National University of Computer and Emerging Sciences

Computer Networks Lab (CL3001)
Section: BCS-5G
Date: October 25th 2024

Course Instructor

Mr. Usama Khan

Sessional-I

Total Time: 2 Hours

Total Marks: 50

Total Questions: 02

Student Name	Roll No	Section	Signature

Semester: Fall-2024

Campus: Lahore

Please review the following instructions attentively:

- Understanding the question statement is an integral part of the exam. Refrain from seeking clarification during the exam. In the event of ambiguity, make appropriate assumptions.
- The exam must be completed within a strict time frame of 2 hours, including submissions. Late submissions will not be accepted under any circumstances.
- Midterm exam materials have been placed on your cactus server at the following path: **\\Cactus1\Fall 2024\Usama Khan\Computer Networks\Mid Term\Exam**
- Rename your submission folder to your Roll number in the format 22L-XXXX. Submission paths are available on Xeon and Google Classroom, respectively. A designated folder has already been created for this purpose. **(\\Cactus1\Fall 2024\Usama Khan\Computer Networks\Mid Term\Submissions)**
- Ensure your code is properly indented and commented, with meaningful variable names. Failure to comply will result in deductions.
- Any form of cheat sheet or code found on your PC will result in immediate disqualification from the midterm exam and an 'F' grade in the Computer Networks Lab. Please ensure all related files are deleted from the Desktop of both your Windows and Ubuntu systems. Additionally, permanently delete all files from the Recycle Bin and Trash respectively for Windows and Ubuntu. Clear all files from your Z Drives before commencing the exam.
- Any student found browsing websites during the exam will have their exam immediately cancelled.
- Internet usage is only permitted for making submissions on Google Classroom.
- It is your responsibility to safeguard your code from being copied. All instances of matching codes will be treated as cheating cases and forwarded to the Disciplinary Committee for further action.
- In the event of a missing or corrupted submission, zero marks will be awarded.
- Immediate disqualification from the exam will occur if:
    - A USB device is found attached to your PC.
    - You are observed talking, whispering, borrowing, or looking at someone else's PC.
    - You are seen using a cell phone or smartwatch.
    - You are caught accessing the internet.

Q. No 1: Wireshark Packet Analyzer **Marks: 15**

****Submission: You have to submit your (Roll-No.docx) word file in answer to this question. You should provide proper explanation along with screenshots. Make your word file with a proper format indicating all the question numbers and the corresponding answers****

*****Use file *Capture 1* for questions 1-4****

1. Filter out all TCP packets which are either going to or coming from IP: 128.119.245.12 on Port: 80. Write your filter as answer.

2. Suppose we take the fifth filtered packet as Packet No. 1, with each successive packet increasing one in number, then what is the request made in Packet No. 16 and what is the response from the server. Mention the packet no. of server response. After how many packets the server send the response? How many data containing TCP Segments are present between the request made and response received?

3. Filter out all the TCP SYN packets. How many SYN packets are sent through the host? Write your filter as answer.

4. Apply simple HTTP filter and answer what is the data length in bits returned by the server in Packet No. 2 and 4, considering 1st filtered packet as packet No. 1.

*****Use file *Capture 2* for questions 5-8******

5. Apply a capture filter to obtain all the packets that are either going from client IP: 192.168.1.2 to server TCP Port: 21 or from server IP:195.89.6.167 and server TCP Port: 20 or 21. Write the filter which you have applied?

6. Apply a filter to get all the packets which are directed from client with MAC Address: 00:0e:f4:d2:2a:bf to other ports but not to Server UDP Port: 53. What filter did you apply?

7. Apply a filter to get all the UDP packets which are directed towards Port Number 53 either by client or by server. What filter did you apply? If we take the first filtered packet as Packet No. #1 with each successive packet increasing one in number, then what will be the acknowledgement number of the DNS request made in Packet No. 12?

8. Filter UDP packets containing particular sequence 192.168.

*******Use file *Capture 3* for questions 9-10********

9. Apply a filter to obtain all those packets which are either going from client with IP:192.168.1.102 to server tcp port: 80 or from server with IP:128.119.245.21 to client tcp port: 1161. What is the filter which you applied?

10. In packet 13, why the acknowledgement number is 1? In which packet (write packet number) we have received the acknowledgement for the TCP Segment being carried in the packet number 13? What is the acknowledgement number and sequence number in the packet received? Show clear calculations how the server has sent the corresponding acknowledgement number? (You can use flow graph)

Q. No 2: TCP SOCKET PROGRAMMING USING PYTHON LANGUAGE **Marks: 35**

Online Library System

Develop a TCP-based client-server application for an online library system with the following functionality:

1. **Search for a Book:**
    - **The client can search for a book by either the title or the author's name.**
    - **The server should respond with a list of matching books, including their availability status (available/borrowed).**
2. **Borrow a Book:**
    - **If a book is available, the client can borrow it by providing a valid student ID.**
    - **The server should verify if the book is available and then mark it as borrowed by the specific student. If not available, notify the client.**
3. **Return a Book:**
    - **The client can return a previously borrowed book by providing the student ID and the book's title.**
    - **The server should verify if the book is currently borrowed by that student and, if so, update the system to mark the book as available again.**

Requirements:

- **The server should be able to handle multiple client requests simultaneously.**
- **Maintain a list of books, including their title, author, and availability status, stored on the server side.**
- **The server must ensure that a student cannot borrow more than one copy of the same book.**
- **Appropriate error handling: For example, if a student tries to borrow a book that is already borrowed or return a book they haven't borrowed, the server should send an appropriate message.**
- **Implement proper logging on the server to track which books are borrowed and returned by which students.**

Best of Luck ☺