



COMSATS University Islamabad

Department of Computer Science

Mid-Term Examination BS(CS) SPRING-2025

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Course Title:	CSC340 Computer Networks	Maximum Marks:	50
Dated:	15-04-2025	Time Allowed:	80 Min

Name: _____ Reg No.: _____

-----CLO-1 -----(Summarize
the fundamental concepts of computer networks)

Question No 1: (Marks 5+5+5=15)

Part A: An FTP transfer is initiated to send a 100 MB file over a connection with a bandwidth of 20 Mbps. During transmission, 5% of the time is spent on control signals and overhead. Calculate effective transfer time and data transmission efficiency?

Part B: Assume a DNS query involves recursive resolution through 3 name servers, each taking **20 ms**, **30 ms**, and **50 ms** respectively, and the response from the authoritative server takes **25 ms**. Calculate the total time taken for DNS resolution.

Part C: Consider a scenario where a web server is running on Host C and listening on port 80. The server supports persistent connections and is currently handling incoming requests from two different hosts, A and B. Are all the requests being received through the same socket on Host C? If the requests are received via different sockets, do both sockets use port 80? Provide a detailed explanation to support your answer.

-----CLO-2 -----
(Apply the concepts of computer networks to solve their related problems)

Question No 2: (Marks 5+7+5+3=20)

Part A: In client-server communication, a client sends a request packet to a remote server. It takes **15 milliseconds** for the packet to travel from the client to the server. After processing the request, the server sends a response packet back to the client, which takes **25 milliseconds** to reach the client.

1. Calculate the Round-Trip Time (RTT) for this communication.
2. If the client needs to download five small objects using non-persistent HTTP, estimate the total time spent waiting for RTTs (ignoring transmission and processing delays).

Part B: Consider a scenario where a server wants to distribute a file of size $F = 10$ Gbits to 6 peers. The server's upload rate is $u_s = 76$ Mbps. The 6 peers have upload rates of: $u_1 = 19$ Mbps, $u_2 = 17$ Mbps, $u_3 = 11$ Mbps, $u_4 = 11$ Mbps, $u_5 = 24$ Mbps, and $u_6 = 14$ Mbps. The 6 peers have download rates of: $d_1 = 27$ Mbps, $d_2 = 14$ Mbps, $d_3 = 36$ Mbps, $d_4 = 12$ Mbps, $d_5 = 35$ Mbps, and $d_6 = 40$ Mbps.

1. Calculate the minimum time required to distribute the file using the Client-Server model.
2. Calculate the minimum time required to distribute the file using the Peer-to-Peer model.
3. For both (a) and (b), identify the root cause (bottleneck) of the distribution time.

Part C: UDP and TCP use 1s complement for their checksums. Suppose you have the following three 8-bit bytes: 01010011, 01100110, 01110100.

1. What is the 1s complement of the sum of these 8-bit bytes? Show all the work.
2. Why is it that UDP takes the 1s complement of the sum; that is, why not just use the sum?
3. With the 1s Complement scheme, how does the receiver detect errors?
4. Is it possible that a 1-bit error will go undetected? How about a 2-bit error?

Part D: Considering that HTTP is a stateless protocol, explain how an e-commerce site can retain information about a customer's previous purchases during future visits.

-----CLO-3-----

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(Analyze various protocols, algorithms, and their functions in a network)

Question No 3: (Marks 7+8=15)

Part A: A client performs a DNS lookup that requires iterative resolution and contacts 4 DNS servers in sequence: root, TLD, authoritative, and final resolution.

1. If each query-response takes 50 ms, what is the total time for resolution?
2. If the DNS response is cached after the first lookup, how much time is saved on a second request?

Part B: An email passes through 3 SMTP servers before reaching the recipient. If each hop adds a 1 KB header, what is the final size of the email message originally 20 KB?