PRINCE OF SONGKLA UNIVERSITY

FACULTY OF ENGINEERING

Final Examination Semester 2 : Academic Year : 2004

Date : 22 December 2004 Time : 9.00 – 12.00

Subject : 240 - 362 Internet Engineering Room : R300

Instructions for Part I: (ตอบลงในเล่มสีชมพู)

- There are 7 problems (70 points in total) in Part I of this exam paper.
- This exam is **OPEN BOOK.**
- **All of your answers can be written either in Thai or English**.
- Dictionary and Calculator are allowed.
- Palm pilots or computers are allowed.

1. Consider the connectionless and connection-oriented services provided by UDP and TCP, respectively. In designing an Internet application where delay is a primary consideration, briefly discuss the tradeoffs that you should evaluate in choosing whether the application should be developed using TCP or UDP. [10 points]
2. It has been said that when IPv6 tunnels through IPv4 routers, IPv6 treats the IPv4 tunnels as link-layer protocols. Do you agree with this statement? Why or why not? [10 points]
3. We have studied three different types of addresses for a host in a network: the MAC (or hardware) address, the IP address, and the DNS address.

   (a) Describe the difference and interrelations among these addresses. [3 points]

   (b) What does "address resolution" found in the Address Resolution Protocol (ARP) protocol mean? [3 points]

   (c) What does "name resolution" used in the Domain Name System (DNS) mean, and describe how the system performs it? [4 points]

4. Explain the difference of two layers in the Internet stack, the data link layer and the transport layer, which are both responsible for the delivery of data between communicating devices. [10 points]
5. If a client computer has two concurrent connections to the same server, how does the transport layer on this client side know where to deliver an arriving TCP segment? Describe in details. [10 points]
6. Describe the mechanism that the both TCP sender and receiver use to notify whether the transmission of segments are complete or not. [10 points]
7. Suppose two TCP connections and one UDP connection are present over some bottleneck link. Do you think the link resource will be shared fairly among these connections? Why or Why not? [10 points]

Instructions for Part II: (ตอบลงในเล่มสีฟ้า)

This part of exam paper has 4 pages (including this page) and 4 sub-questions.

Authorised Materials:

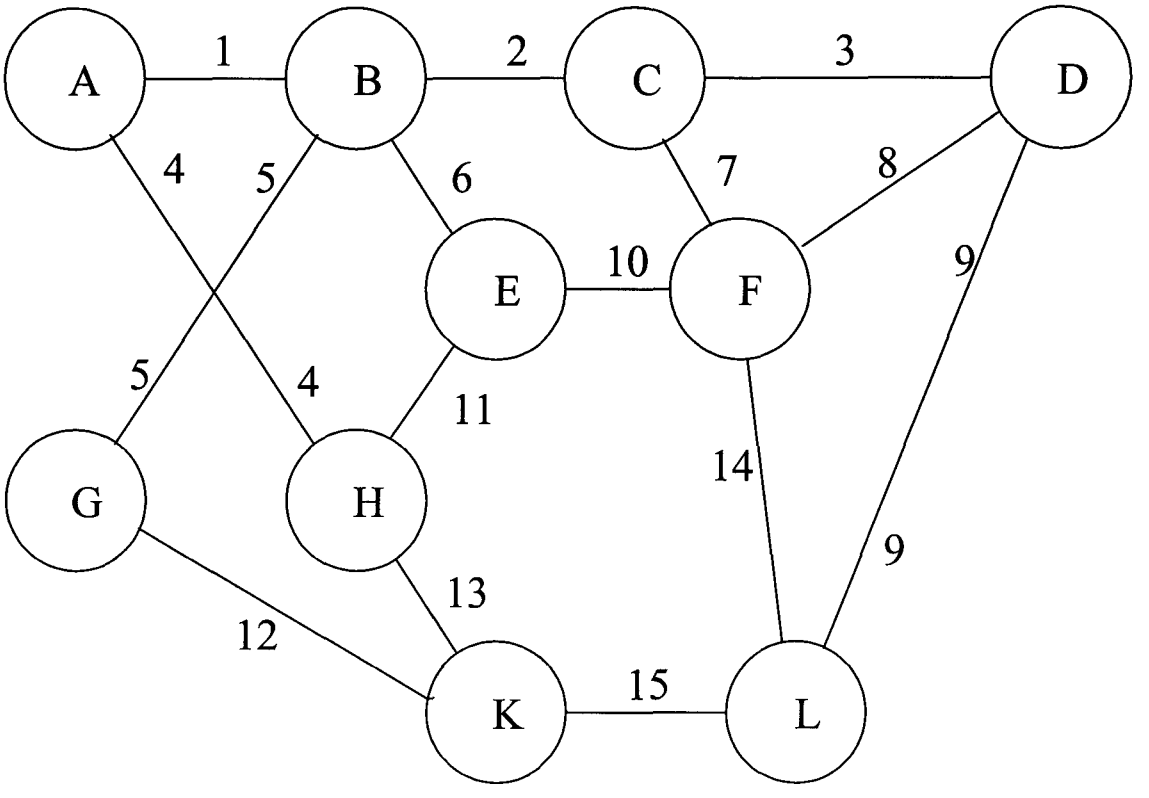
• Anything the student can carry.

