



Sri Lanka Institute of Information Technology

**B. Sc. Special Honours Degree/ Diploma
in Information Technology**

Final Examination
Year 2, Semester II
September / October -2016

**EC244 - Data Communications & Computer
Networks II**

Duration: 3 Hours

Instructions to Candidates:

- ◆ This paper has 5 Questions.
- ◆ Answer all Questions.
- ◆ This paper contains 8 pages and cover page.
- ◆ Total marks 100.

Question 1)**(20 marks)**

1. Following is a dump of a TCP header in the hexadecimal format.

←
0050 C351 0000 0071 0000 0034 A012 0400 0000 0000

Source Port Number (16 Bits)								Destination Port Number (16 Bits)							
Sequence Number (32 Bits)															
Acknowledgement Number (32 Bits)															
Header Length (4 bits)	Reserved Bits (6)	U R G	A C K	P S H	R S T	S Y N	F I N	Window Size (16 Bits)							
Checksum (16 Bits)								Urgent Pointer (16 Bits)							
Options & Paddings															
Data															

Figure 1

Answer the following questions. (Mention the base, if it is not in decimal. Eg: Hex or bin)

- a. Write the source port number and the source server process. (2 marks)
 - b. To which category does the above port number belong? (1 mark)
 - c. Mention the sequence number and explain how it is generated. (2 mark)
 - d. Mention the window size and briefly explain the information given by this value. (3 marks)
 - e. What can you say about this TCP segment by observing the values of six different Control fields (flags)? (2 marks)
 - f. What is the size (in bytes) of this TCP header? (2 marks)
 - g. Are options available? If yes how many bytes are in options? (2 marks)
2. Briefly explain the use of following Control fields. (Eg. URG = 1) (4 marks)
- i. URG
 - ii. RST
3. What are the timers used in TCP? (2 marks)

Question 2)**(20 marks)**

1. What are the four types of memories used in a router? (2 marks)
2. Consider the following network diagram and write down the commands / configurations to perform the following. Indicate the router prompt as well. (R1, R2 – routers, SW1, SW2 – switches, A to R – computers).

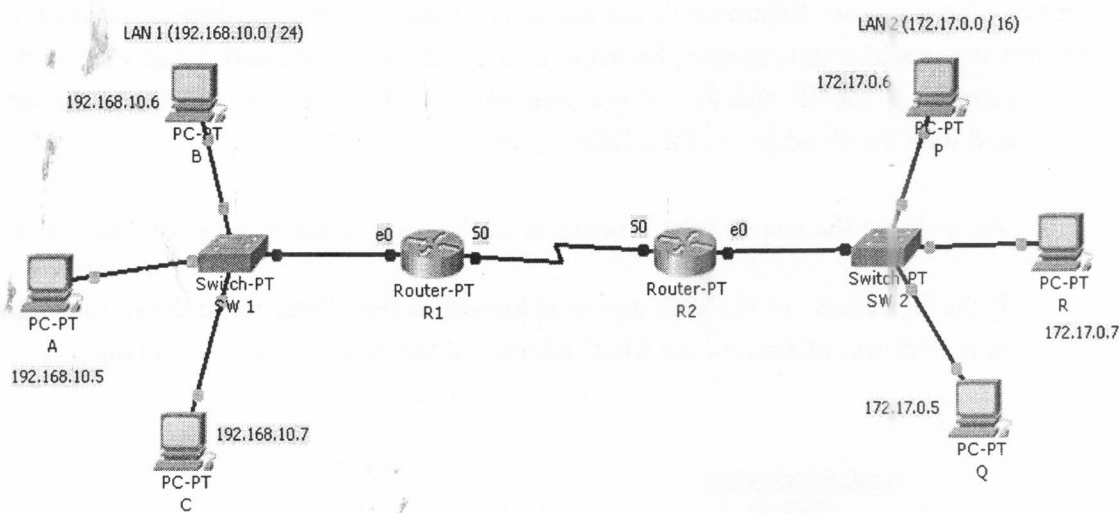
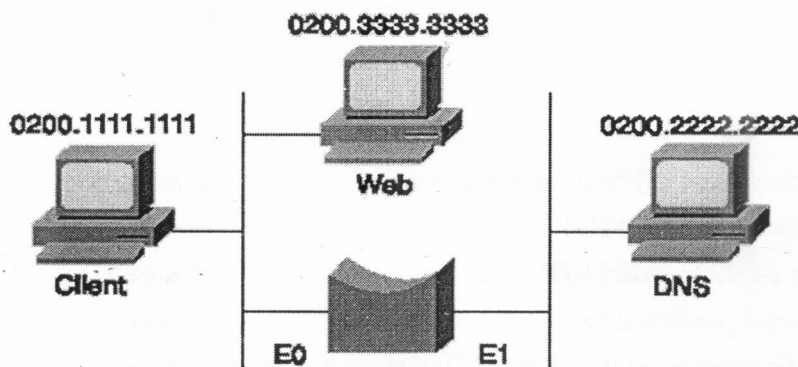


