Computer Networks Lab

Final Exam

Date: May 24th 2025 (CL3001)

Course Instructor(s)

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Total Time (Hrs): 2 hours+ 30 mintes
Total Marks: 80
Total Questions: 3

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Roll No Section Student Signature

- Plagarism and use of internet is highly discourged and can result in a disciplinary action.
- Understanding is part of this exam, do not ask any questions. In case of any confusions you may comment out our assumptions in your code.
- Please make sure to keep track of the time. The exam is **2 hours long** with **30 extra minutes** reserved for intial setup issues and submission problems.
- Submission of exam in the correct folder is your responsibility, if you submit in the wrong folder or submit the wrong file, only you will be responsible and no excuses will be accommodated.
- Submission path is as follows: //exam/Lab_number/Submissions(use your respective lab number)
- For questions related to the packet tracer please submit **All screenshots(of configurations,ping commands,protocols) along with the .pkt file.**In case you fail to comply by this and your submission is corrupted, you will be awarded 0 marks.
- For Cisco questions, please clearly label all IP addresses, AS names etc.
- **Donot zip** your submission. You can use a drag and drop method to submit your exam. The new system disallows multiple submissions. After submitting your exam you can Enlist all the contents of the submission folder(you won't be able to view the contents), in case you plan to change your submission, delete your folder before submitting the updated version.

Good luck.

Attempt all the questions.

CLO : Socket Programming

Q1:TCP MultiThreading [20 marks]

Q1: Develop a TCP-based client-server system in Python that supports concurrent communication with multiple clients using multithreading. The server will manage client connections, validate book selections, and respond appropriately based on available inventory.

Server-Side Requirements:

1. **Socket Initialization:** Create a TCP server socket that listens on a designated port for incoming client connections.
2. **Multithreading:**Implement multithreading to allow .A maximum of three clients to connect concurrently. Each client connection must be handled in a *separate thread.*
3. **Client Interaction:**

Upon connection:

- Prompt the client to enter their name and CNIC number.Along with their Port number
- Display a welcome messagecontaining the client's name and CNIC.
- Read the list of available books and their prices from a file named `books.txt`.(You may make a dummy .txt file, no need to submit it)t
- Send this list to the client.

4. **Book Purchase Workflow:**

- Ask the client to enter the *names of the books* they wish to purchase.
- Validate each book name against the list in `books.txt`.
- If a book is not available, respond with an error message: *"Sorry! This book is not available. Please enter from available books."*
- Repeat the prompt until valid book names are provided.
- Once valid selections are made, send the following goodbye message:*"Thanks for ordering. You will receive your book(s) in 3 working days. Enjoy Reading!"*

Client-Side Requirements:

1. **Connection Initialization:** Establish a connection with the server using a TCP socket.
2. **Client Interaction:**

- Prompt the user to enter their *name* and *CNIC number*.
- Send this information to the server.
- Receive and display:
  - A welcome message from the server.
  - The list of available books and their prices.
- Enter the names of the books to purchase and send them to the server.
- Receive and display the server's final goodbye message.

Multithreading Requirements

- The server must handle up to **three client connections simultaneously**, each in a separate thread.
- Ensure that all client sessions are independent and concurrent.
- Thoroughly test and validate all functionalities via the terminal.

CLO : Cisco Packet Tracer

Q2: Subnetting. [20 marks]

Scenario:

A company has been allocated the network 192.168.50.0/24 and requires subnetting to accommodate the needs of its departments as outlined below:

- Sales: 66 hosts
- Development: 53 hosts
- Support: 10 hosts
- Admin: 5 hosts

Tasks:

Subnet Design:

- Perform the necessary subnetting to meet the requirements of each department
- Ensure that each department is assigned to a separate subnet.
- Within each department, multiple subnets may be used if necessary.
- The subnetting must aim to minimize IP address wastage.

IP Assignment:

- Assign the appropriate IP range to each department based on the subnetting.
- Assign the following specific IPs within each subnet:
- Gateway: The first usable IP of the subnet.
- Server: The last usable IP of the subnet.
- A PC: The middle usable IP of the subnet.

Each department must belong to a different subnet while within a department multiple subnets may be used.

CLO : Cisco Protocols

Q3: BGP Protocol [40 marks]

A transport company has **2 offices each having 3 rooms with 2 PCs in each room.**

- Room 1 125 hosts
- Room 2 90 hosts
- Room 3 ~~30~~ total hosts 29

Currently each of them is using has 2 hosts each. You are given networks **192.168.1.0/24** for office 1 and **192.168.2.0/24** for office 2.
You are to subnet them with the condition that PCs belonging to different rooms must also belong to different subnets, while within the room there may be multiple subnets. Use **BGP Protocol***(where applicable)*. A router can connect to at most 2 other routers with serial connection and to 2 LANs using switches. **Use 2911 Routers and 2950-24 switches.** Ensure minimum possible IP addresses are wasted and minimum possible routers are used. Clearly label each subnet and add at least 5 screenshots of pings between multiple PCs belonging to different subnets to demonstrate it is working correctly.

Short Question: Why did we employ BGP Protocol instead of OSPF, It is possible to encoperate OSPF somewhere in your above network?Add a note for your answer on your network.(5 marks)
Bonus(2 marks): Use minimum possible Hops for your network.

Please add a side note with all your router configurations as well. You may label your working for Q2,3 on the file or submit a seperate .txt file.