
o Packets carry VC number rather than destination address.
o Today, they are effectively used in the backbone of the Internet.
o None of the above.

Φ which of the following headers exists both in IPv4 and IPv6?

o fragment offset
o header checksum
o header length
o flow label
o None of the above

Φ I. DHCP   II. ARP   III. OSPF

In which of the above protocols, broadcasting is used?

o Only I   o I and II   o I and III   o II and III   o I, II and III

Φ I. Providing echo request/reply in `ping` program.
  II. Measuring the delay between the routers from a source to a destination in `traceroute` program.
  III. Communicating network-level information such as error reporting.

In which of the above services, ICMP is used?

o Only I   o I and II   o I and III   o II and III   o I, II and III

Φ which MAC protocol is used in Ethernet?

o CSMA/CA   o CSMA/CD   o Token Ring   o Slotted Aloha   o TDMA

Φ which of the following is a 3G protocol?

o GPRS   o EDGE   o UMTS   o IS-95 CDMA   o IS-136 TDMA
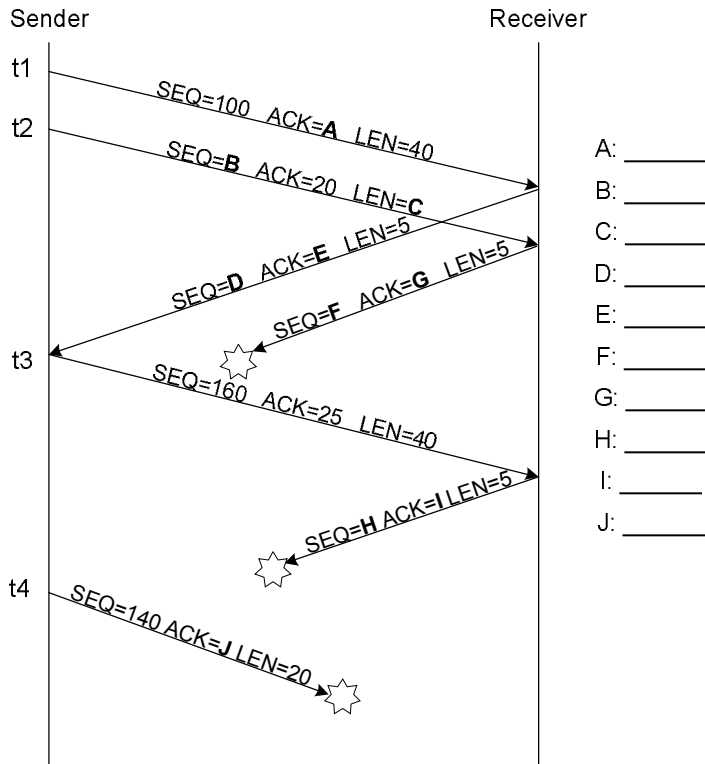
Φ which of the following provide higher data rate?

o 802.11a   o 802.11b   o 802.11g   o 802.11n   o 802.15

Φ the WiMaX protocol:

o provides the maximum available data rate over a wireless channel.
o uses unlicensed spectrum, such as WiFi.
o provides a mechanism for scheduling.
o All of the above options are correct.

Q2 (10+3=13 pts) a) Complete the missing sequence numbers (SEQ), acknowledgment numbers (ACK), and segment length (LEN) in the following TCP connection. We assume:

- No timeouts occur at the receiver.
- The sender starts the timer at t1.
- The connection is full duplex (bi-directional data flow in same connection).
- The sender and the receiver have always data to transmit.
- There are no delayed acknowledgements at the sender or the receiver.

Sender   Receiver

t1 — SEQ=100 ACK=**A** LEN=40 (Sender → Receiver)

t2 — SEQ=**B** ACK=20 LEN=**C** (Sender → Receiver)

SEQ=**D** ACK=**E** LEN=5 (Receiver → Sender)

SEQ=**F** ACK=**G** LEN=5 (Receiver → Sender)

t3 — SEQ=160 ACK=25 LEN=40 (Sender → Receiver)

SEQ=**H** ACK=**I** LEN=5 (Receiver → Sender)

t4 — SEQ=140 ACK=**J** LEN=20 (Sender → Receiver)

A: _____
B: _____
C: _____
D: _____
E: _____
F: _____
G: _____
H: _____
I: _____
J: _____

b) Calculate the value of timeout for the segment with sequence number 140.

Q3 (10 pts) Explain the NAT traversal problem. Give a solution for it.

Q4 (7+5+3=15 pts) Consider the following network. The numbers on links corresponds to the costs corresponding to these links. Assume the nodes know only the costs to their neighbors.
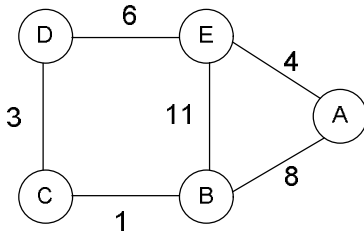
a) Using the distance-vector algorithm, show the distance tables at node E. Assume that the algorithm works in a synchronous manner, where all nodes simultaneously receive distance vectors from their neighbors, compute their new distance vectors, and inform their neighbors if their distance vectors have changed.

Write your answer in a separate sheet.

b) Which problem occurs when the cost of C-D link increases to 20. How?

c) If OSPF were used in the above network, would the problem asked in b) arise? Why?

Q5 (10 pts) In CRC, suppose that 4-bit generator G = 1001, and data D = 10010001. Find the additional bits R that the sender will append to D.

Q6 (5+5=10 pts) a) Compare performance of channel partitioning MAC protocols and random-access MAC protocols in high load and low load.

b) Why and how propagation delay effects the performance of CSMA/CD?

Q7 (5+7=12 pts) a) What is the reason for using CSMA/CA in Wireless LAN (802.11), instead of CSMA/CD?

b) What is hidden terminal problem? Briefly explain solution for this problem using RTS/CTS mechanism.

Bonus Questions

B1 (5 pts) Explain how Head-of-the-Line (HoL) blocking occurs at an input queue of a router

B2 (3 pts) What are the purposes of SYN cookies?

B3 (5 pts) Give the SNR formula in terms of decibels?

B4 (3 pts) Give an example protocol that uses frequency-hopping spread spectrum (FHSS)

B5 (4 pts) Give two advantages of MPLS?