



# TECHNICAL UNIVERSITY OF MOMBASA

INSTITUTE OF COMPUTING & INFORMATICS

COMPUTER SCIENCE & INFORMATION TECHNOLOGY DEPARTMENT

## UNIVERSITY EXAMINATION FOR:

BSC IT

BIT 2116: NETWORK DESIGN & MANAGEMENT

END OF SEMESTER EXAMINATION

**SERIES: 2016**

**TIME: 2 HOURS**

**DATE: ##/05/2016**

### Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of 5 questions. Question 1 is compulsory, then answer any other 2 remaining questions.

**Do not write on the question paper.**

### Question ONE

A. Define each of the following terms from a networking perspective:

- i. Multiple access [1 mark]
- ii. Roundtrip time [1 mark]

B. Distinguish between baseband and broadband signaling types. [2 marks]

C. Briefly describe the mesh topology and state one advantage and one disadvantage of it. [2 marks]

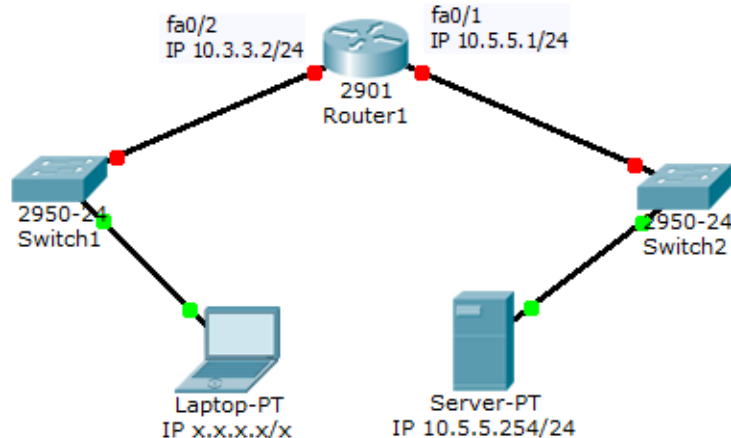
D. Explain how the address resolution protocol (ARP) utilizes the two address concept to enable communication on ethernet networks. [2 marks]

E. Given the IP address 224.0.0.3, determine:

- i. The binary format [1 mark]
- ii. The class it belongs to [1 mark]

iii. Its application [1 mark]

- F. A network has a subnet mask 255.255.224.0 (binary: 11111111.11111111.11100000.00000000), how many hosts can this network have? [2 marks]
- G. Determine the network address for a host with the IP address of 192.168.50.50 using a subnet mask of 255.255.255.240 [3 marks]
- H. Time division multiple access (TDMA) and Frequency division multiple access (FDMA) are used extensively in satellite communications. Briefly describe how each takes advantage of the time and frequency domains. [2 marks]
- I. Refer to the graphic below:



- i) Assign a valid IP address, subnet mask and default gateway to the Laptop to enable it access the server of IP address 10.5.5.254/24 [2 marks]
- ii) Assuming the laptop is running on Microsoft Windows OS, which command would you use on the laptop to test for successful network connectivity to the server? Write down the command. [1 mark]
- iii) As the communication occurs from the laptop to the server, what will be the source MAC address of the frames received by switch2 from the laptop? (MAC addresses not shown in the graphic, give the associated interface) [2 marks]
- iv) Briefly describe how you can securely enable and configure only 1 telnet session on Switch2. [3 marks]
- J. Write a code to configure “LAB-Router” as the router’s name, and IP 192.168.1.1/26 on interface fa0/1 [3 marks]
- K. What is the role of the Internet Corporation for Assigned Names and Numbers (ICANN)? [1 mark]

**Question TWO [20 marks]**

- A. Distinguish between routing and switching, clearly state their differences. **[4 marks]**
- B. What is the role of a default gateway in a network? **[2 marks]**
- C. Describe CSMA/CA as used in IEEE 802.11 (WiFi) **[6 marks]**
- D. A router has the following entries in its routing table:

<u>Address/mask</u>	<u>Next hop</u>
128.114.56.0/22	Interface 0
128.114.60.0/22	Interface 1
192.168.30.0/23	Router 1
Default	Router 2

For packets with the following IP addresses, clearly show where the router will send the packet

- i. 128.114.57.11 **[4 marks]**
- ii. 192.168.31.6 **[4 marks]**

**Question THREE [20 marks]**

- A. An institution (medium sized) has a class C network 200.1.1.0, and it wants to form subnets for 4 departments with the number of hosts as follows:  
Subnet A: 72 hosts  
Subnet B: 35 hosts  
Subnet C: 20 hosts  
Subnet D: 18 hosts

There are 145 hosts in total.

Provide a possible arrangement of the network address space, together with the respective range of IP addresses for each subnet. Explain your work. **[12 marks]**

- B. Suggest what the organization might do if it needs to create a 5th subnet (Subnet E) with 20 new hosts. **[8 marks]**

**Question FOUR [20 marks]**

- A. A client is downloading a 25MB file from a server through a single communication link with bandwidth capacity of 5Mbps. Determine the total delay if the distance between the client and the server is 5,000Km and the propagation speed through the medium is  $2 \times 10^8$  m/s **[5 marks]**
- B. Describe 2 ways to secure the virtual terminal interfaces on a CISCO switch. **[2 marks]**
- C. What is RSA cryptography? Explain how it secures data transmission. **[3 marks]**

D. Sketch the 7-layer OSI model and describe in one sentence (for each layer) the services that each layer provides. **[4 marks]**

E. Refer to the running configuration of a CISCO switch below:

```
!  
interface Vlan1  
 ip address 192.168.0.1 255.255.255.0  
 shutdown  
!  
line con 0  
 password matrix  
 login  
!  
line vty 0 1  
 login  
!  
end
```

- i. A network administrator can not establish a telnet session nor can he successfully ping the switch from his laptop of IP address 192.168.3.50/24. What is the cause of these failures? Describe how to correct the problems. **[3 marks]**
- ii. Describe how you can implement SSH on the switch to further secure the remote sessions. **[3 marks]**

### **Question FIVE [20 marks]**

A. What is the difference between the bit rate and baud rate of a signal? **[4 marks]**

B. An institution has a T1 access line (1.544 Mbps) which services web requests from about 150 users in the network. The institution is considering putting up a proxy server which can act as a cache for all these users. (i.e. whenever a user makes a web request, the request is first sent to the proxy server to see if it can service the request from its cache. Otherwise, the proxy forwards the requests to the origin server.)

- i. The users make on the average 1 request per second, with an average size of a request object being 10 kbits. What percentage of the bandwidth is consumed by the web traffic when there is no proxy server, and all requests are serviced by the origin server? **[5 marks]**
- ii. After installing the proxy server, it was found that the hit rate to the cache is 40%. What percentage of the institutional bandwidth is now consumed by the web traffic? **[6 marks]**
- iii. If the round trip time (RTT) from a user node to the proxy server is 50 msec, and the RTT from the proxy server into the Internet is 2 sec, then what is the average delay experienced by web requests in scenario (ii)? **[5 marks]**