

Computer Networks

Lab(CL3001)

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Course Instructor(s)

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Final Exam

Total Time (Hrs): 2.5

Total Marks: 100

Total Questions: 3

Roll No

Section

Student Signature

Do not write below this line

- Make a folder with your roll number and section eg: 22L-1234-A1
- Submit your exam at the following path: Cactus1//XEON/Fall2024//Sukhan Amir//Your Department/Your Section
- Make sure you use Drag and Drop method for submission and do it twice to confirm your submission. In case your paper remains unsubmitted or if you submit it to a wrong folder, you might be rewarded with a 0 credit.
- Exam time includes your submission as well, use your time vigilantly.
- Question 1 (Multithreading) will be evaluated based on your logic only. If your system does not support NS3 make sure you check its Python Binding (else you can solve it without NS3 environment). Screenshots for this question are not required.

Attempt all the questions:

CLO 4 (Question 1): Apply Socket Programming (client/server) to solve various real-world problems, including ensuring of data integrity.

Question 1: Socket Programming with Multi-Threading

[30 marks]

Develop an intricate online auction system using a TCP multithreaded server-client program. The system simulates a real-life scenario where users log in to participate in auctions for unique items. The system includes enhanced security measures to ensure authenticity and integrity of the voting process.

System Requirements:

• **User Authentication:**

Implement a secure authentication process where clients log in using a unique username and password.

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- **Auction Initialization:**

The server should authenticate the client upon connection by verifying the username and password against the stored credentials.

If authentication is successful, the server welcomes the user and displays the list of ongoing auctions with details such as item name, starting bid, and current highest bid.

item_code:	item_name:	starting_bid:	current_highest_bid
001	Antique Watch	500	750
002	Vintage Camera	200	300
003	Rare Book	150	200

- **Auction Bidding:**

Clients can bid on an item of their choice by specifying the auction item's code and their bid amount. The server validates the bid against predefined rules, such as ensuring the bid is higher than the current highest bid. The bid details are recorded in an output text file.

- **Real-time Auction Updates:**

Implement a mechanism for real-time updates on the bidding process. Clients receive immediate notifications when a new bid is placed or when the auction is about to close.

Moreover, implement a secure log-out process that ensures users cannot participate in auctions once they log out.

CLO 3 (Question 2 & 3): Demonstrate various classical routing and switching protocols via simulations.

Question 2: Cisco Packet Tracer (Subnetting Scenario):

[40 marks]

You have to design a network solution for a software company, which has different departments including SQA, HR, DevOps, Software Developers, and Marketing.

All the departments should be on different subnetworks.

In total, there are 160 computers which are required to be distributed as follows:

1. 32 for SQA department
2. 32 for HR department
3. 32 for DevOps department
4. 32 for Software Developers, and
5. 32 for Marketing Department

Assume that software company is assigned a Network (block) from Class C (/24) with the first three octets of the IP address fixed as 172.19.102.X. You can change the next octet to make the desired number of subnets and desired number of hosts in each subnet for the given topology. Assign the IPs to the following. You may add two dummy IP Addresses (Computers) to show in your solution. Make sure that you optimally design the network considering the number of devices (switches, routers, etc.) used and how you are assigning the IP addresses to different subnets in your design. Use wired connections (straight through and crossover where necessary and applicable)
– no wireless LAN is required for this submission.

- Use a 2911 Router.

- Use 2950-24 switches.

You can connect a maximum of two networks with a single router (except router-to-router connection).

You have to assign IPs to the machines using static IP allocation.

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Use ping from the command prompt of computers to check if your network design is working.

Make your design as neat as possible and properly add the IPs of all the PCs and router interfaces using comments in your design to get the full credit.

Submission: Attach your file as well as a screenshot of your network.

Question 3: OSPF based scenario using Cisco Packet Tracer

[30 marks]

Create a network of three Cisco routers in a triangular topology with the following setup:

- **Network Details:**

- Router1: Connects to Router2 via 10.1.1.0/30 and to Router3 via 10.1.2.0/30.
- Router2: Connects to Router3 via 10.1.3.0/30.
- Router1 LAN: 192.168.1.0/24
- Router2 LAN: 192.168.2.0/24
- Router3 LAN: 192.168.3.0/24

- **OSPF Configuration**

- Configure OSPF on all routers and advertise their respective LANs and connected subnets.
- Assign Router1 as the Designated Router (DR) and Router2 as the Backup Designated Router (BDR). Configure authentication between routers using MD5.

- **Verification**

- Use commands to verify OSPF neighbors, routing tables, and authentication.
- Submit screenshots of configurations and verification output