Sri Lanka Institute of Information Technology

B.Sc. Honours Degree in Information Technology

Specialized in Information Technology

Final Examination
Year 2, Semester 1 (2019)

IT2050 – Computer Networks

Duration: 3 Hours

May 2019

Instructions to Candidates:

- This paper has 4 questions.
- Answer all questions in the booklet given.
- The total marks for the paper is 100.
- This paper contains 07 pages, including the cover page.
- Electronic devices capable of storing and retrieving text and mobile phones are not allowed.
- Calculators are allowed

Question 1

[25 Marks]

a. ABC Company has been granted the network 192.168.100.0/24.
The requirements are given in the following table (Table 1).

The company has four departments connected to separate routers.

Department	Connected Router	Connected device count
IT	R1	100
Purchasing	R2	26
Sales	R3	20
HR	R4	28
Five (5) Serial (WAN) links needed to inter-connect the routers		

Table 1

i. Create an IP address plan for the above requirements by using VLSM concept (indicate all the calculations) (10 Marks)

ii. Copy the following figure (Figure 1) into your answer booklet to illustrate your answer. Mention the LAN network addresses, WAN link addresses and interface IP addresses. (6 Marks)

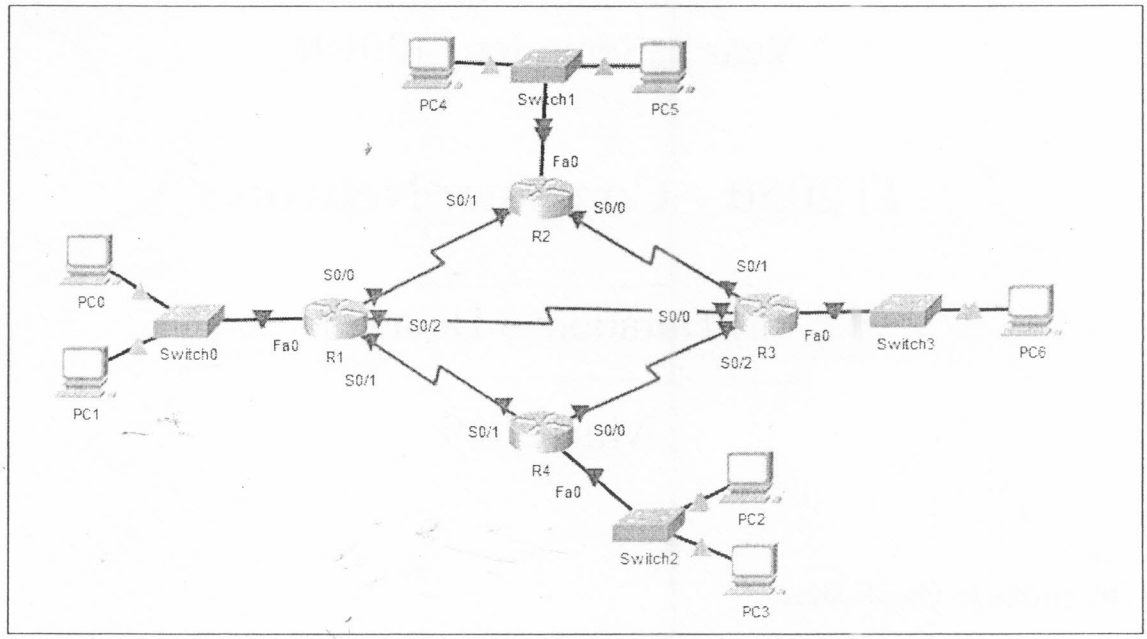

Figure 1 : Sample network topology

b. Briefly explain the three options available for migration to IPv6 from IPv4. (3 Marks)

c. List three types of IPv6 addresses. (3 Marks)

d IEEE defined Extended Unique Identifier (EUI) (or 64 bit interface ID) is generated using the MAC address of the host.
Using the following MAC address, show how the 64-bit Interface ID is generated. (3 Marks)
45A7: 8940:CAFE

Question 2

[25 Marks]

a. Assume that the Network Layer of a computer receives a segment with 3200 bytes of data. The Data Link Layer uses the Ethernet protocol (MTU of the Ethernet frame is 1500 bytes). Assume that the Identification number is 171.

