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Vellore Institute of Technology

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Reg. No. : 23MCA1030

Final Assessment Test (FAT) - May 2024

Programme	**M.C.A.**	Semester	**WINTER SEMESTER 2023 - 24**
Course Title	**DATA COMMUNICATION AND NETWORKING**	Course Code	**PMCA505L**
Faculty Name	**Prof. SENDHIL R**	Slot	**C2+TC2**
		Class Nbr	**CH2023240501382**
Time	**3 Hours**	Max. Marks	**100**

General Instructions:

- Write only Register Number in the Question Paper where space is provided (right-side at the top) & do not write any other details.

Answer all questions (10 X 10 Marks = 100 Marks)

01. Assume that Gean who knows only French is requesting a document from Ram who has prepared the document in Hindi through an application. i) Illustrate the process with a neat diagram (5 marks) [10]
ii) various methods and protocols to demonstrate how the document will be transfered between them by considering the different layers of TCP/IP model.(5 marks)

02. Assume that you need to connect four Local Area Networks at "Netsea" Company. Each LAN has 50 Computer Systems. LAN1 and LAN2 are connected to Router 1. LAN3 and LAN 4 are connected to Router 2. Router 1 and Router 2 are connected directly. [10]
i. Draw a hybrid topology to show the above network design. (3 marks)
ii. Calculate the number of physical links required for the LAN if it uses bus, ring, star and mesh topology. (4 marks)
iii. Discuss the advantages of these network topologies in terms of performance metrics. (3 marks)

03. A hospital named "Global City Hospital" is planning to improve its communication network to support telemedicine services and electronic health records effectively. They prioritize minimal data loss, high efficiency, and low latency to ensure real-time consultations and seamless access to patient data. As an expert in networking technologies, your task is: [10]
i) recommend the most suitable transmission media and network architecture to meet these healthcare-specific requirements. (4 marks).
ii) Justify your answer with one suitable diagram for each requirement illustrating the proposed network setup.(6 marks)

04. In the realm of data transmission, various switching techniques are employed to ensure the secure and efficient transfer of information. Mr. John needs to send secret data to Mrs. Serena prompting an exploration of these techniques. As a network expert, suggest John various switching techniques along with necessary diagrams to illustrate their workings. [10]

05. Prajan wants to send the bits 110011110101 to his brother SaiRanjan. As transmission impairments are possible, errors can happen during the course of transmission. Prajan does not want to retransmit the frame if it encounters single bit error i.e., receiver should be able to detect and correct the single bit error. So, help Prajan to choose an error control strategy to address this scenario and generate the code word with odd parity. Also, demonstrate how SaiRanjan verifies the integrity of the received message. **[10]**

06. a. Apply any three error detection methods except CRC for the given bit sequence 0110011 1101001 1110011 0001100 and discuss the disadvantages of each method. [Use Even Parity wherever required]. (6 marks) **[10]**

b. Apply the suitable error detection method in both sender side and receiver side for the given Message (M) = 1101011011 and divisor (D) = 10011. (4 marks)

07. An organization is granted the block 16.0.0.0/8. The administrator wants to create 500 fixed-length subnets. **[10]**

a. Find the subnet mask. (2 marks)

b. Find the number of addresses in each subnet. (2 marks)

c. Find the first and last addresses in subnet 1. (3 marks)

d. Find the first and last addresses in subnet 500. (3 marks)

08. An ISP is granted a block of addresses starting with 120.60.4.0/22. The ISP wants to distribute these blocks to 100 organizations with each organization receiving just eight addresses. **[10]**

i) Design the subblocks and give the slash notation for each subblock. (8 marks)

ii) Find out how many addresses are still available after these allocations. (2 marks)

09. You are requested to support the employee in an organization, who wants to communicate a message to his friend through a network channel. Its performance should not get affected with packet loss, latency, Jitter and throughput as well. For this purpose you are supposed to identify a suitable transport layer protocol and explain in detail about the various mechanisms available. **[10]**

10. Design a robust remote logging system for a multinational corporation operating logging sites in remote, challenging terrains. The system must ensure continuous communication despite limited internet connectivity, prioritize data security with encryption and authentication, synchronize data between remote sites and a central data center, optimize bandwidth usage, provide fault tolerance, and be scalable for future expansion. **[10]**

i) Develop a detailed plan covering network architecture, communication protocols, encryption methods, data synchronization strategies, fault-tolerance mechanisms, and scalability considerations.Justify your design choices (5 marks)

ii) Explain how your solution addresses the challenges of remote logging operations effectively. (5 marks)