



COMSATS University Islamabad, Lahore Campus

Final Examination– Semester Fall 2022

Course Title:	Data Communications and Computer Networks	Course Code:	CSC339	Credit Hours:	3(2,1)
Course Instructor/s:	Mr. Imran Raza, Dr. Shahbaz Akhtar Abid, Dr. Tahir Maqsood	Program Name:	BS Computer Science, BS Software Engineering		
Semester:	5 th	Batch:	FA20	Section:	All sections
Date:	27-01-2023				
Time Allowed:	3 Hours	Maximum Marks:	100		

Part-A

1. Answer any five of the following short questions. [CLO:1; Bloom Taxonomy Level: <Understanding>] [25]
- How does the head-of-line (HOL) blocking problem affect the performance of HTTP1.1 for various web objects? Explain its impact using an example scenario and illustrate its solution incorporated in HTTP 2.0. (5)
 - Explain why Traffic Engineering is difficult in traditional networking. How Software Defined Networking (SDN) can achieve optimal routing using the control/data plane interaction. (5)
 - Discuss problems with IP Fragmentation & reassembly. Also, propose an alternative to IP fragmentation. (5)
 - Identify the advantages and disadvantages of Network Address Translation (NAT). (5)
 - Consider a new peer Ali that joins BitTorrent without possessing any chunks. Without any chunks, he cannot become a top-four uploader for any of the other peers since he has nothing to upload. How then will Ali get his first chunk? (5)
 - Discuss the efficiency of pure ALOHA. Illustrate how the frame overlapping increases the probability of collision in pure ALOHA and how that problem is resolved in slotted ALOHA. (5)
2. Suppose Datagrams are limited to 1000 bytes (including header) between Host A and Router X. The MTU is 500 bytes (including header) between Router X and Router Y and the MTU is 1000 bytes (including header) between Router Y and Destination B. Assume an IP header of size 20 bytes. In total, how many datagrams reach destination B if Host A is required to send an MP3 file of 8 million bytes? Explain neatly with the help of a figure the various fragments that are generated, their sizes, and all the key fields of the datagram like fragmentation offset, identifier, and flags (DF, MF). The network connection is as follows: [10]
- Host A → Router X → Router Y → Host B
3. Suppose a user wants to load a web page. The IP address of the web page URL is initially not cached, consequently, a DNS search needs to be performed to get the IP address. Assume two DNS servers are queried before the IP address is received from DNS. DNS₁ is the local DNS having a delay of RTT₁ = 2 msec and the remote DNS₂ has RTT₂ = 14 msec. Assume the requested web page consists of some small HTML text. The value RTT between the web server and the requesting host is RTT_{HTTP} = 26 msec. [CLO:1, 2; Bloom Taxonomy Level: <Understanding>] [10]
- Consider the web page (including HTML text) references nine other objects. Ignoring transmission delay, how much time is required to receive the base HTML and the remaining nine objects by the requesting host, considering non-persistent HTTP and no parallel TCP connections? (5)
 - For the same scenario above, how much time is required to receive the base HTML and the remaining nine objects by the requesting host, considering persistent HTTP and that a maximum of five parallel TCP connections are allowed? (5)
4. Consider two 16-bit data words [CLO:1, 2; Bloom Taxonomy Level: <Understanding>] [5]
- 1110011001100110 1101010101010101
- Apply checksum on the given data words at the sender side. Assume that the first two least significant bits of each data word are flipped. Verify the given data at the receiver side and write your observation about the result.
5. Consider the network scenario given below: [CLO:1, 2; Bloom Taxonomy Level: <Understanding, Applying>] [15]
- Show the operation of Bellman Ford's (Distance Vector) algorithm for computing the least cost path from F to all destinations. Only compute the table of F. (5)
 - Identify the path with the "count to infinity" problem and discuss its impact on the convergence of the algorithm in case of a change in the link cost. Why? Will it be resolved on its own? Assume that the poison reverse is not in use. (5)
 - Define Spanning Tree formally. Build a Minimum Spanning Tree (MST) at node F to all nodes in the given network. (5)