i. Clearly show the fragmentation process by showing the values of all the special fields of the ***IP Header***. (4 Marks)

ii. How many IP Fragments will be created? (1 Mark)

iii. What is the fragmentation offset and the Identification number of the last fragment? (2 Marks)

b. Using a diagram, explain how ***Retransmission Timer*** solve the errors due to ***Corrupt Segments***. (2 Marks)

c. The Round Trip Time (RTT)set for a segment is,

Set RTT = α x Previous RTT + (1-α) Current RTT. Consider α as 90%.

i. A client sends a segment at the time 17:30:58. It receives the acknowledgement at 17:31:06. What is the Set value for RTT if the previous RTT was 5 seconds? (1 Mark)

ii. Calculate the Re-transmission Timer value based on the above **(i)** (1 Mark)

d. The following is a dump of a **TCP header** in hexadecimal format.

←

AF08 0017 0000 00A5 0000 0A01 8012 0800 0000 0000

i. State the destination port number and the service. (1 Mark)

ii. State the type of the source port. (1 Mark)

iii. State the type of the TCP segment. (1 Mark)

iv. Calculate the header size and the window size. (2 Marks)

v. The following is an invalid TCP header dump. Mention the existing error/s and write the corrected TCP header. (2 Marks)

←

AF08 0017 0000 00A5 0000 0A01 8000 0800 0000 00A2

e. A TCP client opens a connection with a server using an initial sequence number (ISN) of 12100. The server opens the connection with an ISN of 33200. The following segments are sent by the client and the server respectively. (6 Marks)

Client	Server
500 Bytes	
	200 Bytes

Show the three TCP segments during the Three-way handshake connection establishment, data transmission (piggy backing used) and connection termination. Include Sequence Numbers and Acknowledgement Numbers.

f. What is the state of the TCP server when it is transmitting data? (1 Mark)

Question 3

[25 Marks]

a. Use the following Network (Figure 2) to answer questions i to iv. All VLANs are having /24 network addresses.

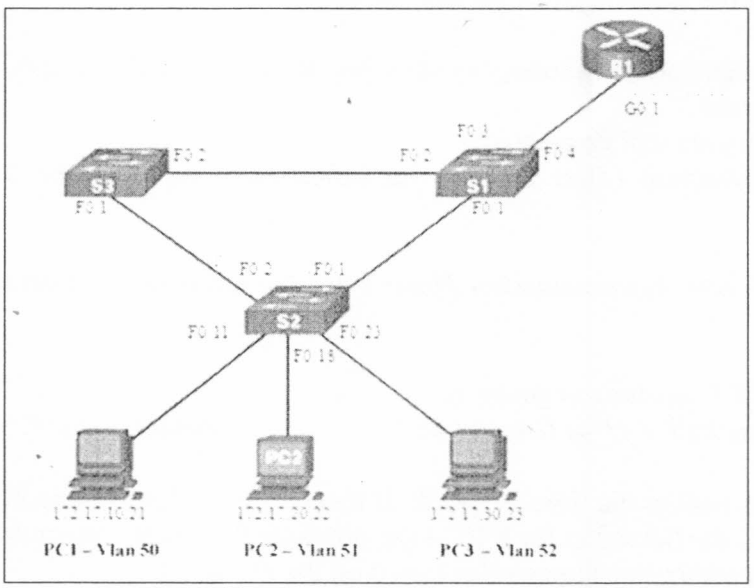

Figure 2

i. Write down the VLAN configurations for F0/1, F0/2, F0/11, F0/18 and F0/23 of S2 Switch. (3 Marks)

ii. Write down the configurations for interface G0/1 of R1 Router to enable inter-VLAN routing. (3 Marks)

iii. State two VLAN tagging/trunking methods and compare the difference between those two methods. (2 Marks)

iv. What is the main purpose of VLAN Trunking Protocol (VTP)? (2 Marks)

b. Describe the summary of the following security policy applied for the interface of the switch. (5 Marks)

SW1#show port-security interface FastEthernet 0/3

Port Security	*: Enabled*
Port Status	*: Secure-up*
Violation Mode	*: Shutdown*
Aging Time	*: 0 mins*
Aging Type	*: Absolute*
Maximum MAC Addresses	*: 5*

Figure 3 : Output of Switch security settings

c. State four business considerations of selecting switches (2 Marks)

d. What are the purposes of configuring an IP address to a layer 2 Switch (2 Marks)

e. Analyze the following LAN design (Figure 4).

