



Subject: Computer Networks
Class: BSCYS-F-24
Section(s): A & B
Course Code: CS260

Time Allowed: 120 Minutes
Max Marks: 50
FM's Name: Mahaz Khan/ Laraib Javed
FM's Signature: *Mahaz Khan
Javed*

INSTRUCTIONS

- Attempt responses on the answer book only.
- Nothing is to be written on the question paper.
- Rough work or writing on question paper will be considered as use of unfair means.

Q. No. 1 (CLO1, C2)	Marks
<p>A newly established university campus is planning to build a high-speed network that connects five departments, a central library, and a data center. The university expects over 1,000 devices, including smartboards, IoT sensors, research servers, and wireless clients.</p> <p>As the network engineer, you are tasked with:</p> <ol style="list-style-type: none">1. Design an appropriate topology that balances scalability, performance, and fault tolerance. Justify your choice with respect to campus structure and traffic flow.2. Recommend suitable transmission media (wired and wireless) for backbone and access networks, including justification based on data rate, noise immunity, and cost.3. Identify network devices (switches, routers, access points, firewalls) and explain their roles with reference to the OSI layers in which they operate.4. Analyze factors affecting bandwidth utilization and latency and propose optimization measures using protocol-level and hardware-level solutions.5. Discuss how reliability can be improved through redundancy and error-control mechanisms.	15
Q. No. 2 (CLO2, C3)	
<p>A financial-data service uses TCP to synchronize transaction logs between three data centers. During heavy market traffic, replication becomes slow and sometimes stalls. Network logs show duplicate ACKs and increasing retransmissions.</p> <p>Questions:</p> <ol style="list-style-type: none">1. Explain step-by-step how TCP segmentation, acknowledgment, and retransmission mechanisms maintain reliability during packet loss.	15

2. Using an example, demonstrate the effect of congestion-window (CWND) adjustment under the *slow-start*, *congestion-avoidance*, and *fast-recovery* phases after packet loss
3. Analyze how latency, buffer overflow, or MTU fragmentation could further worsen performance.

Q. No. 3 (CLO3, C4)

A client in the campus network tries to access www.example.com. The browser shows "DNS lookup failed," but the site opens when the IP address is typed directly.

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Questions:

1. Trace and describe each step in the DNS name resolution process (client → resolver → root → TLD → authoritative server).
2. Identify the most probable cause of failure based on the given symptom.
3. Explain how UDP and TCP are both used in DNS queries and responses.
4. Suggest two methods to troubleshoot this issue at the network level (e.g., testing port 53, verifying DNS cache).
5. Discuss how this failure affects upper-layer protocols like HTTP.