

UNIVERSITY OF SWAZILAND

Faculty of Science

Department of Computer Science

MAIN EXAMINATION - MAY 2017

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).

**DO NOT OPEN THE PAPER UNTIL PERMISSION HAS BEEN GIVEN BY
THE INVIGILATOR.**

QUESTION 1

- a) What is a bridge? Name and discuss two algorithms that bridges use in a network. [5]
- b) Describe the main services provided by the network layer. [4]
- c) Define, and contrast between, *central*, *distributed* and *isolated* routing strategies. [6]
- d) 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? [4]
- e) A packet traversing the Internet typically undergoes several types of delays, including nodal processing delay, transmission delay, propagation delay, and queuing delay. Define each of these four types of delays. How can each of these delays be reduced? [6]

QUESTION 2

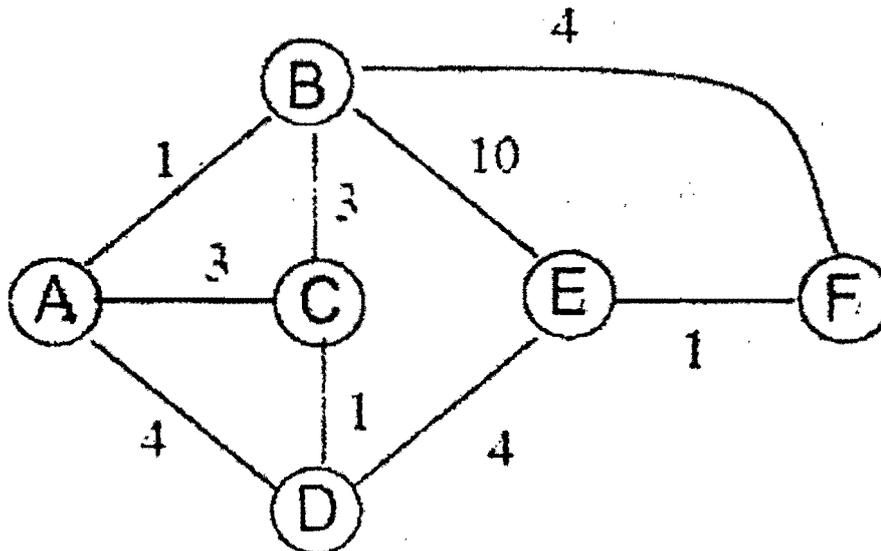
- a) How does a router differ from a bridge? [3]
- b) What is the main advantage of flooding? How does the protocol prevent packets from looping indefinitely? [6]
- c) What is the difference between congestion control and flow control? [3]
- d) What are the pros and cons of distance vector versus link state routing protocols? [6]
- e) Briefly describe the concept of tunneling in Internetworks. [3]
- f) State two reasons of routers to drop packets. [4]

QUESTION 3

- a) The following terms are used when describing the Internet Protocol. Define what they mean;
- (i) Internet Protocol (IP) Address.
 - (ii) Fragmentation.
 - (iii) Maximum Transmission Unit (MTU)
 - (iv) Time to Live (TTL) [8]
- b) Distinguish between TCP and UDP, explaining the kinds of applications to which each is suited. [5]
- c) How is the IPv4 header checksum calculated? [3]
- d) Explain how a new computer attached to a LAN can be assigned an IP address. [4]
- e) TCP employs a “three-way handshake” at the start of the connection. With the aid of well labelled diagram explain what is meant by a “three-way handshake” and why is it necessary. What important control information is carried in the first TCP segment (packet) of the three-way handshake, and why? [5]

QUESTION 4

- a) Given the IP address AC10E681 in hexadecimal, give it in the normal dotted decimal notation. [3]
- b) What is a socket in TCP/IP? [2]
- 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? [1]
- ii) How many sub-networks can you have on this network? Clearly show how you obtained your answer. [4]
- ii) How many nodes can be supported on each of these sub-networks? Again, clearly show how you obtained your answer. [4]
- d) Explain the concept of subnetting. State any 2 benefits of subnetting. [4]
- e) 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, 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 5

- a) What are the major goals of network security? What are the basic parts of an encryption system? [6]
- b) What is Digital Signature? Give an explanation of MD (Message Digest) Digital Signature Method. [5]
- c) Describe the RSA encryption method. [6]
- d) What is firewall? What kind of operations or function does a firewall typically perform? Write any one security threat that a firewall prevents and three different security threats that a firewall is useless against. [5]
- e) Explain the term network jitter. How does jitter affect the performance of an audio streaming application? [3]