Figure 2

- a. Enter to the privilege mode of R2 from user mode of R2. (1 mark)
 - b. Enter to the configuration mode of R2. (1 mark)
 - c. Change the hostname of R2 to 'METRO'. (1 marks)
 - d. Configure privilege level password for R2. (1 marks)
 - e. Configure a suitable IP address on the 'serial 0' interface and configure the clock rate as 64000 to the same interface in R2. (2 marks)
 - f. Assume that 'Ethernet 0' interface is already configured. Configure dynamic routing in R2. Use RIP as the routing protocol. (4 marks)
 - g. What is the command to verify the configuration you did? (1 marks)
 - h. Save the configuration to the NVRAM. (1 marks)
3. Draw the TCP connection establishment process (3-way-handshake) in a timing diagram. Indicate TCP client and TCP server states at each step. Assume that initially TCP client is in CLOSED state and TCP server is in LISTEN state. (6 marks)

Question 3)**(20 marks)**

1. Write down three types of internal switching paths and mention the default method used in present-day switches. (1 marks)
2. List two advantages of creating VLANs. (1 marks)
3. List two VLAN trunking protocols used in switches. (1 mark)
4. Consider the scenario illustrated in the following figure. Client requires connecting to the web server and it only knows the name of the web server. (Client doesn't know the MAC address or the IP address of the web server). Assume that the Client is pre-configured with the IP address of the DNS server.
 - a. Write down the steps in the process of finding the IP address of the web server. (4 marks)
 - b. If the IP address of the web server is known to the client, write down the steps in the process of finding the MAC address of the web server. (3 marks)

*Figure 3: LAN Segment*

5. The following diagram shows a switched network. Bridge IDs of each switch and path costs are given in the diagram. Draw this diagram in your answer booklet.

