A9.3-R5.1 : NETWORK MANAGEMENT

DURATION : 03 Hours   **MAXIMUM MARKS : 100**

OMR Sheet No. : ☐☐☐☐☐

Roll No. : ☐☐☐☐☐☐   **Answer Sheet No. :** ☐☐☐☐☐☐

Name of Candidate : _____   **Signature of Candidate :** _____

INSTRUCTIONS FOR CANDIDATES

- Carefully read the instructions given on Question Paper, OMR Sheet and Answer Sheet.

- Question Paper is in English language. Candidate has to answer in English language only.

- There are **TWO PARTS** in this Module/Paper. **PART ONE** contains **FOUR** questions and **PART TWO** contains **FIVE** questions.

- **PART ONE** is Objective type and carries **40** Marks. **PART TWO** is Subjective type and carries **60** Marks.

- **PART ONE** is to be answered in the **OMR ANSWER SHEET** only, supplied with the question paper, as per the instructions contained therein. **PART ONE** is **NOT** to be answered in the answer book for **PART TWO**.

- Maximum time allotted for **PART ONE** is **ONE HOUR**. Answer book for **PART TWO** will be supplied at the table when the Answer Sheet for **PART ONE** is returned. However, Candidates who complete **PART ONE** earlier than one hour, can collect the answer book for **PART TWO** immediately after handing over the Answer Sheet for **PART ONE** to the Invigilator.

- **Candidate cannot leave the examination hall/room without signing on the attendance sheet and handing over his/her Answer Sheet to the invigilator. Failing in doing so, will amount to disqualification of Candidate in this Module/Paper.**

- After receiving the instruction to open the booklet and before answering the questions, the candidate should ensure that the Question Booklet is complete in all respects.

DO NOT OPEN THE QUESTION BOOKLET UNTIL YOU ARE TOLD TO DO SO.

PART ONE

(Answer all the questions; each question carries ONE mark)

1. **Each question below gives a multiple choice of answers. Choose the most appropriate one and enter in the "OMR" answer sheet supplied with the question paper, following the instructions therein.** (1x10)

1.1 Which of the following topologies is most resilient to a single point of failure but requires the most cabling ?
(A) Ring
(B) Star
(C) Mesh
(D) Bus

1.2 In the context of network classification, which of the following statements about Wide Area Networks (WANs) is TRUE ?
(A) They always use Ethernet technology.
(B) They are typically confined within a building.
(C) They span large geographical areas using leased telecommunication lines.
(D) They cannot connect to other networks.

1.3 What is the primary disadvantage of using a hierarchical topology in a large network ?
(A) It requires fewer cables.
(B) It is less efficient in terms of data transmission.
(C) It is challenging to expand and maintain.
(D) It offers poor security.

1.4 Which of the following is NOT a fundamental design issue for the layers in network architecture ?
(A) Error Control
(B) Flow Control
(C) Channel Allocation
(D) Memory Management

1.5 Which layer in the OSI model would handle the reassembly of a fragmented datagram?
(A) Data Link Layer
(B) Network Layer
(C) Transport Layer
(D) Application Layer

1.6 In a noiseless channel, the maximum data rate is determined by which of the following?
(A) Shannon's theorem
(B) Nyquist formula
(C) Fourier transform
(D) Laplace transform

1.7 Which switching method involves establishing a dedicated path between the source and destination nodes before transmission begins ?
(A) Packet Switching
(B) Message Switching
(C) Circuit Switching
(D) Virtual Circuit Switching

1.8 What is the main difference between the Go-Back-N and Selective Repeat protocols in error control ?
(A) Go-Back-N retransmits only the erroneous frame, while Selective Repeat retransmits all frames.
(B) Go-Back-N retransmits all frames from the erroneous one onward, while Selective Repeat only retransmits erroneous frames.
(C) Both protocols work identically.
(D) Go-Back-N has a larger sliding window than Selective Repeat.

1.9 In the context of Multiple Access Protocols, what is a key characteristic of CSMA/CA that distinguishes it from CSMA/CD ?

(A) It is designed for wired networks.

(B) It detects collisions as they occur.

(C) It avoids collisions by using acknowledgments and time slots.

(D) It operates at the Network Layer.

1.10 Which of the following mechanisms is used by TCP to control congestion in the network ?

(A) Slow Start

(B) Sliding Window Protocol

(C) ARQ (Automatic Repeat Request)

(D) Piggybacking

2. **Each statement below is either TRUE or FALSE. Choose the most appropriate one and enter your choice in the "OMR" answer sheet supplied with the question paper, following the instructions therein.** **(1x10)**

2.1 The OSI model has seven layers, while the TCP/IP model has four or five layers, depending on the version.

2.2 Multiprotocol Label Switching (MPLS) can be used to manage traffic flows and improve the performance of both IP and non-IP protocols.

2.3. In the Stop-and-Wait ARQ protocol, the sender can transmit multiple frames before waiting for an acknowledgment from the receiver.

2.4 The process of Network Address Translation (NAT) alters the source IP address of outgoing packets and can create challenges for applications that require end-to-end connectivity.

2.5 Carrier Sense Multiple Access with Collision Detection (CSMA/CD) is commonly used in modern wireless networks.

2.6 The Spanning Tree Protocol (STP) is used to prevent loops in a switched network by creating a logical tree structure of the network topology.

2.7 Fiber optic cables are less susceptible to electromagnetic interference compared to twisted-pair and coaxial cables.

2.8 In a BGP (Border Gateway Protocol) environment, route aggregation can be used to reduce the size of routing tables and improve routing efficiency.

2.9 The ICMP (Internet Control Message Protocol) is used for delivering data packets between applications over a network.

2.10 The 802.1Q standard is used to implement Virtual Local Area Networks (VLANs) by adding a tag to Ethernet frames to indicate VLAN membership.

3. **Match words and phrases in column X with the closest related meaning/word(s)/phrase(s) in column Y. Enter your selection in the "OMR" answer sheet supplied with the question paper, following the instructions therein.**

(1x10)

	X		Y
3.1	Subnetting	A.	A protocol for mapping IP addresses
3.2	DHCP	B.	Wireless Access Points (WAPs)
3.3	NAT	C.	Method for dividing an IP address into smaller parts
3.4	ICMP	D.	A protocol used to assign dynamic IP addresses
3.5	VLAN	E.	Mechanism for ensuring data integrity during transmission
3.6	Wavelength	F.	Virtual Local Area Network
3.7	Fiber Optics	G.	The physical distance between wave peaks
3.8	Routing Protocols	H.	Used for sending control messages and errors
3.9	Firewalls	I.	Protocols like RIP, OSPF, BGP
3.10	CRC	J.	Communication technology using light
		K.	Media Access Control
		L.	Device that filters traffic based on MAC address
		M.	Error detection using Cyclic Redundancy Check (CRC)

4. Each statement below has a blank space to fit one of the word(s) or phrase(s) in the list below. Enter your choice in the "OMR" answer sheet supplied with the question paper, following the instructions therein. (1x10)

A.	CRC	**B.**	Packet Sniffer	**C.**	Payload
D.	QoS (Quality of Service)	**E.**	Multicast	**F.**	VLAN (Virtual Local Area Network)
G.	TCP Handshake	**H.**	Session Layer	**I.**	Asynchronous
J.	Routing Table	**K.**	Load Balancing	**L.**	Throughput
M.	NAT (Network Address Translation)				

4.1 In a _____ environment, the sender and receiver operate independently, allowing for more flexibility in data transmission timing.

4.2 _____ is a technique used to allow multiple users to access the same bandwidth without interference, often seen in internet connections.

4.3 The _____ is a data structure used by routers to determine the best path for forwarding packets across networks.

4.4 The _____ is responsible for the establishment and termination of sessions between applications in the OSI model.

4.5 _____ is a networking concept that enables multiple logical networks to coexist on the same physical network infrastructure.

4.6 The _____ is a method of providing different priority levels to different types of data, ensuring that critical applications receive the necessary bandwidth.

4.7 In _____, the original source IP address is replaced with a new IP address as packets traverse a router.

4.8 _____ refers to the amount of data successfully transmitted over a network in a given amount of time, often measured in bits per second (bps).

4.9 _____ refers to the addition of metadata to packets, which can be analysed to monitor network traffic for security or performance.

4.10 The _____ establishes a connection between a client and a server by performing a three-way handshake process.

PART TWO

(Answer any FOUR Questions)

5. (a) Explain the process of TCP's three-way handshake mechanism in detail. Discuss how it ensures reliable communication between a client and server. Also, describe what happens if a packet is lost during this handshake process.

(b) Describe the difference between circuit switching, packet switching, and message switching. Provide examples of where each technique is used. **(7+8)**

6. (a) Explain the OSI (Open Systems Interconnection) Model in detail, listing and describing the functions of each of its seven layers.

(b) How many hosts can be assigned IP addresses in a subnet with a subnet mask of 255.255.255.0?

(c) Explain the concepts of CSMA/CD (Carrier Sense Multiple Access with Collision Detection) and CSMA/CA (Carrier Sense Multiple Access with Collision Avoidance). How do they manage data transmission in shared communication channels ? **(7+4+4)**

7. (a) Describe the differences between Transmission Control Protocol (TCP) and User Datagram Protocol (UDP). Provide examples of applications that use each protocol and explain why they are suitable for those applications.

(b) Explain the roles and functions of a router, switch, and hub in a computer network. How do these devices differ in terms of data handling and their impact on network efficiency ? **(10+5)**

8. (a) Explain the process of error detection and correction in the Data Link Layer using the CRC (Cyclic Redundancy Check) method. How does this method ensure data integrity during transmission ?

(b) What is the Domain Name System (DNS), and how does it work? Describe the different types of DNS servers involved in the DNS resolution process when a user accesses a website. **(7+8)**

9. (a) A TCP connection has a round-trip time (RTT) of 150 ms and a window size of 64 KB. Assuming there is no packet loss, calculate the maximum throughput of this connection in Mbps.

(b) Explain how QoS (Quality of Service) mechanisms work in network communication. Discuss the techniques used to prioritize different types of traffic and how they can improve the performance of critical applications in a congested network environment. Include examples of protocols or services where QoS plays a crucial role. **(7+8)**

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