UNIVERSITY EXAMINATIONS
2022/2023 ACADEMIC YEAR

END OF SEMESTER EXAMINATIONS
YEAR THREE SEMESTER TWO EXAMINATIONS

FOR THE DEGREE OF
BACHELOR OF COMPUTER SCIENCE

COURSE CODE : CSC 373E

COURSE TITLE : NETWORK & SYSTEM ADMINISTRATION

DATE: 17/04/2023   TIME: 9:00 A.M – 11:00 A.M.

INSTRUCTIONS TO CANDIDATES

ANSWER QUESTIONS ONE AND ANY OTHER TWO.

QUESTION ONE (COMPULSORY) [30 MARKS]

a) One of the first steps in configuring a device to be managed is to give it an IP address. Why?

[2 marks]

b) Many network administrators use the ping program as a primary management tool.

   i.   Why would you ping a network device? [2 marks]

   ii.   Why would you ping yourself? [2 marks]

c) We have seen that SNMP uses UDP as its transport protocol. Why was UDP chosen over TCP?

[4 marks]

d) What is the disadvantage of having the network management system operate at the application layer? [3 marks]

e) Because SNMP uses two different port numbers (UDP ports 161 and 162), a single system can easily run both a manager and an agent. What would happen if the same port number were used for both? [3 marks]

f) The original (version 1) specification of SNMP has the following definition of a new

type:

Gauge:: = [APPLICATION 2] IMPLICIT INTEGER (0..4294967295)

The standard includes the following explanation of the semantics of this type:

> This application-wide type represents a non-negative integer, which may increase or decrease, but which latches at a maximum value. This standard specifies a maximum value of 232_1 (4294967295 decimal) for gauges.

Unfortunately, the word *latch* is not defined, and this has resulted in two different interpretations. The SNMPv2 standard cleared up the ambiguity with the following definition:

> The value of a Gauge has its maximum value whenever the information being modeled is greater than or equal to that maximum value; if the information being modeled subsequently decreases below the maximum value, the Gauge also decreases.

   i.   What is the alternative interpretation? [2 marks]

   ii.   Discuss the pros and cons of the two interpretations. [4 marks]

g) KIBU network administrator has chosen a possible subnet mask for his\her network and need to determine the number of subnets, number of valid hosts per subnet, valid subnets, broadcast address of each subnet, and valid hosts in each subnet. Calculate for each:

i. A subnet mask 255.255.240.0 (/20) and network address 10.0.0.0 [4 marks]

ii. A subnet mask 255.255.255.192 (/26) and network address 10.0.0.0 [4 marks]

QUESTION TWO [20 MARKS]

a) With today's communication software and hardware, there is a tremendous amount of management capability built into each device. In addition, you can install protocols for the express purpose of more management. As an example, an organization may decide to run the Cisco Discovery Protocol in order to solicit information and control network devices. While it is clear that some level of administration is vital, it is easy to get carried away and spend the day "supervising" devices that are working just fine. There are literally dozens of management "items." Identify some of the information that can be reported from most networking devices. [4 marks]

b) Explain the procedure that guides the management of a web server. [5 marks]

c) Identify the general security measures undertaken by a network administrator to secure a network. [4 marks]

d) As a User Support Technologist for your institution/organization, which command would you use to check basic network connectivity. [2 marks]

e) Discuss the steps followed in troubleshooting network access in TCP/IP stack. [5 marks]

QUESTION THREE [20 MARKS]

a) Discuss any four (4) inherent skills expected of a network designer. [4 Marks]

b) Identify and explain the encapsulation information within four protocol data units given the data forwarding scenario. [4 Marks]

c) State and explain any 4 network design considerations before implementation of a network system. [4 Marks]

d) The IP Protocol is a routable protocol. From this statement, explain two basic routing principles and their algorithms which routers apply for forwarding information. [4 Marks]

QUESTION FOUR [20 MARKS]

a) Describe how the TCP/IP protocol suite addresses the following concerns

i. How fast will the connected devices communicate? [3 Marks]

ii. How shall each device be identified? [3 Marks]

b) The OSI reference model provides a framework for network engineering solutions. Describe each of its abstraction layers and identify the protocols and their implementation. [4 Marks]

c) How can the following user groups apply the OSI reference model?

   i. Network administrators [2 Marks]

   ii. Network designers [2 Marks]

d) Illustrate and explain the role of the windowing mechanism within the TCP protocol. [2 Marks]

e) List and describe the distinguishing features of frames verses packets [4 Marks]

QUESTION FIVE [20 Marks]

a) The Systems Administrator of Acme Company performs the backup of the website database file every day at 15:50. The original file location is /mnt/hda1/www/database.sql. The Administrator copies it to /mnt/sda1/backup/ folder. Provide an automated solution for this problem. Assume that the system is running under Linux and that you have all the necessary tools installed. [5 marks]

b) A web developer wants to implement a Web server on his personal computer, so that his work is accessible on the internet. Given that the developer has the following:

- Only one Computer running Windows XP
- ADSL connectivity

The developer wants his web server to run in Linux Environment, but still needs his Windows XP Operating systems for other administrative work.

   i. Is it possible for the web developer to have two operating systems working simultaneously on his personal computer? Justify your answer. [3 marks]

   ii. Provide the steps the web developer should follow to set up his web server. Your answer should include any software packages used and necessary configurations made. [9 marks]

   iii. The Web developer notices that his IP changes each time he restarts his Router. Why does this happen? What solution can be provided for this issue? [3 marks]