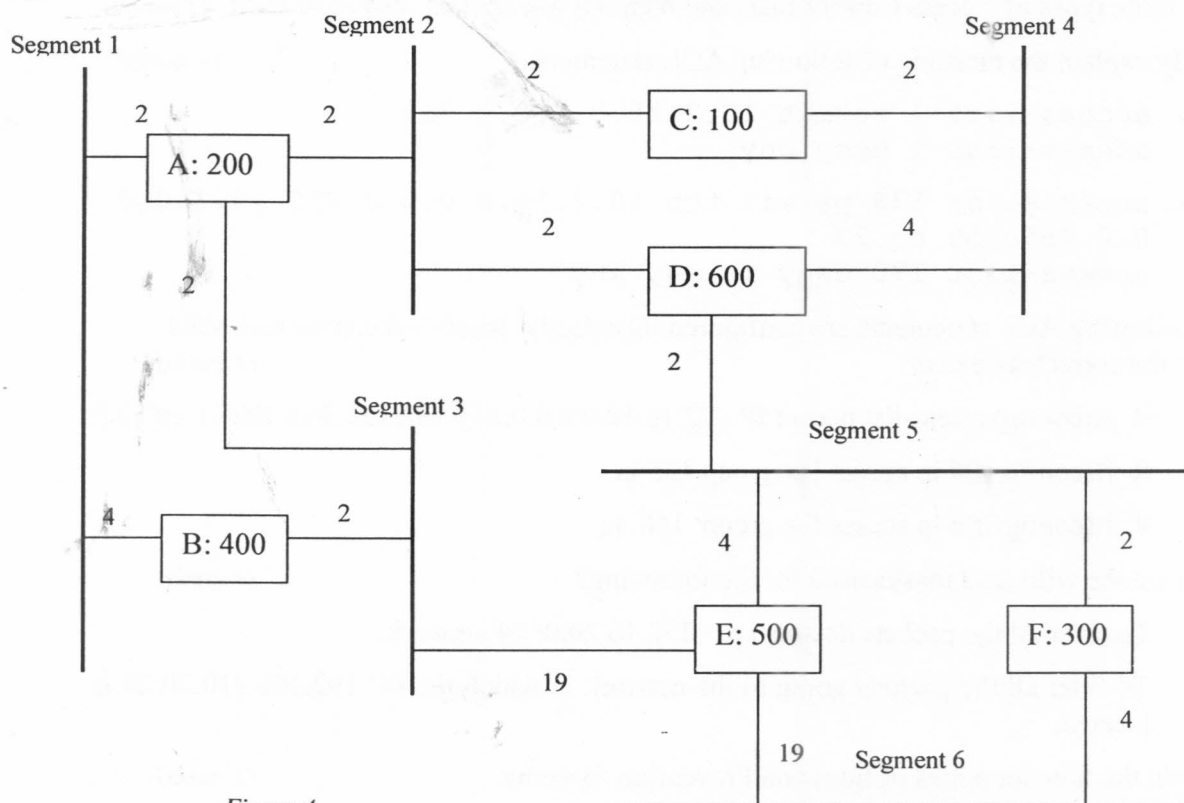


Figure 4

- Mark the Root Bridge in the diagram. (1 mark)
- Indicate the Root Port of each bridge as RP. (2 marks)
- Mark the designated Bridge of each segment. (2 marks)
- Indicate the designated port in each designated bridge as DP. (2 marks)
- If the selected Root Bridge is not working, then what switch is selected as the next root bridge? (1 mark)
- Explain the process of selecting the root bridge by STP? (2 marks)

Question 4**(20 Marks)**

1. State three types of Access Control Lists and mention one special feature of each. (5 marks)
2. Briefly explain the meaning of following ACL statements. (4 marks)
 - a. `access-list 1 permit 10.2.25.0 0.0.0.255`
`access-list 1 deny any`
 - b. `access-list 178 permit tcp 10.2.25.0 0.0.0.255 10.1.0.0 0.0.255.255 eq 23`
`access-list 178 deny ip any any`
3. The following ACL statements are configured incorrectly. Identify the error and write down the correct statement. (4 marks)
 - a. `R_A(config)#access-list permit IP 172.16.10.0 0.0.0.255 192.168.36.6 HOST eq FTP`
 - b. `R_B(config-if)# ip access list group 135 in`
`R_B(config-if)# ip access list group 168 in`
4. What are the wild card masks used for the following? (4 marks)
 - a. To filter all the packets destined to 172.16.20.0/24 network
 - b. To filter all the packets going to the network in which the PC 192.168.210.20/28 is located.
5. Explain the functionalities of Intrusion Prevention Systems. (3 marks)

Question 5**(20 Marks)**

- a. Briefly explain the function of ARP and RARP protocols. (4 marks)
- b. Hosts with an IP address 110.60.70.30 and physical address A2:33:55:10:22:10 has a packet to send to another host with IP address 110.60.70.35 and physical address A3:B6:C8:44:33:11 (which is unknown to the first host). The two hosts are on the same Ethernet network. Show the ARP Request and reply packets encapsulated in Ethernet frames. You need to mention the source addresses and destination addresses of ARP Request, ARP Reply and Ethernet frames. You may use the figure 5 in your answer booklet. (8 marks)

