UNIVERSITY OF SWAZILAND

FACULTY OF SCIENCE AND ENGINEERING

DEPARTMENT OF COMPUTER SCIENCE

MAIN EXAMINATION 2014

TITLE OF PAPER: NETWORKS AND CODING THEORY II

COURSE NUMBER: CS438

TIME ALLOWED: THREE HOURS

INSTRUCTIONS: ANSWER **QUESTION 1 AND ANY OTHER THREE** QUESTIONS.

EACH QUESTION CARRIES **25 MARKS**.

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QUESTION 1

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

[4]

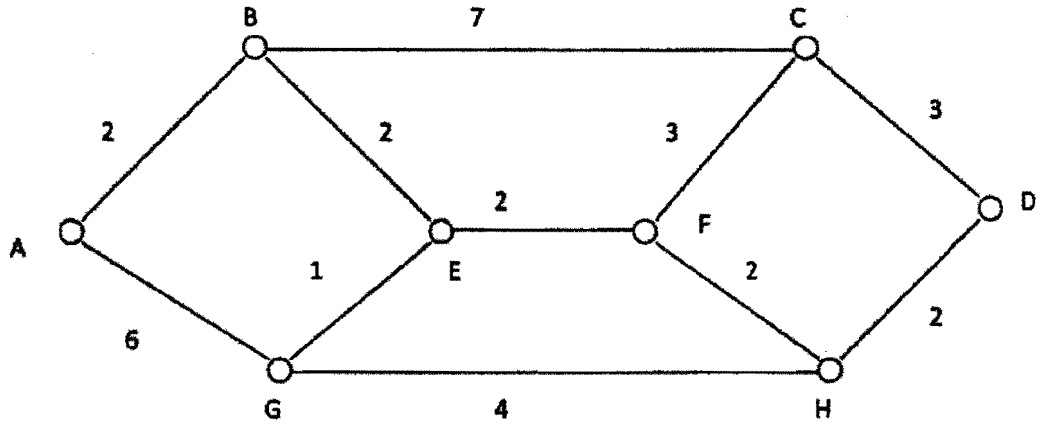
b) Describe the following routing strategies:

(i) Fixed routing

(ii) Random routing

[6]

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



[8]

d) Describe the three way handshake of TCP.

[3]

e) Given the IP address 172.16.10.82/26, calculate the broadcast address and the minimum ip address of the network.

[4]

QUESTION 2

a) What is the main advantage of flooding? How does the protocol prevent packets from looping indefinitely?

[4]

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

[3]

c) If a 4000 byte IP datagram needs to traverse a link that has a maximum transmission unit of 850 bytes, describe what will happen to the datagram at the router that is connected to the link if fragmentation is allowed on the datagram.

[5]

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

[5]

e) How is the IPv4 header checksum calculated?

[3]

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

[5]

QUESTION 3

a) Describe the Token Bucket congestion control algorithm.

[4]

b) Given the IP network 196.100.2.0, how many subnets would result if the maximum number of hosts per subnet is 30? What is the subnet mask?

[5]

c) What is the difference between ARP and RARP?

[2]

d) Given the IP address **AC10E681** in hexadecimal, give it in the normal dotted decimal notation.

[3]

e) What is a socket in TCP/IP?

[2]

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

[3]

g) With the aid of suitable examples, explain how transposition and substitution ciphers work.

[6]

QUESTION 4

a) What causes congestion?

[3]

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

[4]

c) Given that a machine with an IP address of 192.168.45.54 and a network mask of 255.255.255.224 needs to communicate with a machine that has the IP address 192.168.45.74, will a router be involved? Explain your answer.

[3]

d) Describe the RSA encryption method.

[4]

e) A packet traversing the Internet typically undergoes several types of delays, including nodal processing delay, transmission delay, and queuing delay. Define each of these three types of delays. How can each of these delays be reduced?

[6]

f) Proxy servers are widely used in client-server based applications, for example HTTP. Use a diagram to explain how a web proxy server works. List two functions implemented by a web proxy server. What's the difference between HTTP and HTTPS·

[5]

QUESTION 5

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) Describe how DNS works.

[3]

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

[6]

e) Explain how an application that uses only a web browser for input and output could be setup to allow access to information stored in a database management system.

[5]

f) A TCP entity transmits 10,000 bytes of data in 2,000 byte segments (thus, including the TCP header, there will be 2,020 bytes of IP data for each segment). The IP entity is operating with a Maximum Transmission Unit (MTU) of 1024 bytes. Calculate how many packets the IP entity will transmit and justify your answer. (You may ignore errors and assume that the standard IP header is used).

[3]

End of Question Paper