Strathmore
UNIVERSITY

SCHOOL OF COMPUTING AND ENGINEERING SCIENCES

Bachelor of Science in Computer Networks and Cyber Security

END OF SEMESTER EXAMINATION

CNS 2103–Data Network Design and Management I

Date: 25th 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.
3. Do not write on the question paper.

Question 1 (30 Marks) - Sections A& B Compulsory

Q1-Section A (15 Marks) - Compulsory

i. Kendi's Computer College uses VLAN 10 for the classroom network and VLAN 20 for the office network. What is needed to enable communication between these two VLANs while using legacy inter-VLAN routing? **[1 Mark]**
   a) A router with one VLAN interface is needed to connect to the SVI on a switch.
   b) A switch with a port that is configured as trunk is needed to connect to a router.
   c) A router with at least two LAN interfaces should be used.
   d) A router with a port that is configured as trunk is needed to connect to a router.
   e) A switch with one VLAN interface is needed to connect to the SVI on a router

ii. Chiira's PC is to access a web server on another network. Which inter-VLAN method will provide the highest bandwidth at Layer 3 and also provide a default gateway for the PC? **[1 Mark]**
   a) multilayer switch with routing enabled
   b) trunked interface between the router and the switch
   c) multiple physical interfaces on the router, all connected to a Layer 2 switch
   d) router on a stick
   e) multilayer switch on a stick

iii. Abdibilly, a network administrator is determining the best placement of VLAN trunk links. Which two types of point-to-point connections should he choose? **[2 Marks]**
   a) Between two switches that utilize multiple VLANs
   b) Between two switches that share a common VLAN

c) Between a switch and a server that has an 802.1Q NIC
d) Between a switch and a client PC
e) Between a switch and a network printer

iv. Name two attributes that Amani can attribute to VLAN 1 [**2 Marks]**
a) Default VLAN
b) Untagged traffic on the trunk link
c) Uses SSH, Telnet VTY Traffic
d) Used for trunk links only
e) Cannot be deleted or renamed

v. Name two attributes that Gift can attribute to the Native VLAN [**2 Marks]**
a) Default VLAN
b) Untagged traffic on the trunk link
c) Uses SSH, Telnet VTY Traffic
d) Used for trunk links only
e) Cannot be deleted or renamed

vi. Whitney's laptop cannot connect to a wireless access point. Which two are NOT part of the troubleshooting steps that should be taken first? **[3 Marks]**
a) Confirm that the wireless NIC is enabled.
b) Confirm that the laptop antenna is attached.
c) Confirm that the wireless SSID is selected.
d) Confirm that the correct network media is selected.
e) Confirm that the NIC is configured for the right frequency.

vii. When configuring a router as part of a router-on-a-stick inter-VLAN routing topology, where should Kiptoo put the IP address be assigned? **[1 Mark]**
a) to the interface
b) to the subinterface
c) to the SVI
d) to the VLAN
e) to the physical port

viii. Mukengi is configuring Rapid PVST+, which three port states will the protocol use? **[3 Marks]**
a) Listening
b) Discarding
c) Forwarding
d) Blocking
e) Learning

Q1-Section B (15 Marks) Wireless LAN- **Compulsory**

a) Kornelio's and homeboys Inc has transitioned from fixed desktop to laptops and mobiles for use in the running of their businesses. Explain two benefits of such of them having a wireless network. **[2 marks]**

b) **Figure 1.1** below shows connection of nodes in a Wireless LAN (WLAN). Examine it and use it to answer the questions that follow.

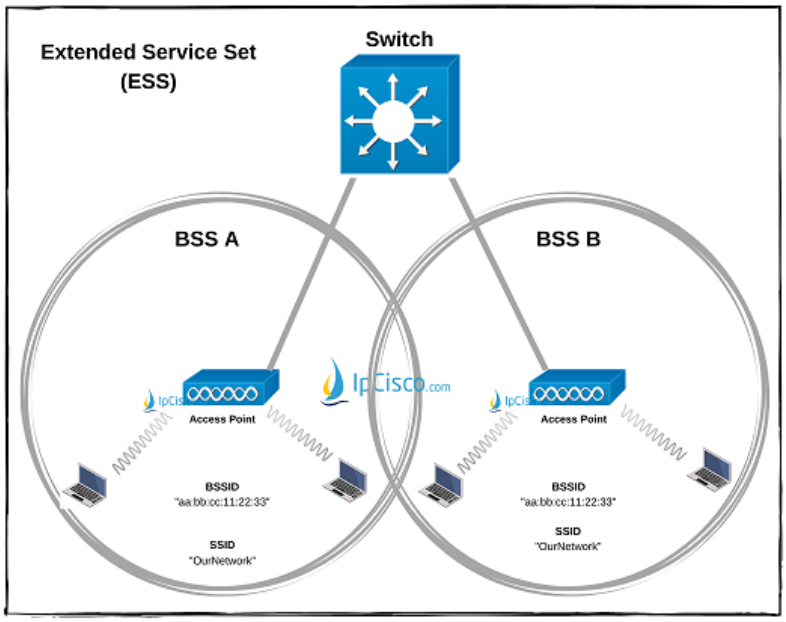

Figure 1.1

i. Using the information in **Figure 1.1** above, describe the following WLAN concepts: BSS, ESS, BSSID, SSID **[4 marks]**
ii. Explain any *two* of the several parameters that the laptops (clients) and the Access Points in **Figure 1.1** above must agree on for a successful connection to occur. **[2 marks]**

