Question Paper

Exam Date & Time: 01-Dec-2023 (02:30 PM - 05:30 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

DEPARTMENT OF INFORMATION AND COMMUNICATION TECHNOLOGY

V SEMESTER B.TECH (COMPUTER COMMUNICATION ENGINEERING)

END SEMESTER EXAMINATIONS, DEC 2023

NETWORK PROGRAMMING AND ADVANCED COMMUNICATION NETWORKS [ICT 3173]

Marks: 50 **Duration: 180 mins.**

A

Answer all the questions.

Instructions to Candidates:

Answer ALL questions

Missing data may be suitably assumed

1)	A)	Consider a client is sending message "COMMUNICATION NETWORKS" to the server. Here, client sends with exactly 250ms delay between each character and RTT is 600ms. The server sends back the echo along with the ACK for each character sent by the client. Calculate and compare the total time taken in this communication for TCP_NODELAY enable and disable. Discuss how the Nagle algorithm effectively reduces the number of communicated packets in a communication network, specifically in the context of LAN and WAN networks.	(5)
	B)	Discuss how a concurrent server effectively handles multiple clients simultaneously with the help of a neat diagram.	(3)
	C)	List and explain the generic socket family and types available while creating a socket.	(2)
2)	A)	Consider a municipality hospital where patients' arrival follows a Poisson distribution with an arrival interval time of 10 minutes. Consider also that the doctors' (examination and dispensing) time may be assumed to be distributed exponentially with an average of 6 minutes. In this context, find: a) What is the probability that a new patient, upon arrival, directly sees the doctor? b) For what proportion of the time is the doctor busy attending to patients? c) What is the average number of patients in the system? d) What is the average waiting time of the system for a patient before seeing the doctor?	(5)
	B)	Explain Receiver-Initiated Reservation (RIR) and Reservation Merging in RSVP with suitable block diagrams.	(3)
	C)	Briefly outline the key features of high-speed Local Area Networks (LANs) and present a table summarizing their characteristics.	(2)
3)		Write an appropriate server-side socket program to demonstrate the following scenario. The server considers a private IP address and a port number. The server displays the local and peer socket	(5)

A) details using *getsockname*() and *getpeername*(). Also, it displays the maximum segment size of the connection. While communicating with the peer device, the client asks server to send the following messages **"Advanced", "Communication" and "Networks"** in one single packet and server sends a single packet and displays the sizes of the message received and sent.

B) Suppose a host machine utilizes the token bucket algorithm for congestion control, with a token bucket capacity of 1 megabyte and a maximum output rate of 20 megabytes per second. Tokens are supplied at a rate to sustain an output of 10 megabytes per second. Given that the token bucket is currently full, the machine aims to transmit 12 megabytes of data. Determine the minimum time required for the data transmission. (3)

C) How do InfiniBand and Ethernet networks differ from each other in terms of their key characteristics and functionalities? (2)

4) A) Discuss how does an IPv6 client communicates to an IPv4 server. Show the sequence of system calls for the IPv6 client and IPv4 server for a stream communication, which demonstrates the IPv4 and IPv6 interoperability. (5)

B) Illustrate the concept of label switching and stacking with suitable block diagram. (3)

C) Distinguish the major differences between Protocol Independent Multicast-Dense Mode (PIM-DM) and Protocol Independent Multicast-Sparse Mode (PIM-SM) multicasting protocol. (2)

5) A) Consider a scenario where the sender sends a message to a group of recipients who are members of the same group. Multicast routers need to collect information about members and share it with other multicast routers. Illustrate this scenario with relevant message formats and the operation of the protocols involved in it. (5)

B) Illustrate how the traffic engineering technique of MPLS is used in the following scenario. Consider an IP-based application that needs to send a traffic via the MPLS network. MPLS directs data from ingress LSR to egress LSRs by placing the label in the packet's header. In case of congestion in the network, a network administrator may elect to explicitly define the path between nodes to ensure successful transmission of the packet. (3)

C) Interpret the various ways to initiate daemon processes with an example. (2)

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