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 [30 marks]

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

   i) Latency **[1 mark]**
   ii) Carrier sense **[1 mark]**

B. Distinguish between broadcasting and multicasting. **[2 marks]**

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

D. Explain how network address translation (NAT) is used to extend the use of the limited IPV4 address space. **[2 marks]**

E. Given the IP address 127.0.220.53, determine:

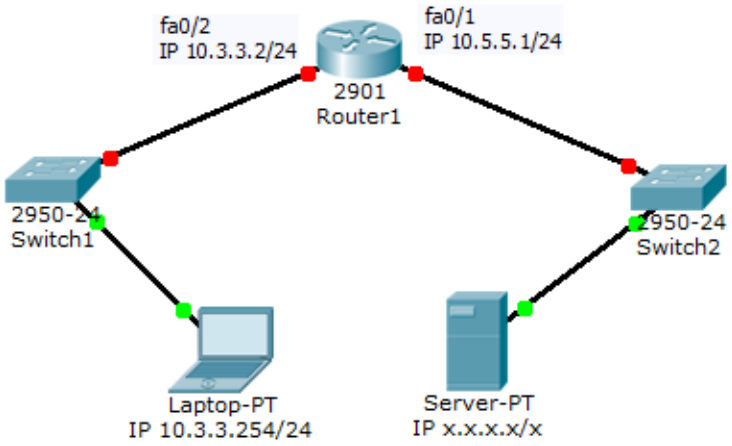
   i) The binary format **[1 mark]**
   ii) The class it belongs to **[1 mark]**
   iii) Its application **[1 mark]**

F. A network has a subnet mask 255.255.252.0 (binary: 11111111.11111111.11111100.00000000), how many hosts can this network have? **[2 marks]**

A. Determine the network address for a host with the IP address of 192.168.50.250 using a subnet mask of 255.255.255.224 **[3 marks]**

G. Briefly describe wavelength division multiplexing (WDM) and how it has transformed fiber optics communication today. **[2 marks]**

H. Refer to the graphic below:



i) Assign a valid IP address, subnet mask and default gateway to the server to be accessible by the laptop of IP address 10.3.3.254/24 **[2 marks]**

ii) Assuming the server is running on Linux OS, which command would you use on the server to test for successful network connectivity to the laptop? Write down the command. **[1 mark]**

iii) As the communication occurs from the server to the laptop, what will be the source MAC address of the frames received by switch1 from the server? (MAC addresses not shown in the graphic, give the associated interface) **[2 marks]**

iv) Assuming the laptop is connected to the fast ethernet 0/1 interface of Switch1, briefly describe how you can implement and configure switchport security on the interface to enable only the laptop to access that port. **[3 marks]**

I. Write a code to configure "TUM-Router" as the router's name, and IP 192.168.1.1/25 on interface fa0/3 **[3 marks]**

J. What is the role of the Internet Assigned Numbers Authority (IANA)? **[1 mark]**

Question TWO [20 marks]

A. Distinguish between routing and forwarding, clearly state their differences. **[4 marks]**

B. What is a VLAN? How can network administrators use VLANs to segment local area networks into smaller groups of networks? **[2 marks]**

C. Describe CSMA/CD as used in IEEE 802.3 (Ethernet) **[6 marks]**

D. A router has the following entries in its routing table:

Address/mask	Next hop
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. 128.114.63.9 **[4 marks]**
ii. 192.168.33.5 **[4 marks]**

Question THREE [20 marks]

A. An organization has been assigned the network address: 140.25.0.0, and it needs to create a set of subnets that support up to 25 hosts on each subnet.
   i. What is the subnet mask you would use to do this? **[5 marks]**
   ii. What is the maximum possible number of such subnets in the given network? The use of special address must be avoided! **[3 marks]**
   iii. Given that there are 25 hosts on each subnet, what percentage of the address space is being wasted? **[5 marks]**

B. In a network which has been allocated the address of 165.65.X.X and a subnet mask of 255.255.240.0, What will be the first and last assignable addresses on the 3rd usable subnet of such a network? Explain your work! **[7 marks]**

NOTE: The use of subnet/host IDs with all 1's and all 0's is NOT permitted.

Question FOUR [20 marks]

A. A client is downloading a 500MB file from a server through a single communication link with bandwidth capacity of 15Mbps. Determine the total delay if the distance between the client and the server is 8,000Km and the propagation speed through the medium is 2.5×10^8 m/s **[5 marks]**

B. Describe how network access control lists (ACLs) can be used to control traffic in and out of a subnet. **[3 marks]**

C. What is DNS and what is it used for? If all DNS servers could be "crashed" (taken offline), what would happen to the Internet (be precise). **[2 marks]**

D. Sketch the 5-layer Internet protocol stack 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
 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 192.168.0.50/24. What is the cause of these failures? Describe how to correct the problems. **[3 marks]**

ii. After solving the above issue, a colleague of the first administrator tries to also telnet to the switch from his laptop of IP 192.168.0.51/24 at the same time. Will his telnet session succeed? If not explain how you can solve the issue. **[3 marks]**

Question FIVE [20 marks]

A. Compare and contrast between circuit-switched and packet-switched networks. Give examples of both networks **[6 marks]**

B. A user in Mombasa, connected to the internet via a 100 Mbps (b=bits) connection retrieves a 250 KB (B=bytes) web page from a server in Washington, where the page references 3 images of 500 KB each. Assume that the one way propagation delay is 75 ms and that the user's access link is the bandwidth bottleneck for this connection.

i. Approximately how long does it take for the page (including images) to appear on the user's screen, assuming non-persistent HTTP using a single connection at a time (for this part, you should ignore queuing delay and transmission delays at other links in the network)? **[6 marks]**

ii. How long does it take if the connection uses persistent HTTP (single connection)? **[5 marks]**

iii. Suppose that user's access router has a 4 MB buffer (B=byte) on the link from the router to the user. How much delay does this buffer add during periods when the buffer is full? **[3 marks]**