UNIVERSITY OF SWAZILAND

FACULTY OF SCIENCE

DEPARTMENT OF COMPUTER SCIENCE

SUPPLEMENTARY EXAMINATION 2006

TITLE OF PAPER: DATA NETWORK AND CODING THEORY (**II**)

COURSE NUMBER: CS440 (II)

TIME ALLOWED: THREE HOURS

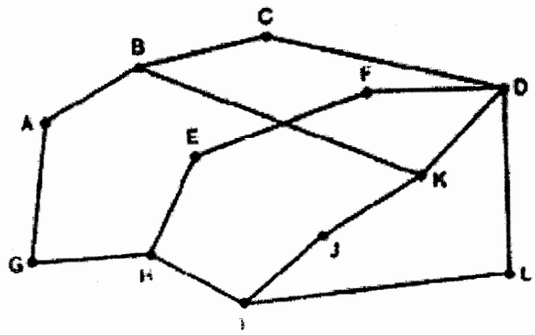
INSTRUCTIONS: ANSWER **ANY FOUR** QUESTIONS.

EACH QUESTION CARRIES **25 MARKS**.

DO NOT OPEN THE PAPER UNTIL PERMISSION HAS BEEN GIVEN BY THE INVIGILATOR.

QUESTION 1

a) Compute a multicast spanning tree for router D in the subnet below for a group with members at routers A, B, D, E, F, H, I and L.



[6]

b) Using the subnet diagram in (a), how many packets are generated by a broadcast from H using

(i) reverse path forwarding?

(ii) sink tree?

[8]

c) Describe the three way handshake of TCP.

[3]

d) Illustrate the basic structure of an IP address. Given an IP address, how would you determine whether it is a class A, B or C address?

[5]

e) Why is slotted Aloha more efficient than pure Aloha?

[3]

QUESTION 2

a) Describe the fields of an IP packet header.

[5]

b) Why is it useful to have more than one possible path through a network for each pair of stations?

[2]

c) What causes congestion?

[3]

d) Describe how machine A with IP address 192.168.4.3 sends a packet to machine B with IP address 192.168.4.13, and how machine A sends a packet to machine C with IP address 192.168.5.13

[6]

e) Is the following ISBN **0-7676-3086-X** valid? Find the third digit **u**, for the ISBN **0-7u79-0382-9**.

[6]

f) Describe a congestion avoidance technique

[3]

QUESTION 3

a) With the help of diagrams, describe the following routing strategies:
   (i) Fixed routing
   (ii) Random routing

[5]

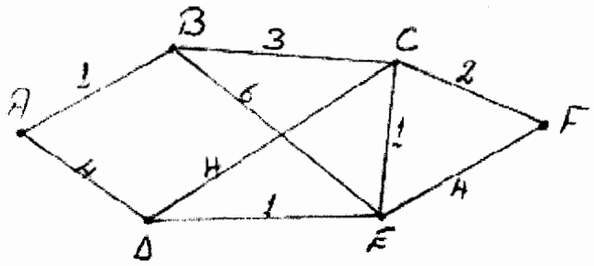
b) Describe how SMTP and POP 3 work.

[6]

c) What is the function of ARP?

[4]

d) Use Djikstras' algorithm to compute the shortest paths for the network of routers shown below



[7]

e) Given that a host has IP address **196.24.65.229** and network mask of 255.255.255.224, what is the broadcast address of the network?

[3]

QUESTION 4

a) Describe the RSA encryption method. What type of encryption is it, and how does it differ from an encryption that uses DES?

[6]

b) Describe the series of actions that occur when a user on a PC in the Computer Science lab accesses the url http://www.uniswa.sz.

[5]

c) Explain how slow start congestion control in TCP works.

[5]

d) Describe the **Go back N** sliding window protocol. What is the receiver's window for Go back n?

[6]

e) Given the IP address **C40B7C22** in hexadecimal, give it in the normal dotted decimal notation.

[3]

QUESTION 5

a) What is a socket in TCP/IP? Briefly describe how a network program that acts as a client is coded using sockets

[4]

b) Describe how you would use a firewall to make an organizations' network secure.

[4]

c) Describe the operation of the binary countdown protocol, using station with addresses **1011, 0110, 1010, 1001** to illustrate its operation. How does it differ from the Aloha protocols?

[6]

(d) An Ethernet protocol analyser observes the following frame:

```
0000  00 00 e2 4a cf dd 00 14  38 4e a4 2e 08 00 45 28
0010  00 3c d5 79 40 00 34 06  01 76 42 5e ed 34 c4 0b
0020  7c 06 86 26 00 19 6b 64  8f 56 00 00 00 00 a0 02
0030  ff ff d5 47 00 00 02 04  05 b4 01 03 03 01 01 01
0040  08 0a 2f 14 56 0c 00 00  00 00
```

By decoding the hexadecimal bytes of this frame, determine the:

(i) Ethernet Source Address
(ii) IP Source Address
(iii) destination port

Service Access Point (SAP) codes:
Ethernet: (in hexadecimal):0x0800 = IP; 0x0806 = arp
IP: (in decimal) 1 = ICMP; 2= IGMP; 6 = TCP; 17= UDP
TCP: (in decimal) 23 = Telnet; 25 = Mail; 69 = TFTP; 80 = WWW (http)

[6]

(e) Describe how DNS works.

[5]