

UNIVERSITY OF SWAZILAND

Faculty of Science

Department of Computer Science

MAIN EXAMINATION May 2010

Title of paper: NETWORKS AND CODING THEORY – II

Course number: CS438

Time allowed: 3 hours

Instructions to candidates:

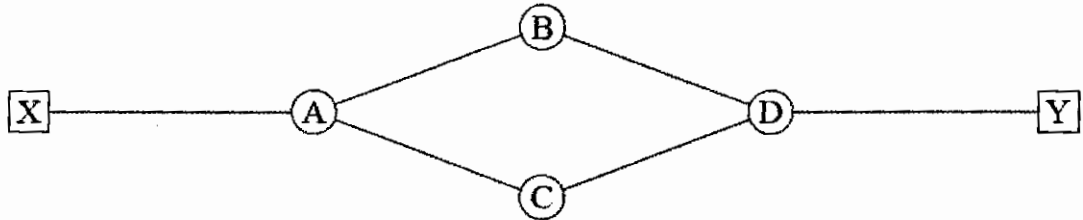
This question paper consists of **SIX (6)** Questions. Answer any **FOUR (4)** questions. Marks are indicated in the square brackets.

All questions carry equal marks.

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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? [9]
- b) Given the diagram below, hosts X and Y are communicating through the data network provided by the Routers A, B, C and D and the links interconnecting them as shown above. Initially all packets are traveling through Routers A, C and D.
- i) If router C fails. Describe the events that follow to recover when [7]
1. The network is a datagram network
 2. The network is connection oriented

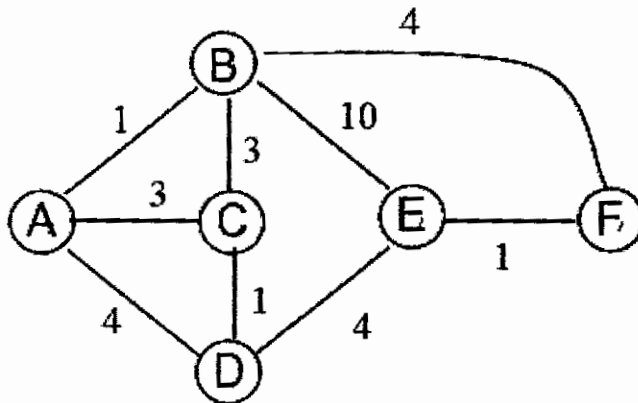


- c) A packet traversing the Internet typically undergoes several types of delays, including transmission delay, propagation delay, and queuing delay, etc. Define each type of delay. How can the effect of each of these delays be reduced? [9]

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? Give examples derived from protocols in use today. Where are hybrid schemes employed and why? [6]

- c) Consider the network represented by the directed graph below. Show the operation of Dijkstra's (Link State) algorithm for computing the least cost path from **E** to all destinations. Also, derive the routing table for node **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 for node **B**. [10]



QUESTION 3

- a) Explain the term network jitter. How does jitter affect the performance of an audio streaming application? [3]
- b) In the context of networking, what is congestion? Describe the use of the Token bucket algorithm, Choke packets and Load shedding as applies to congestion control. [10]
- c) TCP employs a "three-way handshake at the start of a connection. With the aid a well labeled diagram explain what is meant by a "three way handshake" and why it is necessary. Explain the "Two Army" problem in connection with connection release. [6]
- d) What is a VPN and explain how the concept of tunneling is relates to VPN? [6]

QUESTION 4

- a) Briefly explain the following. Give full names for acronyms and specify which layer they are included
- i. BGP
 - ii. ARP
 - iii. RIP
 - iv. OSPF
 - v. MAC
 - vi. POP3
 - vii. SMTP
- [2 marks each]
- b) State 2 ways in which IPv4 and IPv6 addresses differ. One of the hosts at MTN (www.mtn.co.sz) has the IP address: 69.63.68.196 while one of the hosts at Standard Bank (www.standardbank.co.sz) has the IP address: 196.8.95.20. According to the address classification scheme for IPv4, to which classes do these IP addresses belong? State the network and host portion for each. [8]
- c) State 3 benefits of subnetting. [3]

QUESTION 5

- a) i) Is multiplexing at the Transport layer different from multiplexing at the physical layer? Explain your answer. [3]
- ii) Explain the main differences between addressing done at the Network layer and addressing done at the Transport layer. [4]
- b) With the aid of appropriate examples explain how transposition and substitution ciphers work. [5]
- c) Compare and contrast symmetric key cryptography (typified by the use of the DES algorithm), with public key cryptography (typified by the use of the RSA algorithm). In your answer you should list the major features of these approaches, but not discuss the details of DES or RSA. [8]
- d) Who or what parties have the authority to decide or dictate the technical solutions of the Internet? How are these decisions made? [5]

QUESTION 6

- a) i) State 3 different techniques you can use to authenticate a user? [3]
ii) What are the basic parts of an encryption system? [2]
- b) Describe briefly the meaning of the following terms:
i) Blog
ii) Wiki
iii) Cookie
iv) Web cache [2 each]
- c) Briefly explain how DNS queries are resolved in the DNS system. Why does the DNS have *zones*? [4]
- d) Proxy servers are widely used in client –server based applications, for example HTTP. List three functions implemented by a web proxy server, and briefly describe the benefits of implementing a web proxy server. What's the transport protocol employed by HTTP? What's the difference between non-persistent HTTP and persistent HTTP? [8]

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