



UNIVERSITY OF RUHUNA

Faculty of Engineering

End-Semester 8 Examination in Engineering: September 2023

Module Number: EE8203 Module Name: Design and Management of Data Networks
[Three Hours]

[Answer all questions, each question carries 10 marks]

Q1 a) What is *policy-based connectivity* provided by the distribution layer of the hierarchical model? Mention four methods of implementation used for *policy-based connectivity*.

[2.0 Marks]

b) A retail company with several branches across the country has decided to expand into the online business model. The company already has a network connecting their branches to the head office, but it requires significant expansion to support online business operations. As a network engineer, you have been assigned to manage this project.

Explain how you would apply the PPDIIO process to provide a solution for this company. Give detailed examples of the steps you would take at each phase in the PPDIIO process for this project.

[3.0 Marks]

c) Consider the following two scenarios:

Scenario 1: A financial institution requires high-speed, uninterrupted connectivity between its main office and a remote data center.

Scenario 2: A small business has a primary connection linking its office to the internet. The business can tolerate some slowdown in network services but cannot afford a total network outage.

For providing redundancy in each scenario, which type of a backup link would you recommend in terms of capacity and ISP? Justify your recommendations.

[1.5 Marks]

d) Explain why modular network design is important in building scalable and reliable networks?

[2.0 Marks]

- e) i) List the four main modules inside the enterprise edge module.
- ii) Why is the enterprise edge often referred to as the “last line of defense” against external threats in a network?

[1.5 Marks]

- Q2 a) Describe the importance of taking network applications into account when designing a LAN.

[2.0 Marks]

- b) A university campus is planning to upgrade its network infrastructure. The campus consists of multiple buildings spread across a large area. Some buildings are located close to each other, while others are several hundred meters apart. The university wants to ensure high-speed, reliable internet access in all buildings for its students and staff.

Given this scenario, what would you suggest as the most appropriate solutions for their LAN design in terms of different physical media and wireless solutions? Discuss how you would make these decisions mentioning the considerations you make.

[2.0 Marks]

- c) State and explain two main advantages of using baseband communication for Ethernet.

[1.0 Marks]

- d) Describe the fundamental operating principles behind Virtual Private Dial-up Networks (VPDN) using a diagram.

[2.0 Marks]

- e) i) What are the four main components of Cisco SD-WAN architecture? Briefly explain the purpose of each of these components.
- ii) What is the main idea behind the concept of Hybrid-WAN?

[3.0 Marks]

- Q3 a) i) What is the main difference between destination based forwarding and generalized forwarding?

- ii) Figure Q3-a) illustrates an example of orchestrated open flow forwarding tables creating network-wide behavior. By observing the given flow tables explain how network-wide behavior is achieved in this example.

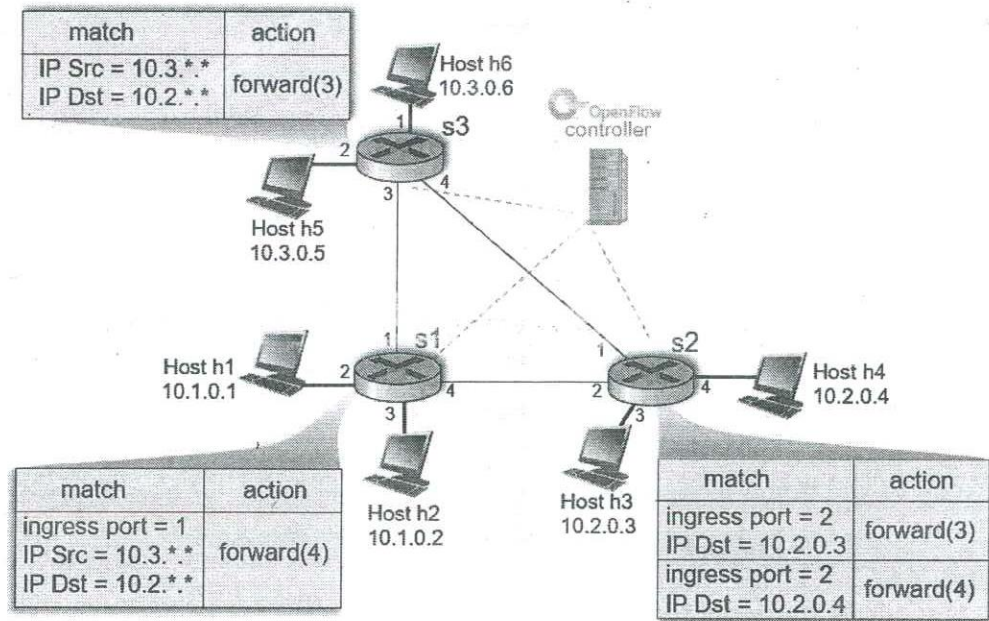


Figure Q3-a)

[3 Marks]

- b) Table Q3-b) shows three subnets with network addresses and several IP addresses belonging to it.

Table Q3-b)

Network address	IP address 1	IP address 2	IP address 3	IP address 4
192.168.0.0/29	192.168.0.1	192.168.0.2	192.168.0.3	192.168.0.4
192.168.0.8/30	192.168.0.9	192.168.0.10		
192.168.0.16/28	192.168.0.17	192.168.0.18	192.168.0.19	192.168.0.20

- Find a summarized route for these three networks.
- State three advantages of route summarization in IP networks.
- What could be a possible disadvantage of route summarization?

[4.5 Marks]

- Explain the purpose of iBGP and eBGP protocol messages in BGP.
 - Explain the concept of areas used in OSPF.

[2.5 Marks]

- Q4 a) Name three main entities of simple network management protocol (SNMP) and briefly describe their roles.

[1.5 Marks]

- State three main differences between SNMP vs NETCONF.

[1.5 Marks]

- c) What are the additions or improvements for SNMP V2 and SNMP V3 compared with original SNMP V1?

[2.0 Marks]

- d) Go through the following Access Control List (ACL) in a router and answer the following questions.

```
access-list 101 permit tcp 192.168.1.0 0.0.0.255 any eq www
access-list 101 deny tcp 192.168.1.0 0.0.0.255 any eq ftp
access-list 101 permit ip any any
```

- i) What is the purpose of this ACL?
- ii) Which traffic is explicitly allowed by this ACL?
- iii) Which traffic is explicitly denied by this ACL?
- iv) What is the purpose of the last statement? What happens if you remove the last statement?
- v) What is a wildcard mask? Explain how you interpret the wild card mask given in the above example.
- vi) How do standard access lists and extended access lists differ from each other?

[5.0 Marks]

- Q5 a) Briefly explain two advantages of having logically centralized control plane achieved via SDN.

[2 Marks]

- b) Briefly explain the role of an SDN controller.

[2 Marks]

- c) Explain how SDN helps network virtualization and network automation.

[2 Marks]

- d) i) Explain the functionality of five key functions used in Python socket programming.
- ii) Specify which of these functions you mentioned in Q5 d) i) are typically used on the client side and which are used on the server side and their order of appearance.

[4 Marks]