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|------|---|---|----------|------------|----------|----------|-----|----------------------------------|--------------------------------------|
| OR | iii. | Explain the differences between broadcast and multicast routing and discuss the main challenges associated with each method in network communication. | 6 | 4 | 1,3 5 | 1,2 4 | 1,2 | <i>Total No. of Questions: 6</i> | <i>Total No. of Printed Pages: 4</i> |
| Q.6 | Attempt any two: | | | | | | | Enrollment No..... | |
| i. | Compare TCP and UDP in terms of reliability, header structure, and typical use cases. | 5 | 4 | 1,5 | 3,5 | 2 | | | |
| ii. | Discuss the structure of the HTTP protocol, explaining its request and response model. | 5 | 2 | 1,2 3,5 | 3 | 2 | | | |
| iii. | Explain the concept of data compression in the Presentation Layer and its importance in network communications. | 5 | 2 | 1,3 5 | 1,2 3 | 2 | | | |



Knowledge is Power

Programme: B.Tech.

Branch/Specialisation: IT

Faculty of Engineering

End Sem Examination Dec 2024

IT3CO39 Computer Networks

Duration: 3 Hrs.**Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d. Assume suitable data if necessary. Notations and symbols have their usual meaning.

| Marks | BL | PO | CO | PSO |
|---|---|----------|----|---------|
| 1 | 1 | 1,2 | 1 | 2 |
| i. | In the OSI model, which layer is responsible for session establishment, management, and termination? | | | |
| (a) Network | (b) Transport | | | |
| (c) Session | (d) Data Link | | | |
| ii. | The main difference between connection-oriented and connectionless services is: | 1 | 4 | 1 1,2 2 |
| (a) The number of devices they can connect | | | | |
| (b) Whether a session is established and maintained | | | | |
| (c) The type of data transmitted | | | | |
| (d) The network topology used | | | | |
| iii. | Which of the following is NOT a function of the Data Link Layer? | 1 | 1 | 1 2,3 2 |
| (a) Framing | | | | |
| (b) Routing | | | | |
| (c) Error detection | | | | |
| (d) Flow control | | | | |
| iv. | Which protocol allows the sender to continue sending frames up to a specified window size even without receiving acknowledgments? | 1 | 2 | 1,2 3 2 |
| (a) Stop-and-Wait | | | | |
| (b) 1-bit sliding window | | | | |
| (c) Go-Back-N | | | | |
| (d) Stop-and-Restart | | | | |

| | [2] | | [3] |
|-------|--|---|--|
| v. | In CSMA/CD, the "CD" stands for: (a) Collision Detection (b) Collision Division (c) Communication Delay (d) Communication Division | 1 1 2 1,2 2 | ii. Compare the star and bus network topologies in terms of structure, reliability, and ease of troubleshooting. |
| vi. | Which IEEE standard is associated with Ethernet? (a) 802.3 (b) 802.4 (c) 802.5 (d) 802.11 | 1 1 2,5 1,2 3 | iii. Explain the role of each layer in the OSI model with specific focus on data flow and error handling. |
| vii. | Which of the following is a key function of the Network Layer? (a) Flow control (b) Routing of data packets (c) Error detection and correction (d) Data encryption | 1 1 1 2,3 1,2 | OR iv. Describe the concept of connection-oriented and connectionless services, and explain how TCP and UDP provide these services in the TCP/IP model. |
| viii. | Which of the following is a primary difference between IPv4 and IPv6? (a) IPv4 has a 128-bit address, while IPv6 has a 32-bit address (b) IPv4 uses broadcast addresses; IPv6 uses multicast only (c) IPv6 supports NAT, whereas IPv4 does not (d) IPv6 does not support DNS, whereas IPv4 doe | 1 4 1,2 3 2,3 4 2 | Q.3 i. What is framing, and why is it important in the Data Link Layer? ii. What are the main challenges of framing in the Data Link Layer? Describe any three framing techniques, highlighting how each addresses these challenges. |
| ix. | What is the main purpose of the Transport Layer? (a) Data formatting (b) Process-to-process delivery (c) Physical addressing (d) Error detection | 1 2 2,3 1,3 1,2 | OR iii. Compare HDLC and SDLC protocols, describing their structure, data transfer modes, and main use cases in networking. |
| x. | What is the purpose of flow control in TCP? (a) To manage the speed of data transmission (b) To prevent data from being lost during transmission (c) To detect and correct errors (d) To establish a connection between two hosts | 1 2 1,2 3 | Q.4 i. What is the channel allocation problem in the MAC sublayer, and why is it important? ii. Explain how CSMA (Carrier Sense Multiple Access) works, and compare the three variations: CSMA, CSMA/CD, and CSMA/CA. |
| Q.2 | i. Explain the concept of network topologies and name two common types. | 2 2 2,3 1,4 2 | OR iii. Explain the Slotted ALOHA protocol, including its operational principles and how it improves efficiency compared to pure ALOHA. |
| | | | Q.5 i. List the main fields of the IPv4 header and explain the role of any two fields. ii. Explain subnetting and how it is used to organize and efficiently manage IP address allocation within networks. |

Marking Scheme
IT3CO39 (T) Computer Networks (T)