c) Kendi, in a Systems Analyst job interview, is asked to explain why *wireless Denial of Sevice (DoS) attacks* occur. Assuming you are Kendi, write your answer. **[3 marks]**

d) Kipkemboi a novice IT administrator walks into your computer shop, Crystal Computers, and wants to procure an *Access Point (AP).* Explain to him the differences between *Autonomous Access Points* and *Controller-based APs.* Include sketches to make it easier to understand. **[4 marks]**

Question Two [15 marks] LAN Design

During the Data Network Design class, a debate ensues between Tia and Zamzam on the *two-tier* and the *three-tier* switched LAN design *architectures.* The class asks each to explain their stand.

a) Assuming you are Tia,
   i. Draw a clearly labelled sketch of the *three-tier* switched LAN design. **[3 marks]**
   ii. Describe the key aspects and strengths of the *three-tier* switched LAN design, focussing on the roles of the discrete layers. **[5 marks]**

b) Assuming you are Zamzam,
   i. Draw a clearly labelled sketch of the *two-tier* switched LAN design. **[3 marks]**
   ii. Describe the main strengths of the *two-tier* switched LAN design. **[4 marks]**

Question Three (15 Marks) Spanning Tree Protocol

Nduku, a new network administrator at Mafuriko Inc, headquartered in Monrovia is using the logical representation in **Figure 3.1** below to implement Spanning Tree Protocol (STP). Examine the topology and answer the questions that follow.

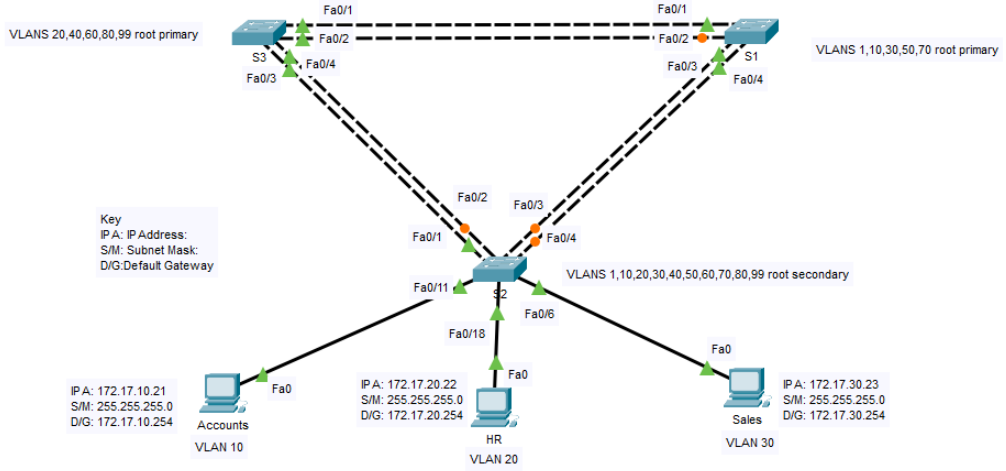

Figure 3.1: Mafuriko Inc topology 1

a) Describe the role of the STP in the topology. **[1 mark]**
b) Without VLANs and STP, the network above may experience a broadcast storm. What is a broadcast storm? **[1 mark]**
c) During the implementation, Nduku reboots all switches. What will be the first step of the spanning-tree election process? **[1 mark]**
d) After the election process in c) above, which switch is elected as the *root bridge and which switch ports* are *root ports?* **[3 mark]**
e) Using the VLAN information given in the topology, briefly explain how Nduku can configure and achieve Rapid Spanning Tree PVST+ *load balancing*. **[2 marks]**

f) Which *two port states* from the following five are NOT actively used by Rapid PVST+? *Listening, Learning, Forwarding, Blocking, Discarding.* **[1 mark]**

g) Nduku also plans to *configure PortFast and BPDU Guard* on some switch ports.

i. Which ports should she configure with *PortFast and BPDU Guard* **[2 marks]**

ii. What is the effect of configuring the switch ports in g(i) above with *Portfast* and to which *state* will the switch ports immediately transition to? **[2 marks]**

iii. What is the effect of configuring the switch ports in g(i) above with *BPDU Guard?* **[2 marks]**

Question Four (15 Marks) Inter-VLAN routing**,** EtherChannel

Mukengi joins Nduku as an assistant and is posted to a new branch of Mafuriko Inc in Addis Ababa. They successfully link the departments in the Monrovia HQ to their respective counterparts in the Addis Ababa Branch by adding the PCs in the new office to the existing VLANs as shown in **Figure 4.1** However, the CEO requests them to allow communication across the various departments too.

