(T) Roll No. .....

PAPER ID—11563

B. Tech. EXAMINATION, 2025

(Sixth Semester)

COMPUTER NETWORK AND INTERNET OF THINGS

Open Elective II

Time : 3 *Hours* *Maximum Marks* : 70

Before answering the question-paper candidates should ensure that they have been supplied to correct and complete question-paper. No complaint, in this regard, will be entertained after the examination.

Note : Q. No. 1 is compulsory consisting of seven short answer type questions each of 2 marks. There are four units. Each Unit contains two questions. Attempt any *one* question from each Unit. Each question carries 14 marks.

1. (a) Can two clients bind to the same port on the same machine ? Why *or* why not ?

(b) Define network edge and network core.

(c) Why is it that UDP is preferred over TCP in real-time applications like VoIP or online gaming, despite lacking reliable delivery ?

(d) What's the difference between a socket and a port number ?

(e) What is the minimum number of bits required to detect and correct single-bit errors in a 7-bit message using Hamming Code ?

(f) Mention any *two* characteristics of IoT.

(g) Name any *one* application of IoT in agriculture. **2×7=14**

Unit I

2. (a) Compare circuit switching and packet switching in terms of resource utilization, efficiency and scalability. 7

   (b) Discuss the role of POP3 and IMAP in email retrieval. How do they differ in functionality ? 7

3. (a) A user reports high delay but low packet loss. What are the possible causes from a networking perspective ? 7

   (b) Describe the working of FTP. How does it differ from HTTP in terms of connection management ? 7

Unit II

4. (a) In TCP, the sliding window protocol is used to manage the flow of data. How does the size of the sliding window impact the network performance, both in terms of throughput and congestion ? Provide a scenario where an excessively large window size could reduce efficiency and another where a small window could lead to underutilization. 7

(b) UDP is often referred to as a 'best-effort' protocol. Explain, why this is the case and how it differs from TCP's approach to reliability. 7

5. (a) Explain in detail the differences between UDP and TCP in terms of reliability, data delivery guarantees and congestion control mechanisms. 7

(b) Why is the checksum mandatory in UDP but optional in TCP ? How does the checksum contribute to ensuring data integrity in both protocols, and what are the potential consequences if the checksum is not used or is incorrectly calculated in a critical application ? 7

Unit III

6. (a) Explain why shortest-path trees may not be optimal for multicast routing. How does Reverse Path Forwarding (RPF) solve part of this inefficiency ? 7

   (b) Compare and contrast congestion control and error control in the context of TCP/IP. 7

7. (a) Why is CRC considered more reliable ? Explain with the help of suitable example. 7

   (b) Compare hub *vs* switch *vs* router in terms of functionality. 7

Unit IV

8. (a) Discuss how cloud computing enhances IoT functionality. What are the security and privacy trade-offs involved in sending sensor data to the cloud for analysis ? Suggest at least two techniques to ensure secure communication. 7

(b) IoT systems often have constraints like limited power, memory and processing capabilities. How does the physical design of IoT devices overcome these limitations while ensuring reliability and scalability ? Provide real-world examples.

9. (a) IoT communication models include device-to-device, device-to-cloud and gateway-based models. In what scenarios would a gateway-based model be preferred over direct device-to-cloud communication ? Justify your answer. 7

(b) IoT enables data collection through sensors and performs actions via actuators. Explain how improper calibration of sensors or actuator failure could affect a smart energy grid. What mechanisms can be used to detect and prevent such issues ? 7

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