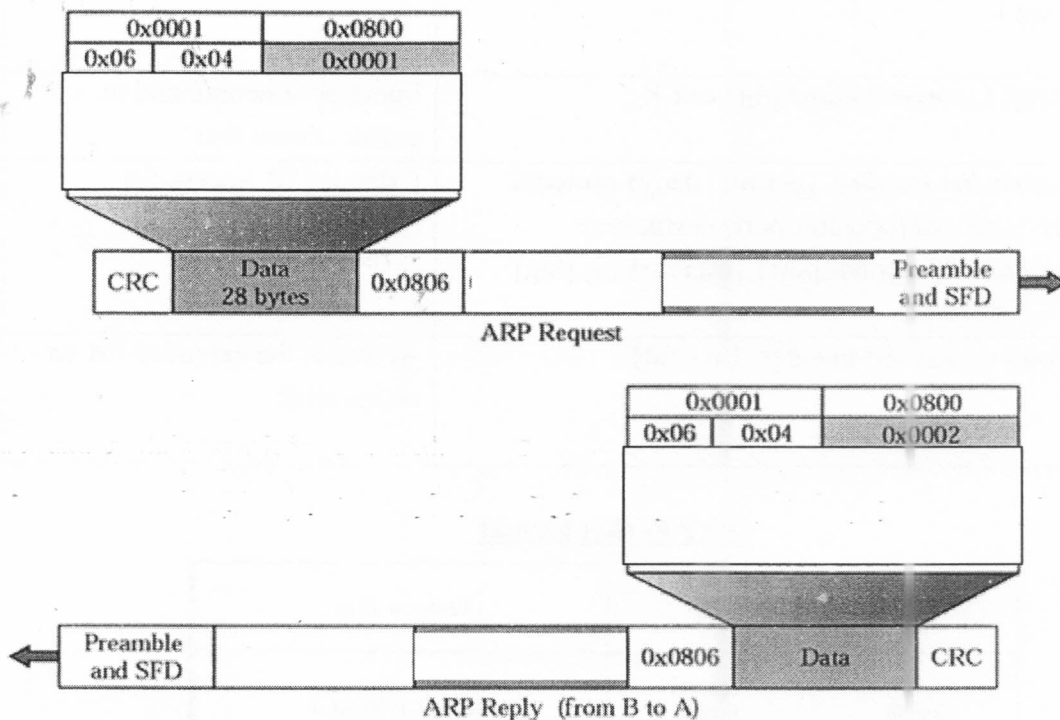


Figure 5: ARP Request and ARP Reply with Ethernet Encapsulation

- c. Explain the below routing algorithms. (4*2 Marks)
- Bellman-Ford
 - Dijkstra's

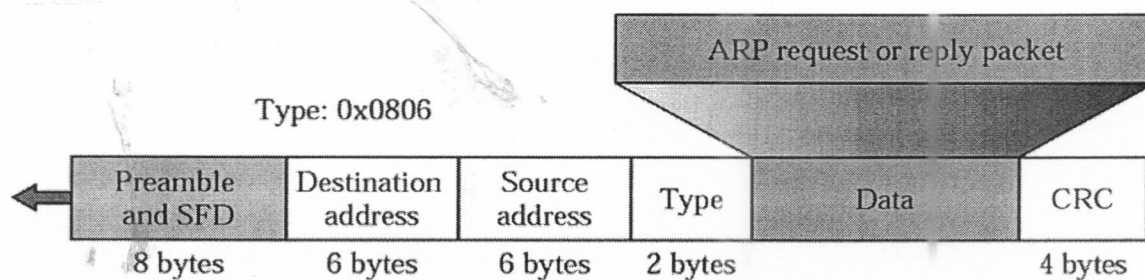
USEFUL COMMANDS FOR DATACOMMUNICATIONS AND COMPUTER NETWORKS II

Standard IP Access List and Extended Access list Configuration Commands

Command	Configuration Mode and Description
access-list <i>access-list-number</i> { deny permit } <i>source</i> [<i>source-wildcard</i>] [log]	Global command for standard numbered access lists
access-list <i>access-list-number</i> { deny permit } <i>source</i> [<i>source-wildcard</i>] <i>destination</i> [<i>destination-wildcard</i>] [log]	Global command for extended numbered access lists
ip access-group { <i>number</i> <i>name</i> [in out] }	Interface subcommand to enable access lists
access-list <i>access-list-number</i> { permit deny } protocol <i>source</i> <i>source-wildcard</i> [operator <i>port</i>] <i>destination</i> <i>destination-wildcard</i> [operator <i>port</i>] [established] [log]	Extended IP Access-list configuration
ip access-group <i>access-list-number</i> { in out }	Activates the extended list on an interface

ARP Packet format

Hardware Type		Protocol Type
Hardware length	Protocol length	Operation Request 1, Reply 2
Sender hardware address (For example, 6 bytes for Ethernet)		
Sender protocol address (For example, 4 bytes for IP)		
Target hardware address (For example, 6 bytes for Ethernet) (It is not filled in a request)		
Target protocol address (For example, 4 bytes for IP)		

Encapsulation of ARP Packet with Ethernet frame

End of Paper