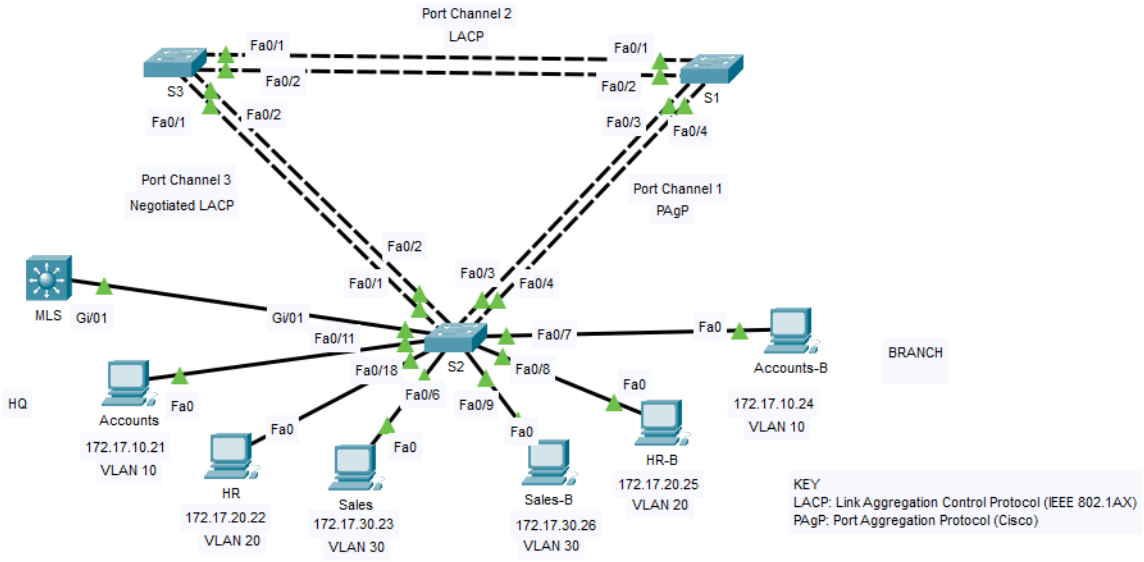

Figure 4.1: Mafuriko Inc topology 2

a) After doing some research, Mukengi discovers she has the three options he can use to implement inter-VLAN routing. He settles for the multilayer Switch (MLS). Identify and sketch the other two VLAN routing options. **[2 marks]**

b) Nduku asks Mukengi to defend her choice of using Layer 3 switches, whereas the other VLAN routing options were cheaper. Assuming you are Mukengi, defend yourself by briefly explaining three advantages of MLS InterVLAN routing over the other two. **[3 marks]**

c) The next day, after a lengthy explanation on *EtherChannel*, Nduku asks Mukengi, 'So, how does *EtherChannel* work and how does it improve the network?' Assuming you are Mukengi, show your understanding by briefly answering the question. Include a sketch to illustrate your answer. **[2 marks]**

d) Mukengi further states five interface parameters that must match for an *EtherChannel* to form. Assuming you are Mukengi, state and support with brief explanations any *three* from the five. **[3 marks]**

e) Nduku further probes Mukengi on her knowledge on *LACP* (implemented between S1 and S3), and *Negotiated LACP* (implemented between S2 and S3). Assuming you are Mukengi, explain to Nduku the difference of the two. **[2 marks]**

f) Nduku then points out to PAgP between S1 and S2 and asks Mukengi to write down the series of commands in their correct sequence to achieve PAgP from S1's CLI. Assume you are Mukengi. ***(Hint:** Configure correct interface range, link-type, channel-group and mode).* **[3 marks]**

Question Five [15 marks] Dynamic Trunking Protocol (DTP)

a) Dynamic Trunking Protocol (DTP) is a Cisco proprietary protocol.
   i. What does this mean and what happens when you configure DTP from a Cisco switch to a non-Cisco Switch? **[2 marks]**
   ii. How do you avoid / remedy the situation in Q5a)i above? **[1 mark]**
   iii. Complete the configuration below to achieve Q5a)ii above. **[1 mark]**

        S1(config-if)# switchport mode trunk
        S1(config-if)# _____ _____

   iv. Complete the configuration below to re-enable DTP achieve Q5a)iii above. **[1 mark]**

        S1(config-if)# switchport _____ _____ _____

b) Dynamic mode has two options, *dynamic auto* and *dynamic desirable*. Differentiate them by briefly describing each mode **[4 marks]**

c) The **switchport mode** command has four options for negotiating an interface mode between that lets them automatically negotiate trunking with a neighbouring device for their Ethernet trunk interfaces using DTP. Fill up the table below with the correct outcome of each negotiation (½ each). **[6 marks].**

S1 / S2	**Dynamic Auto**	**Dynamic Desirable**	**Trunk**	**Access**
Dynamic Auto	Access			
Dynamic Desirable		Trunk		
Trunk			Trunk	
Access				Access