



Strathmore
UNIVERSITY

STRATHMORE UNIVERSITY
FACULTY OF INFORMATION TECHNOLOGY
BACHELOR OF SCIENCE IN COMPUTER NETWORKS AND CYBERSECURITY
END OF SEMESTER EXAMINATION
CNS 4107 - SPECIAL TOPICS IN COMPUTER NETWORKS

DATE: 31st July, 2024

Time: 10:30-12:30 Hours

Instructions

1. This examination consists of **FIVE** questions.
2. Answer **Question ONE (COMPULSORY)** and any other **TWO** questions.

QUESTION ONE [30 Marks]

- a. Explain the role of network automation in modern network management. **[1 Marks]**
- b. Discuss how automation tools can improve efficiency, reduce errors, and enhance network security. **[2 Marks]**
- c. Discuss any organisational and technical challenges and considerations when transitioning from a traditional network environment to an automated and programmable infrastructure. **[5 Marks]**
- d. Describe a scenario where using BASH scripting for network automation would be more advantageous than using Python. **[2 Marks]**
- e. Explain how Python's paramiko library can be used for SSH automation in network tasks. **[2 Marks]**
- f. Describe the differences between Ansible, Puppet, and Chef network automation tools and give the primary use cases for each. **[3 Marks]**
- g. Explain the role of Handlers in an ansible playbook. **[2 Marks]**
- h. Explain the key considerations when designing a network architecture for automation. **[5 Marks]**
- i. Name and explain the use of four key protocols and standards for enabling network automation. **[8 Marks]**

QUESTION TWO [15 Marks]

a. Using an architecture diagram, explain how ansible network automation tool can be used to configure a Nagios network monitoring cluster. **[5 Marks]**

b. Discuss the function of each line in the following Ansible playbook.

1. ---
2. name: Install Exim4 MTA
3. hosts: all
4. become: yes
5. tasks:
 - a. name: Update apt cache
 - b. apt:
 - i. update_cache: yes
 - c. name: Install Exim4
 - d. apt:
 - i. name: exim4
 - ii. state: present
 - e. name: Ensure Exim4 service is enabled and running
 - f. service:
 - i. name: exim4
 - ii. state: started
 - iii. enabled: yes
 - g. name: Configure Exim4
 - h. template:
 - i. src: exim4.conf.j2
 - ii. dest: /etc/exim4/update-exim4.conf.conf
 - iii. owner: root
 - iv. group: root
 - v. mode: '0644'
 - vi. notify: restart exim4
6. handlers:
 - a. name: restart exim4
 - b. service:
 - i. name: exim4
 - ii. state: restarted

[10 Marks]

QUESTION THREE [15 Marks]

a. Using an example of a network switch scenario, discuss how network automation can be integrated with monitoring tools such as Nagios and incident response systems to create a self-healing network. **[10 Marks]**

b. Explain how implementing version control in network configuration management enhances the overall security and reliability of the network. **[5 Marks]**

QUESTION FOUR [15 Marks]

- a. Explain how Infrastructure as Code (IaC) principles can be applied to network automation. **[7 Marks]**
- b. Discuss the role of Continuous Integration/Continuous Deployment (CI/CD) pipelines in network automation. **[8 Marks]**

QUESTION FIVE [15 Marks]

- a. Discuss five primary benefits of automating network monitoring and troubleshooting in large-scale enterprise networks. **[5 Marks]**
- b. By giving five examples, describe the role of machine learning in automating network issue detection and resolution. **[10 Marks]**