



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: 13 December, 2022

Time: 2 Hours

Instructions

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

QUESTION ONE

- a. Use a diagram to explain the basic interaction between an LDAP server and LDAP client.
Note: Label protocols used on the communications interface between the two.
[5 Marks]
- b. Give the definition of the following terms; interconnection, interoperability, interworking, internetworking.
[5 Marks]
- c. Discuss, with aid of a diagram, the role of the Domain Naming System (DNS) in supporting the coordination and operation of load balancing systems such as multimedia content distribution networks (CDN)
[5 Marks]
- d. Draw a diagram depicting two email servers being used by two users to exchange email messages. Label the interfaces where SMTP, IMAP and HTTP protocols are used in the communications system.
[5 Marks]
- e. Representational State Transfer (REST) is used in Web Services communications. REST uses JSON message format and is transported over HTTP. Use a diagram to illustrate how a REST Application Programming Interface (API) can be used to support a scenario where users send SMS to a number on the Global System for Mobile (GSM) communication network and this results with them being prompted to authorise a mobile money payment for parking.
[10 Marks]

(Total: 30 Marks)

QUESTION TWO

- a. The Domain Naming System (DNS) offers key services to Internet Communication systems such as email. The DNS MX record enables the sending email server to discover the IP address of the receiving email server. With respect to the role of DNS in email communications:
- Use a diagram to describe the flow of events when a receiving mail server utilizes DNS PTR (Pointer) resource records to authenticate the sending mail server
[5 Marks]
 - Explain how the receiver email server uses either Sender Policy Framework (SPF) or Domain Keys Identified Mail (DKIM) to authenticate sending mail server
[3 Marks]
 - Explain how sender email servers use DNS to authenticate replies to MX record queries.
[3 Marks]
- b. In the SMTP configurations, explain how Routers and Transports can be used to achieve the goal where incoming email execute a script that extracts its information for saving in a database.
[4 Marks]
(Total: 15 Marks)

QUESTION THREE

- a. Use a diagram to illustrate and explain the LDAP tree. **[5 Mark]**
- b. 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]
- c. Describe the process of setting up LDAP services using Open-LDAP solutions.
[5 Marks]
(Total: 15 Marks)

QUESTION FOUR

- a. Discuss, using real Internet service examples, applications of Oauth 2.0 **[3 Marks]**
- b. Discuss the roles of the following entities in Oauth 2.0 framework: resource owner, client, authorisation server, resource server **[5 Marks]**
- c. Use a diagram to illustrate and explain the message flow of Oauth 2.0 Identity and Access Management (IAM) system.
[7 Marks]
(Total: 15 Marks)

QUESTION FIVE

- a. You are required to design a network that comprises the following communication and networked systems: email, SMS, mobile money payment and airtime vending. Draw a diagram that illustrates the four systems and use it to discuss the flow information for the following event.
- i. User sends an email to the address `airtime@yr3.cns` with the following message “airtime#100#07xxx” where 07xxx is a mobile number.
 - ii. The user is prompted with a payment authorisation request on the mobile phone for Ksh. 100
 - iii. After approving the payment request, the user receives Ksh. 100 worth of airtime
 - iv. In addition the user receives an Email as well as SMS notification of the purchase

You should show the flow of signalling information for the four steps above.

[15 Marks]
(Total: 15 Marks)