INFORMATION AND COMMUNICATION UNIVERSTIY

SCHOOL OF ENGINEERING

LAN MAN II

ASSIGNMENT

Lecturers Details:

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Marks: 15

INSTRUCTIONS

1. **Answer all questions**
2. Write your answers to the questions as clearly as possible.
3. You are required to illustrate your answers using appropriate diagrams and sketches where and when the question requires such.
4. **Due: May 15, 2025.**

5. **Once you've completed these steps, create a ZIP file containing the reports along with any additional documents or reports required for submission and upload on AIMS.**

As a network engineer at SkyNet Solutions, you're tasked with designing and implementing a hybrid enterprise network using Cisco Packet Tracer. The company operates on two floors: the Admin Department and the Technical Department. Each department has both wired and wireless devices, along with VoIP phones for communication.

The organization requires a secure, scalable, and segmented network. Devices should be organized by VLAN, and both wireless and wired users must have internet access and inter-department communication where allowed. Wireless devices should connect via distinct SSIDs, and IP phones should operate on a dedicated voice VLAN. A central server must provide services to all departments.

Your job is to configure the complete network topology, ensure full connectivity, and apply security best practices, such as SSID encryption and NAT for external access.

🎯 Objective

- Configure VLANs for segmentation.
- Set up wireless access with secure SSIDs.
- Implement DHCP, NAT, routing, and VLAN trunking.
- Connect wired and wireless devices.
- Enable communication between departments via router-on-a-stick.
- Test and validate full network functionality.

Network Topology Overview

- **5 Wired PCs**
    i. 3 in Admin (VLAN 10)
    ii. 2 in Technical (VLAN 20)
- **2 Wireless Laptops**
    i. 1 connects to AdminNet (VLAN 10)
    ii. 1 connects to TechNet (VLAN 20)
- **2 IP Phones**

    i. One in Admin and one in Technical (Voice VLAN 99), each paired with a PC

- **1 Server**
    i. Connected to VLAN 50 with static IP 192.168.50.10
- **1 Wireless Access Point (AP)**

  Broadcasting two SSIDs:

    i. AdminNet – WPA2 key: Admin123
    ii. TechNet – WPA2 key: Tech123
- **1 Router**
    i. Acts as default gateway, DHCP provider, and Internet gateway

Configuration Tasks

1. VLAN Configuration

- Create VLANs:
    i. VLAN 10: Admin
    ii. VLAN 20: Technical
    iii. VLAN 50: Server
    iv. VLAN 99: Voice
- Assign appropriate ports to each VLAN.
- Use trunk ports between switches and router.

2. Wireless Network Configuration

- Configure the Access Point:
    i. SSID AdminNet for VLAN 10 (WPA2 key: Admin123)
    ii. SSID TechNet for VLAN 20 (WPA2 key: Tech123)
- Assign the AP an IP address or configure it to use DHCP.
- Ensure both laptops connect to their respective SSIDs.

3. DHCP Configuration

- Enable DHCP on the Router for:
    i. VLAN 10: 192.168.10.0/24
    ii. VLAN 20: 192.168.20.0/24
    iii. VLAN 99: 192.168.99.0/24
- Use the ip dhcp excluded-address command to reserve static IPs for servers, router interfaces, and AP.

4. Routing & NAT

i. Configure **router-on-a-stick** for inter-VLAN routing.
ii. Use **OSPF** or **RIP** as the routing protocol.
iii. Implement **PAT** to simulate Internet access from inside hosts.

5. VoIP Configuration

i. Configure **Voice VLAN 99** on IP phone ports.
ii. Ensure phones receive IPs via DHCP and can ping each other.
iii. If possible, configure a basic call server or simulation.

6. Server Configuration

i. Assign static IP 192.168.50.10 in VLAN 50.
ii. Enable services like HTTP, FTP, or File Sharing.
iii. Allow access from both Admin and Technical departments.

7. Connectivity Testing

- Ping from:
    i. PCs ↔ Server
    ii. Wireless laptops ↔ Server
    iii. Laptops ↔ Internet (via NAT)
- Test DHCP on all client devices.

- Check SSID connectivity and encryption.
- Verify trunking and inter-VLAN routing.

Submissions

1. A fully functional Packet Tracer .pkt file with:
    i. VLANs, SSIDs, routing, NAT, DHCP, and server
2. A written report including:
    i. Network diagram
    ii. IP addressing plan
    iii. VLAN/SSID mapping
    iv. Configuration summary
    v. Screenshots of testing results
    vi. Observations or challenges