Instructions to Students:

- **Answer questions must be in English.** Good English is not required.
- Attempt all questions.
- Write answers in an answer book **(ตอบลงในเล่มสีฟ้า)**.
- Clearly Number the answers. It is not required that questions be answered in order.
- Anything illegible is incorrect.
- Show all calculations, not just the final result.
- Answer briefly where possible, essays are not required.

Question 1. *(23 marks)*

The diagram shows a small network with 10 routers and 15 links (networks) connecting those routers. The routers are labelled with letters (A – L) and the links with numbers (1 – 15). These labels are for ease of reference only.



The accompanying tables, on the following pages, show the network addresses, link MTUs, and routing protocol link costs of each of the links, and the network addresses, and neighbour routers for each of the routers and each of the links connected to each router.

Some of this information may be useful in answering the following 4 sub-questions.

A) Find the Path MTU (PMTU) from router A to router L. Show how you obtained this value.

[10 marks]

B) How many fragments would be required to transmit an IP datagram that is 4000 bytes long from A to L? What is the maximum possible size of the complete first fragment?

[5 marks]

C) If the link numbered 1 (between routers A and B) were to fail, what effect would this have on the PMTU ?

[3 marks]

D) Assuming all links are working, no additional links are possible, and that none of the MTU values for the links can not be altered, how could the network manager increase the PMTU of the path between A and L ?

[5 marks]

Table of Networks

label	network	netmask	connected routers	mtu	cost
1	10.1.16.0	255.255.255.0	A, B	1500	1
2	128.100.0.0	255.255.0.0	B, C	1400	2
3	172.30.19.0	255.255.255.0	C, D	1500	3
4	192.168.1.0	255.255.255.0	A, H	1500	3
5	128.101.0.0	255.255.0.0	B, G	1500	1
6	128.102.0.0	255.255.0.0	B, E	1320	4
7	172.30.20.0	255.255.255.0	C, F	1400	2
8	172.30.22.0	255.255.255.0	D, F	1500	2
9	172.30.23.0	255.255.255.0	D, L	1280	1
10	172.30.21.0	255.255.255.0	E, F	1500	1
11	192.168.2.0	255.255.255.0	E, H	1400	1
12	18.3.0.0	255.255.0.0	G, K	1360	1
13	192.168.3.0	255.255.255.0	H, K	1500	3
14	23.24.25.0	255.255.255.0	F, L	1400	1
15	23.24.27.0	255.255.255.0	K, L	1500	2

E	6	128.102.102.128	B	1320	4
	10	172.30.21.128	F	1500	1
	11	192.168.2.128	H	1400	1
F	7	172.30.20.5	C	1400	2
	8	172.30.22.5	D	1500	2
	10	172.30.21.5	E	1500	1
	14	23.24.25.5	L	1400	1
G	5	128.101.17.6	B	1500	1
	12	18.3.3.17	K	1360	1
H	4	192.168.1.2	A	1500	3
	11	192.168.2.2	E	1400	1
	13	192.168.3.2	K	1500	3

Table of Routers

router	network label	network address	neighbour router	mtu	cost
A	1	10.1.16.1	B	1500	1
	4	192.168.1.1	H	1500	3
B	1	10.1.16.2	A	1500	1
	2	128.100.3.1	C	1400	2
	5	128.101.17.5	G	1500	1
	6	128.102.128.102	E	1320	4
C	2	128.100.2.2	B	1400	2
	3	172.30.19.4	D	1500	3
	7	172.30.20.7	F	1400	2
D	3	172.30.19.3	C	1500	3
	8	172.30.22.3	F	1500	2
	9	172.30.23.3	L	1280	1
E	6	128.102.102.128	B	1320	4
	10	172.30.21.128	F	1500	1
	11	192.168.2.128	H	1400	1
F	7	172.30.20.5	C	1400	2
	8	172.30.22.5	D	1500	2
	10	172.30.21.5	E	1500	1
	14	23.24.25.5	L	1400	1
G	5	128.101.17.6	B	1500	1
	12	18.3.3.17	K	1360	1
H	4	192.168.1.2	A	1500	3
	11	192.168.2.2	E	1400	1
	13	192.168.3.2	K	1500	3
K	12	18.3.3.12	G	1360	1
	13	192.168.3.13	H	1500	3
	15	23.24.27.15	L	1500	2
L	9	172.30.23.1	D	1280	1
	14	23.24.25.1	F	1400	1
	15	23.24.27.1	K	1500	2