



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: 11 December, 2023

Time: 08:00 -10:00 Hours

Instructions

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

QUESTION ONE

- a. Give the names of key actors in Oauth 2.0 and explain the role of each. **[5 Marks]**
- b. With respect to a Receiving email server, illustrate the role of DNS in authenticating email senders across domains in an internetwork. Use a diagram to aid your explanation and give examples of relevant technologies. **[5 Marks]**
- c. Use a diagram to illustrate the architecture of a network where RADIUS is used to support AAA services. The architecture should depict the key network components. **[5 Marks]**
- d. In the operation of REST APIs, explain the role of the following: Client key, Client secret, Authentication Token. **[6 Marks]**
- e. Explain how basic file and printer sharing can be supported in a domain with multiple operating system such as Linux and MS Windows. **[5 Marks]**
- f. Give the definition of the following terms; interconnection, interoperability, interworking, internetworking. **[4 Marks]**

(Total: 30 Marks)

QUESTION TWO

- a. Enterprises can integrate their networked systems with a private or public Single Sign On (SSO) service that implements OAuth 2.0. Using an illustrative diagram, explain how an organisation such as LinkedIn uses Google Identity and Access Management (IAM) services to enable authentication and login for its users. Show the message flow at each step. **[10 Marks]**
- b. Content Distribution Networks (CDN) rely on load balancing to direct user requests to different servers based on location. Explain how DNS servers operate in order support the operation of CDNs. **[5 Marks]**
(Total: 15 Marks)

QUESTION THREE

- a. Representational State Transfer (REST) is commonly used in a distributed services architecture where several servers are internetworked to support user requests. Use a diagram to illustrate a scenario where users send SMS to a number on the Global System for Mobile (GSM) communication network in order for them to receive an item from a vending machine, after being prompted to authorise a mobile money payment transaction. **[10 Marks]**
- b. Use a diagram to illustrate components of the hierarchical LDAP tree. **[5 Mark]**
(Total: 15 Marks)

QUESTION FOUR

- a. Using an event sequence diagram, illustrate the process of LDAP client performing operations. Explain the full process from binding to unbinding. **[5 Marks]**
- b. An enterprise can design and implement a centralised Identity and Access Management (IAM) framework to support access control for users of computing devices with multiple operating systems. Use a diagram to demonstrate the design of an IAM system that supports interoperability between MS Windows based and Unix (Linux) based host computers, where LDAP and Samba domain controller are used. **[10 Marks]**
(Total: 15 Marks)

QUESTION FIVE

- a. Use a diagram to explain the RADIUS user (device) authentication process. **[5 Marks]**
- b. Explore the design of two networks each serving a different domain (e.g. one per college A and B). While visiting college B, members of college A can connect to the WLAN network and access Internet and other services after being authenticated using credentials stored in a database e.g. LDAP or MySQL in their home college. Illustrate the network

with a diagram, and use a signal sequence diagram to explain how access is granted to the visitors.

Your answer should explore the full process from attaching to WLAN until exchange of usage records is made between the colleges.

[10 Marks]

(Total: 15 Marks)