



- KEEPING MOBILE PHONE/ANY ELECTRONIC GADGETS, EVEN IN 'OFF' POSITION IS TREATED AS EXAM MALPRACTICE
- DON'T WRITE ANYTHING ON THE QUESTION PAPER

Answer ALL Questions

(10 X 10 = 100 Marks)

1. a) Imagine an individual who wishes to email their friend via the internet. What components are needed for a data communications system to enable network communication? [5]
 - b) You are a network administrator responsible for setting up a network in a small office environment. The office consists of three departments such as sales, marketing and accounting. Each department requires secure and independent communication within their own team, but they also need to share files and collaborate on certain projects. Based on the given scenario, Identify and explain the most suitable network topology for the small office environment - Justify your answer with illustration. [5]
- 2.a) Examine how does information get passed from one layer to the next in the TCP/IP model? Mention the functionalities of each layer carried out in TCP/IP Protocol Suite.

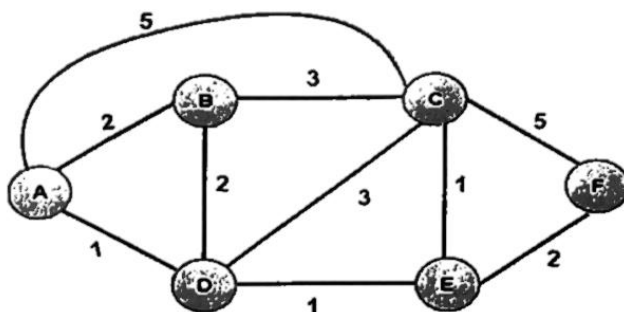
OR

- 2.b) In the context of computer networks, analyze the differences between various types of networks such as LAN (Local Area Network), MAN (Metropolitan Area Network), and WAN (Wide Area Network). Provide detailed comparisons based on their architecture, scalability, transmission speed, typical use cases, and security considerations. Additionally, discuss the impact of emerging technologies like 5G and IoT on the evolution and functionality of these network types.
3. Discuss the various components of Spanning Tree Protocol (STP). Explain how does Spanning Tree Protocol (STP) works using STP Algorithms? Discuss the various states of STP. Also explain its advantages with suitable example.
- 4.a) A sender needs to send the four data items 0x3456, 0xABCC, 0x02BC and 0xEEEE. Answer the following:
- i) Find the checksum at the sender site.
 - ii) Find the checksum at the receiver site if there is no error.

OR

- 4.b) Suppose you have a 7-bit data sequence: 1101101. Assume position of error bit is 3rd bit from right to left. Use Hamming Code to detect and correct a single-bit error in this sequence.
5. a) Consider one hundred stations on a slotted ALOHA network share a 1Mbps channel. If frames are 1000 bits long, find the throughput if each station is sending 10 frames per second. [5]
- b) Illustrate the sender side and receiver side window configuration for the following scenario for Selective Repeat ARQ flow control algorithm for a window size of 4. Let's assume both forward channel and the reverse channel is unreliable. [5]
- i) Frame 0,1, and 2 are sent; ACK is delayed
 - ii) Frames 3,4, and 5 are sent; ACK is lost
 - iii) Frames 3,4, and 5 are sent; Frame 4 lost
 - iv) Frames 4,5,6, and 7 are sent; Frame 6 is damaged
6. Perform the following:
- a) In a block of addresses, we know the IP address of one host is 182.44.82.16/26. What are the first address (network address) and the last address (limited broadcast address) in this block? Also find the number of address. [3]
- b) Given the network address 220.34.76.0, find the class type, the block, and the range of the addresses. [2]
- c) What is the subnetwork address if the destination address is 190.78.45.39 and the subnet mask is 255.255.244.0? [2]
- d) A company is granted the site address 193.128.64.0 (class C). The company needs 40 subnets. Design the subnets. [3]
7. An ISP is granted a block of addresses starting with 188.50.0.0/16. The ISP wants to distribute these blocks to 100 customers as follows.
- a) The first group has 30 medium-size businesses; each needs 128 addresses.
 - b) The second group has 50 small businesses; each needs 64 addresses.
 - c) The third group has 20 households; each needs 32 addresses.
- Design the sub-blocks and give the slash notation for each sub-block. Find out how many addresses are still available after these allocations.

8. Consider the following network graph where nodes represent routers and edges represent the direct connections between them, with the weights indicating the cost of each connection:



Given the above network graph, use Dijkstra's algorithm to determine the shortest path from router A to router F. List the steps involved in the algorithm and the resulting shortest path along with the total cost.

9. Your company is tasked with developing a live video conferencing tool that requires high Quality of Service (QoS) to ensure seamless user experiences. How would you implement the leaky bucket algorithm to achieve effective traffic shaping and control the amount and rate of traffic sent to the network? Discuss the techniques you would use to optimize the performance and improve QoS, ensuring smooth and uninterrupted video streams for users.
10. a) How does the FTP (File Transfer Protocol) ensure secure file transfer, and why should there be limitations on anonymous FTP? What could an unscrupulous user do? [5]
- b) Provide a detailed explanation of HTTP (Hyper Text Transfer Protocol), emphasizing its role in the OSI model and its importance in web communication. Explain various types of HTTP transaction functionalities between client and server. [5]

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