Graphic Era
HILL UNIVERSITY
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End Term (Odd) Semester Examination December 2025

Roll no.....

Name of the Course: B. Tech. CSE (AI/ML, AI/DS, CYBER)
Semester: V
Name of the Paper: Computer Networks
Paper Code: TCS511

Time: 3 hours **Maximum Marks: 100**

Note:

(i) All questions are compulsory
(ii) Answer any two sub questions from a, b and c in each main question.
(iii) Total marks for each question is 20 (Twenty).
(iv) Each sub-question carries 10 marks.

Q1. (2×10 = 20Marks)

a. A server needs to send data to a client using TCP/IP. Explain with help of a diagram, the process of encapsulation at different protocol layers. Also explain the specific functions performed by each layer in TCP/IP protocol suite. [CO2]
b. A developer creates an app for real-time taxi booking. Which transport and application layer protocols are to be used and why? Justify your answer. [CO3]
c. A packet of size 8,000 bits is transmitted over a link with a bandwidth of 2Mbps and a propagation delay of 20 ms. Calculate (i) Transmission delay and (ii) total end-to-end delay. Assume there are no processing or propagation delays. With help of a neat diagram answer the questions. [CO1]

Q2. (2×10 = 20Marks)

a. Draw the HTTP request and response message formats. Describe each field in the message formats. Also differentiate between persistent and non-persistent HTTP. [CO3]
b. What are various protocols used in an e-mail system? Explain MIME protocol and its use in an e-mail system. [CO3]
c. List the applications of domain name system (DNS). How a name-address resolution is performed in the DNS system? Explain with help of examples. [CO3]

Q3. (2×10 = 20Marks)

a. With help of suitable diagrams, describe the connection establishment and connection termination using three-way-handshake. How the sequence and acknowledgement numbers are chosen in a three-way-handshake? [CO4]
b. Draw the TCP segment header and explain the fields present in a TCP segment. How the checksum field is calculated in a TCP segment? [CO4]
c. Discuss the importance of round-trip time (RTT). How a round-trip-time is estimated? [CO1]

Q4. (2×10 = 20Marks)

a. An ISP is granted a block of IPv4 addresses starting with 190.100.0.0/16 (65,536 addresses). The ISP needs to distribute these addresses to three groups of customers as follows:
   (i) The first group has 32 customers; each needs 512 addresses.
   (ii) The second group has 64 customers; each needs 128 addresses.

(iii) The third group has 96 customers; each needs 128 addresses.
Design the sub-blocks and find out how many addresses are still available after these allocations. [CO5]

b. Name and explain all error reporting messages and query messages and their importance in ICMP. [CO5]

c. Describe the transition strategies used for migration from IPv4 to IPv6. [CO5]

Q5. (2×10 = 20Marks)

a. What are various functions performed by the data-link layer in OSI reference model? How transmission errors are handled by the data-link layer? [CO6]

b. