Sri Lanka Institute of Information Technology

# B.Sc. Honours Degree in Information Technology

Specialized in Computer Systems and Network Engineering

Final Examination
Year 2, Semester 2 (2019)

# IE2040 - Advanced Internetworking

Duration: 2 Hours

October, 2019

Instructions to Candidates:

- This paper is preceded by 10 minutes reading period. The supervisor will indicate when answering may commence.
- This paper has 4 questions.
- Answer all questions in the booklet given.
- The total marks for the paper is 100.
- This paper contains 4 pages, including the cover page.
- Electronic devices capable of storing and retrieving text, including calculators and mobile phones are not allowed.

## Question 1 (25 marks)

a. Differentiate In-band management and out of-band management methods use for connecting a PC to a network device for configuration and monitoring tasks.

(4 marks)

b. Businesses increasingly rely on their network infrastructure to provide mission-critical services. As businesses grow and evolve, they hire more employees, open branch offices, and expand into global markets. To support a large, medium or small network, the network designer must develop a strategy to enable the network to be available and to scale effectively and easily. Recommend four network design requirements to be consider when implementing a network to be available and to scale effectively and easily as needed.

(6 marks)

c. Using an example, explain what is meant by failure domain of a network.

(4 marks)

d. Compare VLAN Trunking Protocol (VTP) server mode, client mode and transparent mode.

(6 marks)

e. Router-on-a-stick routing model for inter-VLAN routing is used in the network indicated in the following Figure 1.1. It is observed that this network is not functioning as expected. You are required to analyse the configurations to find the issue/s and recommend a solution to fix the identified issue/s.

(5 marks)

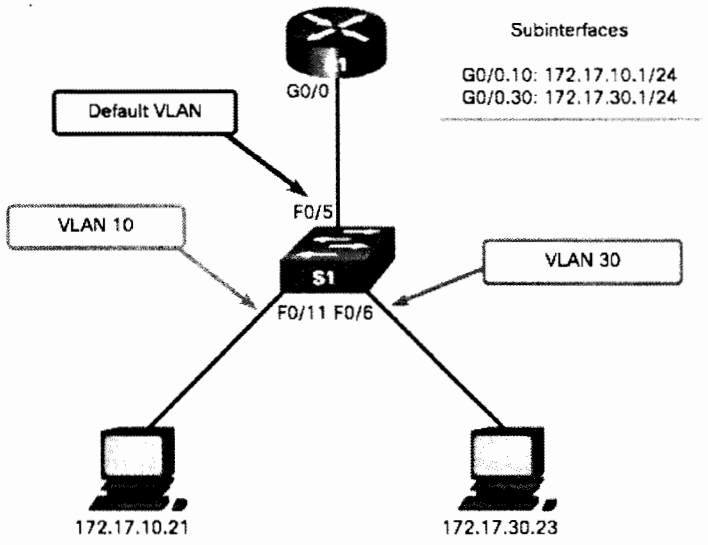


**Figure 1.1**

## Question 2 (25 marks)

a. *"It is a must to use Spanning Tree Protocol (STP) in a switched Ethernet with redundant paths."*

Do you agree with the above statement? Justify your answer by explaining why the statement is correct or incorrect.

(6 marks)

b. The following Figure 2.1 shows a LAN topology with bridges to interconnect different LAN segments. The spanning tree algorithm is used for deciding the forwarding path. Assume all links are Fast Ethernet links. MAC address and priority of each bridge are indicted in the table below.

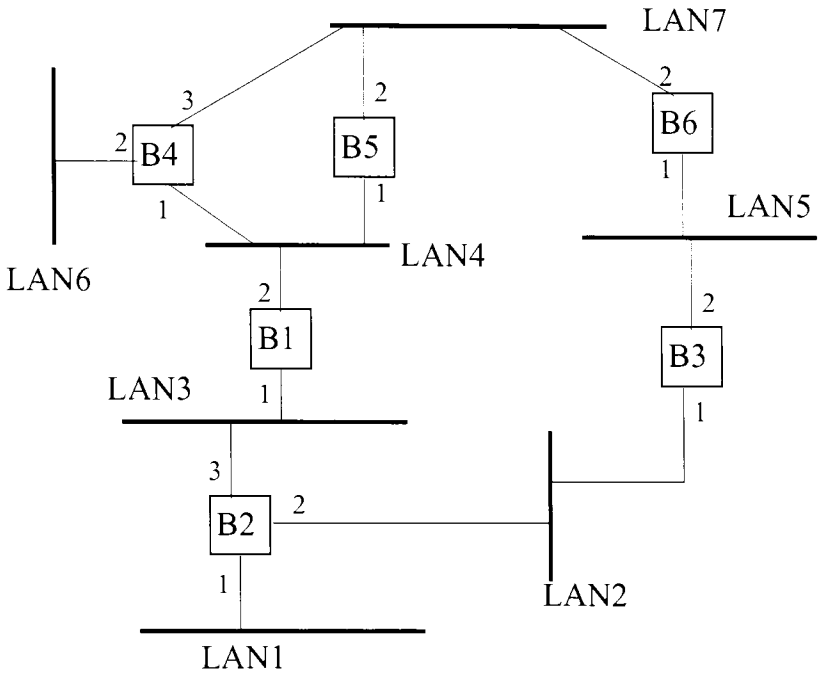


**Figure 2.1**

| Bridge | Priority | MAC address |
|---|---|---|
| B1 | 24577 | 000A00333333 |
| B2 | 32769 | 000A00111111 |
| B3 | 32769 | 000A00222222 |
| B4 | 24577 | 000A00444444 |
| B5 | 32769 | 000A00555555 |
| B6 | 24577 | 000A00666666 |

i) Compute the resulting spanning tree. Clearly indicate root bridge, roots ports, designated ports and blocked ports (alternate ports).

(6 marks)

ii) Specify the path followed by a frame from LAN segment 4 to LAN segment 2.

(3 marks)

c. Explain why it is not possible to use multiple ports to add multiple physical links between two switches to increase the bandwidth of the connectivity between the switches without using a technology like EtherChannel.

(5 marks)

d. Using an example, explain how not implementing a first hop redundancy protocol can lead to a single point of failure at the default gateway.

(5 marks)

## Question 3 (25 marks)

a. State two routing protocol per each of the following routing protocol categories.

(4 marks)

i) Distance vector
ii) Link state

b. Compare Open Shortest Path First (OSPF) routing protocol and Enhanced Interior Gateway Routing Protocol (EIGRP) based on the following Characteristics.

i) Speed of Convergence
ii) Scalability (Size of the network)
iii) Support for classless IP addressing
iv) Bandwidth usage
v) Memory and processing power usage
vi) Implementation and maintenance easiness

(6 marks)

c. Briefly describe the usage of the following five EIGRP packet types and indicate whether these packets are sent reliably or unreliably.

i) Hello packets
ii) Update packets
iii) Query packets
iv) Reply packets
v) Acknowledgment packets

(10 marks)

d. By default, EIGRP uses the delay and bandwidth values in its composite metric to calculate the preferred path to a network. Load and reliability can also be used to calculate the cost, but not recommended. Assess the impact of using load and reliability as part of the EIGRP metric to calculate the cost in a network.

(5 marks)

## Question 4 (25 marks)

a. Differentiate between Feasible Distance (FD) and Reported Distance (RD) with respect to EIGRP.

(4 marks)

b. Explain the purpose of the following databases maintains by OSPF configured router.
   i) Adjacency database
   ii) Link-state database (LSDB)
   iii) Forwarding database

(6 marks)

c. Evaluate the importance of implementing multiple areas OSPF, when the autonomous system is large (have a lot of routers and networks).

(6 marks)

d. "*In OSPF, using Designated Router (DR) and Backup Designated Router (BDR) operations in a multi-access network segments such as Ethernet significantly reduce flooding of Link State Advertisements (LSAs)*"

   Do you agree with the above statement? Justify your answer by explaining why the statement is correct or incorrect.

(5 marks)

e. Using examples, explain the equal cost load balancing and unequal cost load balancing supported by routing protocols such as EIGRP.

(4 marks)

--END OF PAPER--