UNIVERSITY OF SWAZILAND

Faculty of Science

Department of Computer Science

MAIN EXAMINATION - MAY 2018

Title of Paper: NETWORKS AND CODING THEORY II

Course Number: CS438

Time Allowed: 3 hours

Instructions to candidates:

*This question paper consists of **FIVE** (5) questions. Answer any **FOUR** (4) questions*
Marks are indicated in square brackets.
All questions carry equal marks (25 Marks Each).

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QUESTION 1

a) State 4 functions of the network layer. What functions are performed by a router? Why is it important for routers to know about all of the possible routes through a network topology? [8]

b) Why is routing necessary in the network? What are the major properties of routing algorithms? Is the shortest path routing algorithm a static routing algorithm? [7]

c) Distinguish between adaptive and non-adaptive routing algorithms. [6]

d) Explain the concept of subnetting. State any 2 benefits of subnetting. [4]

QUESTION 2

a) Distributed routing algorithms in communications systems are designed to provide a fault-tolerant computation of end-to-end paths in the event of link or router failure (or repair).

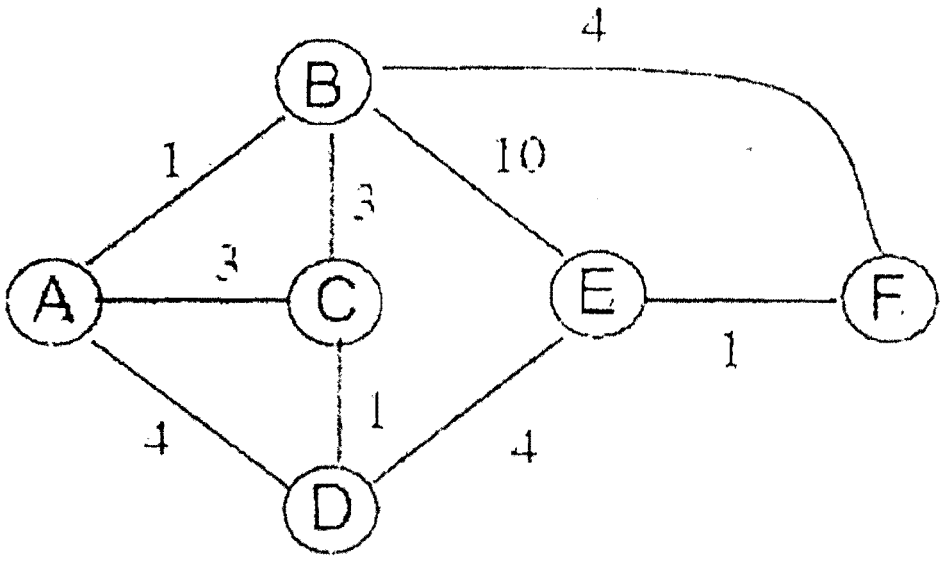
i. Describe how this occurs, using as an example the distance-vector algorithm. [4]

ii. Distance-vector routing is said to be slow to react to changes. Explain why, and outline why link-state protocols are therefore preferred in today's Internet. [5]

b) What are the pros and cons of distance vector versus link state routing protocols? [3]

c) Distinguish between the leaky bucket and the token bucket algorithm. [6]

d) Consider the network represented by the directed graph in the next page. Show the operation of Dijkstra's (Link State) algorithm for computing the least cost path from E to all destinations. Also, explicitly list the shortest path routes from E to all destinations that are the result of the algorithm's computation. Show the distance table that would be computed by the distance vector algorithm in B. [7]



QUESTION 3

a) 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]

b) How many classes can an IP address fall into, and how do you determine which class it belongs to?[5]

c) Your organization has been assigned the Class C address of 200.127.12.0 and your network Administrator intends to use the extended network prefix to be /28.

i) What is the Directed Broadcast IP address for this network? [2]

ii) How many sub-networks can you have on this network? Clearly show how you obtained your answer. [4]

iii) How many nodes can be supported on each of these sub-networks? Again, clearly show how you obtained your answer. [4]

d) 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]

QUESTION 4

a) Distinguish between TCP and UDP, indicating where it is suitable to use one over the other. [6]

b) Where is it appropriate to use UDP instead of TCP? [3]

c) What is a socket in TCP/IP? [2]

d) What is the difference between ARP and RARP? [4]

e) What's the difference between HTTP and HTTPS? [2]

f) What does DHCP stand for, and what is its function? [4]

g) Describe two protocols that are involved when sending and receiving electronic mail. [6]

QUESTION 5

a) What is a firewall? [3]

b) 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]

c) Describe the RSA encryption method. [4]

d) Explain briefly what is meant by confidentiality, integrity and authentication. [6]

e) With the aid of appropriate examples explain how transposition and substitution ciphers work. [6]

End of Question Paper