



UNIVERSITY OF RUHUNA

Faculty of Engineering

End-Semester 5 Examination in Engineering: October 2019

Module Number: EE5302

Module Name: Computer Networks

[Three Hours]

[Answer all questions, each question carries 10 marks]

- Q1 a) Explain using a suitable diagram, the encapsulation and de-encapsulation processes for raw application data to be transmitted from a source node to a destination node. Show all the protocol data units (PDUs) used at each layer of the five layer TCP/IP protocol suite. [3.0 Marks]
- b) i) State the meaning of encoding and decoding processes used for data communication.
ii) A host on a Local Area Network (LAN) sends a bit stream 11011001. Sketch the transmitted signal for
I) Non Return-to-Zero Level (NRZ-L) encoding.
II) Bipolar Alternate Mark Inversion (AMI) encoding. [3.0 Marks]
- c) Discuss the feasibility of using the following term pairs with computer networks.
i) Peer-to-peer topology and Client-server topology
ii) Circuit switching and Packet switching
iii) Unicasting and Broadcasting
iv) Connectionless protocols and Connection oriented protocols [4.0 Marks]
- Q2 a) Explain whether the following statements are TRUE/ FALSE regarding the use of switches and hubs for network connectivity.
i) Hubs can filter frames.
ii) Switches increase the number of collision domains in the network. [2.0 Marks]
- b) Identify the collision domains in the network topology shown in Figure Q2. [2.0 Marks]

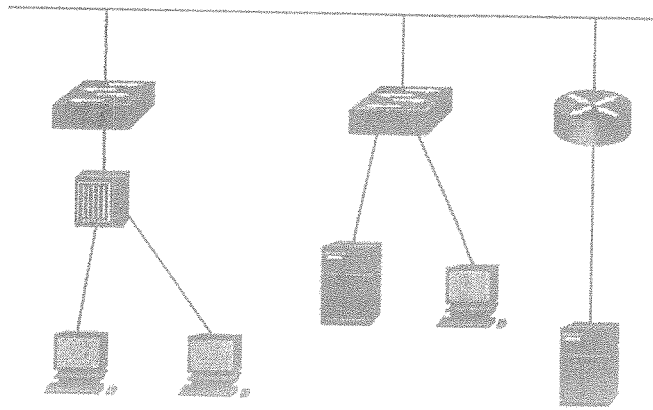


Figure Q2

- c) Describe how a computer connected to an Ethernet LAN determines its own Ethernet address and the Ethernet addresses of other computers in the same LAN it needs to communicate.
- [2.0 Marks]
- d) An Ethernet LAN connects two workstations A and B. The following information is provided about the IP interfaces of the workstations connected to the LAN and their Media Access Control (MAC) addresses.

Workstation A : IP = 139 . 101 . 1 . 7 MAC = 08 : 00 : 20 : 02 : b7 : f9
 Workstation B : IP = 133 . 101 . 1 . 63 MAC = 08 : 00 : 20 : ff : 00 : 00

The workstation A has not previously sent any packets to the Ethernet LAN. The user at workstation A runs a program which sends one IP packet to the destination address of workstation B. Explain the procedure for how that frame is sent by workstation A.

Note:

Discuss the MAC address resolution table and the structure of the Ethernet and other transmission frames.

[4.0 Marks]

- Q3 a) Since IPv6 is designed to be the successor to IPv4, the limited IPv4 address space is required to be replaced by IPv6 addresses. However, this cannot be done without having a proper translation while the network devices are in operation. What are migration techniques that can be used to keep the IPv4 and IPv6 coexistence?

[3.0 Marks]

b) Express the following IPv6 addresses in the compressed form by omitting leading zeros and all zero segments.

i) 2001 : 0DB8 : 0000 : 0000 : ABCD : 0000 : 0000 : 0100

ii) FE80 : 0000 : 0000 : 0000 : 0123 : 4567 : 89AB : CDEF

[2.0 Marks]

c) i) Suppose that you are the network administrator of ABC (Pvt) Ltd and is asked to provide an IP addressing plan for the network topology shown in Figure Q3 c) i). Use the 192.168.10.0/24 network address to create the subnets for the given topology.

Hint:

You should find answers for the following questions.

- How many subnets are there?
- How many bits should you borrow to create the required number of subnets?
- How many usable host addresses per subnet are in this addressing scheme?
- What is the new subnet mask in dotted decimal format?
- How many subnets are available for future use?

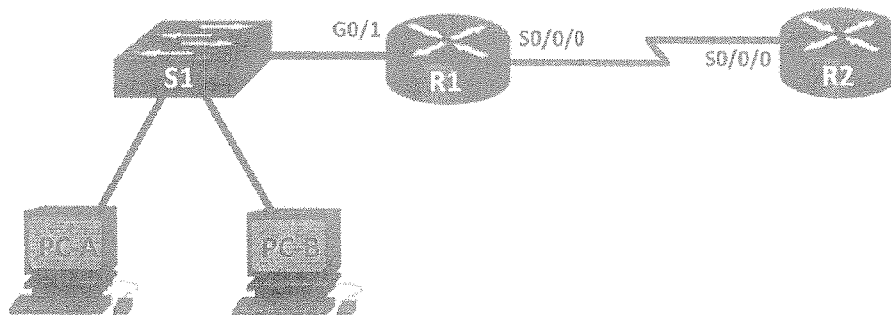


Figure Q3 c) i)

ii) The network topology shown in part i) is expanded to accommodate the router R3 and its accompanying network as illustrated in Figure Q3 c) ii). Design a new addressing scheme to support the additional network requirement with the 192.168.10.0/24 IP address.