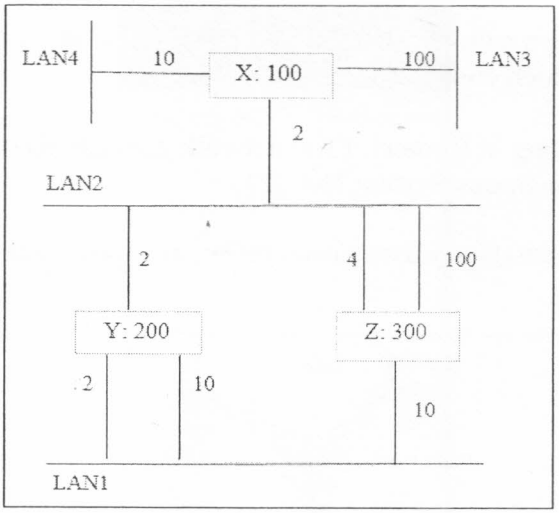

Figure 4

Indicate the root bridge, root ports, designated bridges and designated ports which will be selected by Spanning Tree Protocol (Draw the diagram in the answer script).

(6 Marks)

Question 4 **[25 Marks]**

a. Use the following network diagram (Figure 5) to answer the questions given below. Write down the commands to perform the following tasks. Indicate the relevant prompt in your answer.

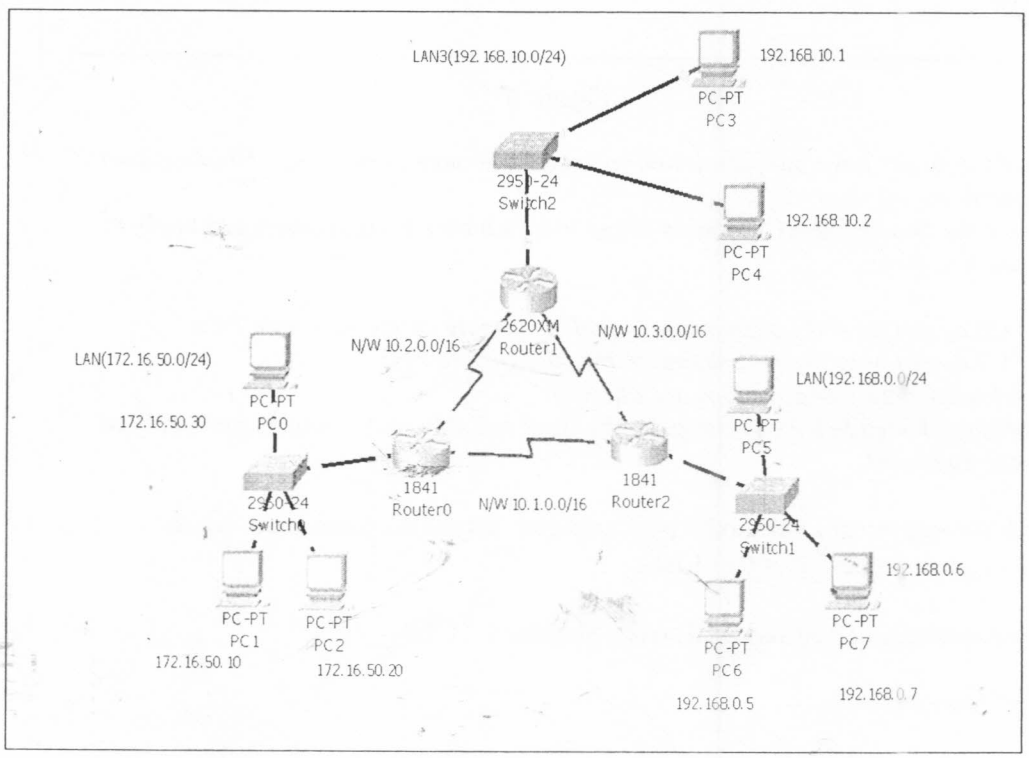

Figure 5

i. To change the hostname of Router2 to GAMPAHA. (2 Marks)

ii. In Router0, to configure a suitable IP address and the clock rate as 64000 to the 'Serial 0/0' interface which connects Router0 to Router1. (3 Marks)

iii. To enable dynamic routing in Router1. (The network uses EIGRP as the Routing Protocol. Autonomous System No: 321) (3 Marks)

b. Use the following network diagram (Figure 6) to answer the questions given below. Write down the commands to perform the following tasks.

