UNIVERSITY OF SWAZILAND

FACULTY OF SCIENCE AND ENGINEERING

DEPARTMENT OF COMPUTER SCIENCE

SUPPLEMENTARY EXAMINATION 2014

TITLE OF PAPER: NETWORKS AND CODING THEORY II

COURSE NUMBER: CS438

TIME ALLOWED: THREE HOURS

INSTRUCTIONS: ANSWER **ANY FOUR** QUESTIONS.

EACH QUESTION CARRIES **25 MARKS**.

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QUESTION 1

a) Identify the layers of the OSI Reference Model where the following would be used:
- Frame sequence number
- MLT-3 encoding
- IP protocol version number
- TCP header length
- Encryption
- Destination port
- Email address

[7]

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

[2]

c) Given the IP address **452D69FE** in hexadecimal, give it in the normal dotted decimal notation.

[3]

d) Into how may classes can an IP address fall into, and how do you determine which class it belongs to?

[4]

e) The IP network address 196.24.64.32 has a broadcast address of 196.24.64.63. What is the network mask of the network?

[3]

f) If a 1500 byte IP datagram needs to traverse a link that has a maximum transmission unit of 750 bytes, describe what will happen to the datagram at the router that is connected to the link if fragmentation is allowed on the datagram.

[3]

g) What is the main advantage of flooding? How does the protocol prevent packets from looping indefinitely?
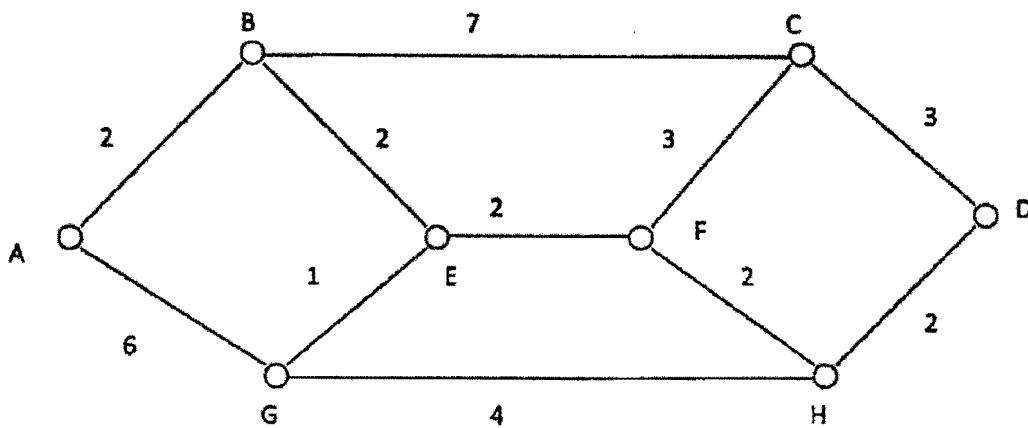
[3]

QUESTION 2

a) Describe the functions of the IP Header length, Identification and Fragment Offset fields of an IP version 4 packet header.

[6]

b) What is the major difference between an IP version 4 packet and an IP version 6 packet?

[2]

c) Using Dijkstra's algorithm on the network of routers shown, find the minimum distances and routes between **node A** and all other nodes.

[8]

d) Explain the two main functions performed by a router.

[4]

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

[5]

QUESTION 3

a) The following terms are used when describing the Internet Protocol. Define the following terms
        (i) Internet Protocol Address.
        (ii) Fragmentation.
        (iii) Maximum Transmission Unit.
        (iv) IP Router.

[8]

b) Given that a machine with an IP address of 196.24.64.66 and a network mask of 255.255.255.192 needs to communicate with a machine that has the IP address 196.24.64.35, will a router be involved? Explain your answer.

[3]

c) What is the function of ARP?

[2]

d) Describe the three way handshake of TCP.

[3]

e) Given the IP network 192.168.4.0, how many subnets would result if the maximum number of hosts per subnet is 14? What is the subnet mask? Why are some IP addresses not assigned to hosts in the subnet?

[6]

f) With the aid of a suitable example, explain how substitution ciphers work.

[3]

QUESTION 4

a) What is the difference between secret key cryptography and public key cryptography?

[3]

b) Describe the RSA encryption method.

[4]

c) Distinguish between TCP and UDP, indicating where it is suitable to use one over the other.

[4]

d) What is NAT?

[3]

e) Give three functions of the Transport layer.

[3]

f) Describe the three way handshake of TCP connection establishment.

[3]

g) In socket programming, how does the client application differ from the server application?

[2]

h) What is network jitter? How does jitter affect the performance of an audio streaming application?

[3]

QUESTION 5

a) What is the difference between congestion control and flow control?

[3]

b) How is the TCP header checksum calculated?

[2]

c) Describe two protocols that are involved when sending and receiving electronic mail.

[6]

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

[5]

e) What is the function of DHCP?

[3]

f) What is the maximum number of TCP ports that can be open on a host?

[2]

g) Define the following terms
   • Plaintext
   • Ciphertext

[4]

End of Question Paper