UNIVERSITY OF SWAZILAND

FACULTY OF SCIENCE AND ENGINEERING

DEPARTMENT OF COMPUTER SCIENCE

SUPPLEMENTARY EXAMINATION 2015

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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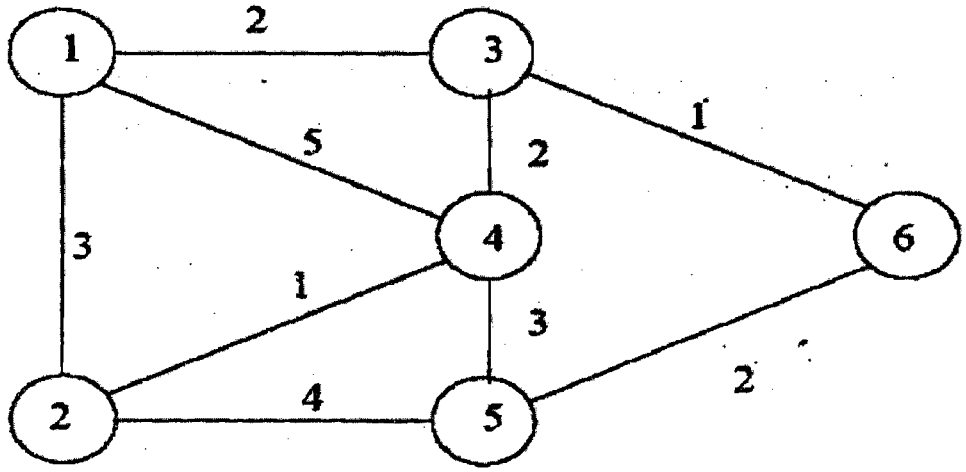
QUESTION 1

a) Using Dijkstra's algorithm on the network of routers or nodes shown, find the shortest path from **node 1** to all other nodes.



[5]

b) Show the routing table for **node 1**.

[3]

c) Explain two main functions performed by a router.

[4]

d) Describe Flooding routing strategy. Indicate how packets are prevented from indefinitely looping through the network.

[5]

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

[4]

f) Given the IP address **192.168.56.32** in dotted decimal notation, express it in hexadecimal.

[4]

QUESTION 2

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

[5]

b) Describe the operation of the Token Bucket congestion control algorithm. How is the Token Bucket algorithm implemented by routers or hosts?

[6]

c) Give three (3) reasons why a router would drop data packets.

[3]

d) Where is it appropriate to use UDP instead of TCP?

[3]

e) What is the difference between secret key cryptography and public key cryptography? Give an example of a cipher that public key and secret key cryptography.

[5]

f) Identify the layers of the OSI Reference Model where the following would be used:

- IP protocol version number
- Destination port
- Email address

[3]

QUESTION 3

a) With the aid of a suitable example, explain how a substitution cipher works.

[3]

b) In relation to the Internet Protocol, define what the following terms mean.

i. IP Address
ii. Fragmentation
iii. Maximum Transmission Unit
iv. Time to Live

[8]

c) What is the difference between routing and forwarding?

[2]

d) State three (3) differences between Link-State and Distance Vector routing algorithms.

[6]

e) Given the IP network 192.20.254.0, how many subnets would result if the maximum number of hosts per subnet is 14? What is the subnet mask?

[6]

QUESTION 4

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

[4]

b) Why is the TCP 3 way handshake necessary?

[2]

c) How is the TCP header checksum calculated?

[3]

d) Given that a host with an IP address of 192.168.64.34 and a network mask of 255.255.255.0 needs to communicate with another host that has the IP address 192.168.64.254, will a router be involved? Explain your answer.

[3]

e) List three causes of congestion?

[3]

f) Describe how DNS works.

[4]

g) Describe the series of actions that occur when a user in the computer science lab uses a web browser to access http://www.google.com

[4]

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

[2]

QUESTION 5

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

[6]

b) What is a firewall?

[3]

c) 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]

d) Describe the RSA encryption method.

[4]

e) What's the difference between HTTP and HTTPS·

[2]

f) What does DHCP stand for, and what is its function?

[4]

End of Question Paper