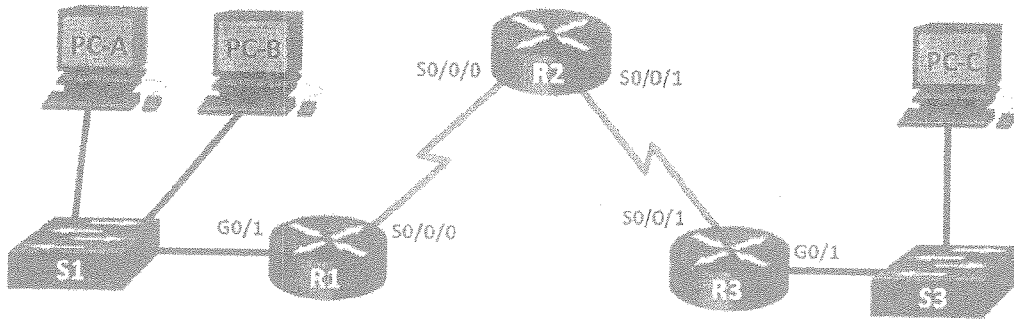
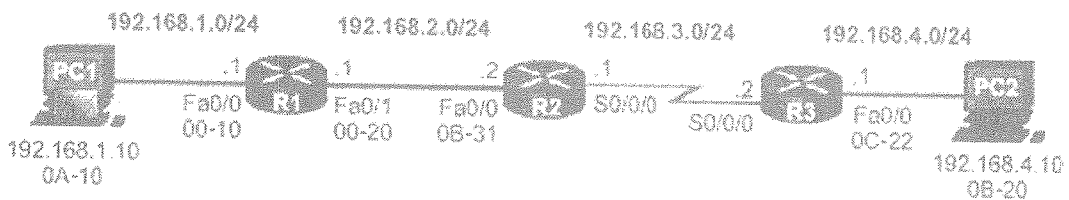


Figure Q3 c) ii)

[5.0 Marks]

Q4 a) Suppose that PC1 wants to send a packet to PC2 as shown in Figure Q4 a) i).



Layer 2 Data Link Frame			Packet's Layer 3 data				
Dest. MAC 00-10	Source MAC 0A-10	Type 800	Source IP 192.168.1.10	Dest. IP 192.168.4.10	IP fields	Data	Trailer

PC1's ARP Cache for R1	
IP Address	MAC Address
192.168.1.1	00-10

Figure Q4 a) i)

Show how the packet is switched among the nodes of the network. You are required to complete the routing table entries of routers, layer 2 data link frames and layer 3 packet headers for each network segment from PC1 to PC2. As an example, the routing table at R1 is shown in Figure Q4 a) ii).

R1's Routing Table			
Network	Hops	Next-hop-IP	Exit Interface
192.168.1.0/24	0	Dir. Connect.	Fa0/0
192.168.2.0/24	0	Dir. Connect.	Fa0/1
192.168.3.0/24	1	192.168.2.2	Fa0/1
192.168.4.0/24	2	192.168.2.2	Fa0/1

Figure Q4 a) ii)

[6.0 Marks]

- b) Determine a single summary network address and the network prefix for which R1 needs to reach all networks as shown in Figure Q4 b).

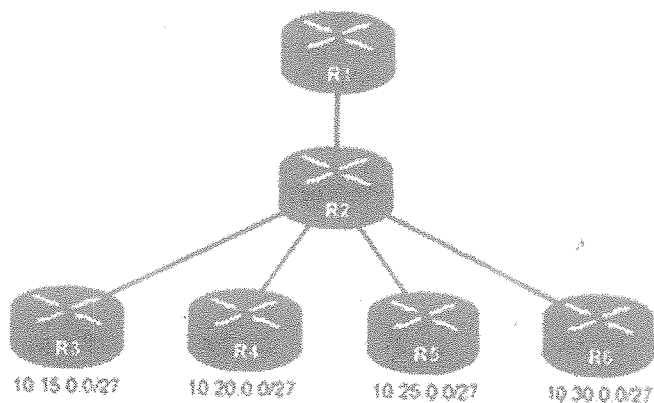


Figure Q4 b)

[4.0 Marks]

- Q5 a) Compare the two transport layer protocols, Transmission Control Protocol (TCP) and User Datagram Protocol (UDP), based on their characteristics. [2.0 Marks]
- b) Suppose you are asked to design the communication part of a multi-functional teleconferencing application. Your teleconferencing application allows voice talk and text-based messaging among the users. The Quality of Service (QoS) of the general users' demand for the two functions are tabulated in Table Q5.

Table Q5

	Loss	Bandwidth	Time Sensitivity
Messaging	No Loss	Infinite	Not Required
Talk	Loss Tolerant	Audio; 5 kbps	Required

Explain which transport layer protocol, TCP or UDP, is preferred to transfer the following.

- Text messages
- Voice talk

[3.0 Marks]

- c) Both File Transfer Protocol (FTP) and Server Message Block (SMB) provide file sharing services. Explain the difference between them.

[2.0 Marks]

- d) To browse a web page, it is required to get the service of several application layer protocols. Discuss briefly the role of each protocol starting from switching on your computer.

[3.0 Marks]