



UNIVERSITY OF RUHUNA

Faculty of Engineering

Mid-Semester 7 Examination in Engineering: June 2015

Module Number: EE7245

Module Name: Design and Management of Networks

[Two Hours]

[Answer all questions]

-
- Q1 a) Give short answers for the following questions.
- State at which layer, the Spanning Tree Protocol (STP) operates in the Open System Interconnection (OSI) model
 - State at which layer, the Internet Protocol (IP) operates in the OSI model
 - What is the well-known port number of the Simple Mail Transfer Protocol (SMTP)?
 - List two active devices and two passive elements used in Local Area Networks (LANs).
 - State two advantages of using fiber cables over copper cables in data networks. [2.5 Marks]
- b) Read the following statements and identify whether they are True or False.
- A hub is an intelligent device.
 - A switch operates in the Data Link layer, whereas a multilayer switch operates in the Network Layer of the OSI Model.
 - A Virtual Local Area Network (VLAN) can segment the broadcast domain of a switch.
 - The initial switch operation of a network is defined based on the broadcast function.
 - Both routers and switches block the multicast traffic in a network. [2.5 Marks]
- Q2 a) Evaluate the functional difference between the Network Hub and the Network Switch. [1.0 Mark]
- b) Explain the address learning and the frame forwarding function of an Ethernet Switch using diagrams. [2.0 Marks]
- List the private address ranges of each IP address class in IPv4 addressing scheme.
 - Explain the advantage of having Private IP addresses in LAN Design. [2.0 Marks]
- d) Explain the function of a Dynamic Host Control Protocol (DHCP) server. [1.5 Marks]

- e) An Internet Cafe needs a LAN with ten hosts. This LAN connects to the Internet using a router. The owner of the Internet Cafe expects a low cost design.
- i) List the active and the passive elements that are required to implement this design.
 - ii) Design an IP plan by indicating the network address, the subnet mask, the default gateway address, the host IP range and the broadcast address of the design.
 - iii) Draw the network diagram of this design and label all the devices with IP details.
- [3.5 Marks]

- Q3 a) Briefly explain the term Variable Length Subnet Mask (VLSM) using diagrams.
- [1.0 Mark]
- b) State one advantage of using VLSM over Static Length Subnet Mask (SLSM).
- [1.0 Mark]
- c) XYZ Company is an Internet Service Provider (ISP). They provide Internet leased lines to customers with Quality of Service (QOS) enabled using clean pipe services.

Recently, the XYZ company has received some service requests for leased lines with the following requirements.

The Company A1 requests 10 Mbps bandwidth with 120 public IP addresses.

The Company A2 requests 5 Mbps bandwidth with 60 public IP addresses.

The Company A3 requests 15 Mbps bandwidth with 30 public IP addresses.

The Company A4 requests 1 Mbps bandwidth with 12 public IP addresses.

The Company A5 requests 1 Mbps bandwidth with 14 public IP addresses.

Presently, the XYZ company has the public IP address range of 203.115.20.0/24. The senior design engineer asks you to design an IP address plan for the above mentioned requirements using 203.115.20.0/24 IP block. You need to define the network address, the subnet mask, the broadcast address and the host range for each service request.

[3.0 Marks]

- Q4 a) Briefly explain the VLAN concept and how it increases the security and the flexibility of a LAN.
- [2.0 Marks]
- b) ABC is a private company. This company has six departments, namely IT, Sales, Marketing, Finance, Production and Human Resource (HR) and number of employees in each department is 25, 50, 40, 35, 125 and 15 respectively. This company has launched the Bring Your Own Device (BYOD) concept. Design an IP plan
- i) by defining a network address for the ABC Company and

- ii) by defining the sub networks for the departments under the main network address.

Note: Assume each employee in the organization uses an IP configurable end device.

[3.0 Marks]

- c) This company has two buildings (Building A and Building B) having two floors each. The employee distribution according to the floor arrangement is as follows.

Building/Floor Number	IT	Sales	Marketing	Finance	Production
A/1	15	5	10	0	20
A/2	0	25	0	20	40
B/1	0	0	30	15	20
B/2	10	20	0	0	45

Note: A/1 means Building A and floor 1.

The ABC company has requested an Internet Leased Line (ILL). The ISP has placed a router in network equipment room of Building A, floor 1.

Design a Network by considering following requirements.

- Each Department traffic should be isolated.
- The redundancy needs to be addressed and a single point of failure should be avoided.
- The device uplinks needs to carry for all department traffic in a reliable way.
- The distance between two buildings is 150 m. The Designer should select a reliable and less delay transmission mechanism between the buildings. The Distance between the two floors less than 20 m.
- The subnetwork address, the subnet mask and the default gateway of each department need to be mentioned in the design.
- The Designer should clearly mention the VLAN details and the used cable types.

Note: Do not include the end devices in the network diagram and use the relevant network symbols.

[5.0 Marks]