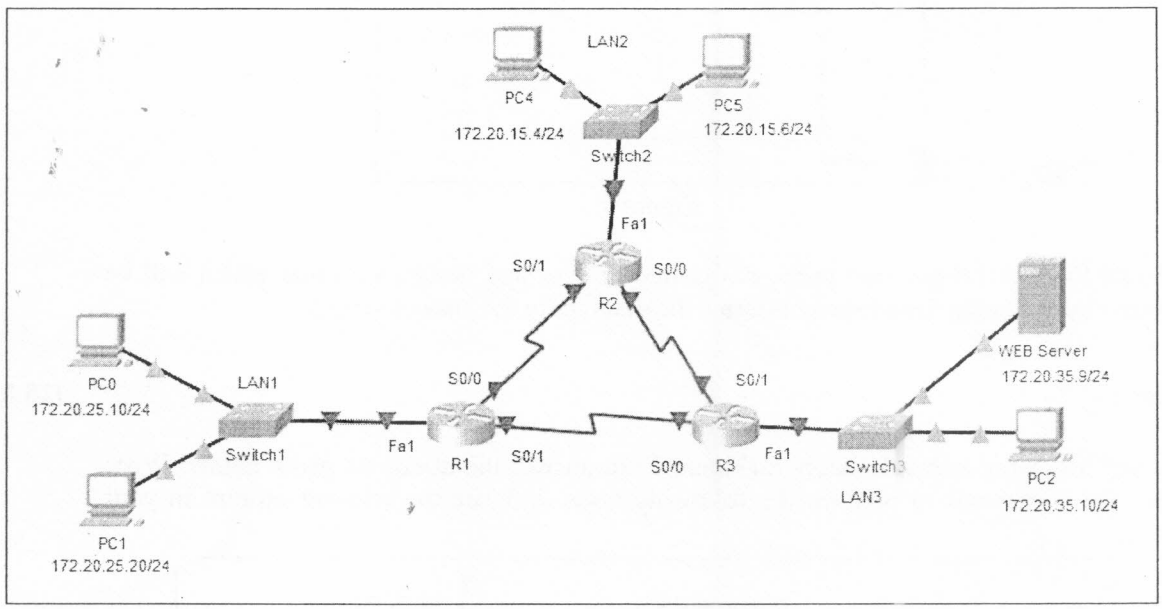

Figure 6

i. *PC1 and PC2 do not have the permission to access the devices in LAN2. All other data transmissions are allowed.*
Write down the **Standard** ACL entries in the most suitable router/routers and apply to the relevant interfaces. (4 Marks)

ii. a. *PC0 do not have the permission to make a remote connection with PC2.*
b. *PC1 do not have the permission to transfer files to PC5.*
c. *All other data transmissions are allowed.*
Write down the **Extended** ACL entries in the most suitable router/routers and apply to the relevant interfaces. (6 Marks)

c. Explain the ***additional parameters*** used by Extended Access Control Lists when compared to Standard Access Control Lists. (3 Marks)

d. What are the advantages of Named ACL over Standard ACL? (2 Marks)

e. List two types of basic firewalls. (2 Marks)

End of the paper

Format of the IP Header

VER 4 bits	HLEN 4 bits	Service type 8 bits	Total length 16 bits
Identification 16 bits		Flags 3 bits	Fragmentation offset 13 bits
Time to live 8 bits	Protocol 8 bits	Header checksum 16 bits	
Source IP Address			
Destination IP Address			
Option			

Format of the TCP Header

Source port address 16 bits								Destination port address 16 bits
Sequence number 32 bits								
Acknowledgment number 32 bits								
HLEN 4 bits	Reserved 6 bits	URG	ACK	PSH	RST	SYN	FIN	Window size 16 bits
Checksum 16 bits								Urgent pointer 16 bits
Options and Padding								