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|-----|--|--|
| Q.1 | i) (c) Session. ii) (b) Whether a session is established and maintained. iii) (b) Routing. iv) (c) Go-Back-N v) (a) Collision Detection vi) (a) 802.3 vii) (b) Routing of data packet viii) (b) IPv4 uses broadcast addresses; IPv6 uses multicast only ix) (b) Process-to-process delivery x) (a) To manage the speed of data transmission | 1 1 1 1 1 1 1 1 1 1 |
| Q.2 | i. Explain the concept of network topologies and name two common types. Explanation of the concept of network topologies: 1 mark Naming two common types (e.g., star, bus, ring, mesh): 1 mark | 2 |
| OR | ii. Compare the star and bus network topologies in terms of structure, reliability, and ease of troubleshooting. Comparison of structure: 1 mark Comparison of reliability: 1 mark Comparison of ease of troubleshooting: 1 mark | 3 |
| Q.3 | iii. Explain the role of each layer in the OSI model with a specific focus on data flow and error handling. Brief explanation of the function of each layer (7 layers): 3 marks Explanation of data flow and error handling roles in specific layers (Transport, Data Link, etc.): 2 marks | 5 |
| OR | iv. Describe the concept of connection-oriented and connectionless services, and explain how TCP and UDP provide these services in the TCP/IP model. Explanation of connection-oriented and connectionless services: 2 marks Description of how TCP provides connection-oriented services: 1.5 marks Description of how UDP provides connectionless services: 1.5 marks | 5 |
| Q.4 | i. What is framing, and why is it important in the Data Link Layer? <ul style="list-style-type: none"> • Definition of framing: 1 mark • Explanation of its importance in the Data Link Layer: 1 mark | 2 |

ii. **What are the main challenges of framing in the Data Link Layer? Describe any three framing techniques, highlighting how each addresses these challenges.**

- Explanation of main challenges in framing: 2 marks
- Description of three framing techniques (such as character count, byte stuffing, and bit stuffing): 3 marks (1 mark per technique)
- Explanation of how each technique addresses the challenges: 3 marks (1 mark per technique)

OR iii. **Compare HDLC and SDLC protocols, describing their structure, data transfer modes, and main use cases in networking.**

- Comparison of HDLC and SDLC structure: 2 marks
- Comparison of their data transfer modes: 2 marks
- Description of main use cases for each protocol in networking: 2 marks
- Highlighting key differences or advantages: 2 marks

i. **What is the channel allocation problem in the MAC sublayer, and why is it important?**

- Explanation of the channel allocation problem: 2 marks
- Explanation of its importance in the MAC sublayer: 1 mark

ii. **Explain how CSMA (Carrier Sense Multiple Access) works, and compare the three variations: CSMA, CSMA/CD, and CSMA/CA.**

- Explanation of how CSMA works: 2 marks
- Comparison of CSMA, CSMA/CD (Collision Detection), and CSMA/CA (Collision Avoidance): 5 marks
- CSMA/CD: 2 marks
- CSMA/CA: 2 marks

OR iii. **Explain the Slotted ALOHA protocol, including its operational principles and how it improves efficiency compared to pure ALOHA.**

- Explanation of the Slotted ALOHA protocol and its operational principles: 4 marks
- Explanation of how it improves efficiency compared to pure ALOHA: 3 marks

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P.T.O.

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- Q.5 i. **List the main fields of the IPv4 header and explain the role of any two fields.** 4

Listing the main fields of the IPv4 header (e.g., Version, IHL, Total Length, Identification, Flags, Fragment Offset, TTL, Protocol, Header Checksum, Source and Destination IP): 2 marks
Explanation of the role of any two fields: 2 marks (1 mark per field explained)

- ii. **Explain subnetting and how it is used to organize and efficiently manage IP address allocation within networks.** 6

Explanation of the concept of subnetting: 2 marks
Explanation of how subnetting organizes networks and manages IP address allocation: 2 marks
Explanation of subnet masks and how they help in network segmentation: 2 marks

- OR iii. **Explain the differences between broadcast and multicast routing and discuss the main challenges associated with each method in network communication.** 6

- Explanation of broadcast routing: 1.5 marks
- Explanation of multicast routing: 1.5 marks
- Discussion of main challenges in broadcast routing (e.g., network congestion, inefficiency): 1.5 marks
- Discussion of main challenges in multicast routing (e.g., group management, scalability): 1.5 marks

Q.6

- i. **Compare TCP and UDP in terms of reliability, header structure, and typical use cases.** 5

Comparison in terms of reliability (TCP is reliable with acknowledgment, UDP is unreliable): 2 marks

Comparison of header structure (TCP's complex header vs. UDP's simpler header): 1.5 marks

Typical use cases (TCP for web browsing, email, file transfer; UDP for streaming, gaming, etc.): 1.5 marks

- ii. **Discuss the structure of the HTTP protocol, explaining its request and response model.** 5

Explanation of the HTTP protocol structure (headers, methods, status codes, etc.): 2 marks

Explanation of the request model (client request types like GET,

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POST): 1.5 marks

Explanation of the response model (server responses, status codes, response headers): 1.5 marks

- iii. **Explain the concept of data compression in the Presentation Layer and its importance in network communications.** 5

Explanation of data compression in the Presentation Layer: 2 marks

Description of how compression reduces data size and transmission time: 1.5 marks

Importance in network communication (bandwidth saving, efficiency): 1.5 marks
