



Strathmore
UNIVERSITY

STRATHMORE UNIVERSITY
FACULTY OF INFORMATION TECHNOLOGY
BACHELOR OF SCIENCE IN COMPUTER NETWORKS AND CYBERSECURITY
END OF SEMESTER EXAMINATION
CNS 3101 – INTERNETWORKING COMMUNICATION SYSTEMS

DATE: 17 December, 2024

Time: 15:30–17:30 Hours

Instructions

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

QUESTION ONE [30 Marks]

- a. Use a diagram to demonstrate the use of REST to implement an API between two web servers. **[5 Marks]**
- b. Explain how the receiver email server uses Sender Policy Framework (SPF) to authenticate sending mail server **[5 Marks]**
- c. Give a technical evaluation of the benefits of using LDAP for Identity and Access Management (IAM) as compared to authentication on stand- alone servers. **[5 Marks]**
- d. Discuss the roles of the following entities in Oauth 2.0 framework: resource owner, client, authorisation server, resource server **[5 Marks]**
- e. Explain the main concept of Network File System (NFS) operation. **[2 Marks]**
- f. Describe the process of setting up NFS on a Linux server. Note: You are not required to provide actual configuration files. **[3 Marks]**
- g. Explain how MySQL replication setup can be used to improve the performance and reliability of a database system. **[5 Marks]**

QUESTION TWO [15 Marks]

- a. Use a diagram to illustrate and explain the message flow of Oauth 2.0 Identity and Access Management (IAM) system from the point an anonymous user or application requests a protected page until the page is displayed. You may use a practical Internet application for illustration. **[10 Marks]**
- b. Use a diagram to illustrate the level of an LDAP domain with the following distinguished name: dn=babs, dc=people, dc = example. **[5 Mark]**

QUESTION THREE [15 Marks]

- a. Using a diagram, illustrate the use of DNS to support load balancing for HTTP web servers. **[6 Marks]**
- b. Discuss the advantages of using a reverse proxy for web server load balancing when compared to Round Robin DNS. **[2 Marks]**
- c. Using a diagram with two serving web servers, illustrate the setup and operation of a reverse proxy, such as HAProxy, for HTTP load balancing. **[7 Marks]**

QUESTION FOUR [15 Marks]

- a. Use a diagram to illustrate the basic protocol messages exchanged between an LDAP client and LDAP server. **[7 Marks]**
- b. Use a diagram to describe how RADIUS can be used to authentication user devices on a WLAN to enhance security. **[8 Marks]**

QUESTION FIVE [15 Marks]

You are required to design an integrated system for a small enterprise to support the following scenario:

- A SNMP-based network monitoring system generates and sends email alerts when statuses of services pass thresholds on monitored systems
- When an email server hosting the domain stu.cns receives mails addressed to admin@stu.cns, it saves the message in a MySQL database.
- A copy of the message is forwarded to the email addresses of a list of engineers defined in a MySQL table
- A copy of the alert message is sent via SMS to phone numbers of the same list of engineers
- The network has one SNMP manager server, one email server, a MySQL replication cluster with three servers, and connect to an SMS provider using a REST API

Use a diagram to illustrate the design and explain protocols used to internetwork the different systems.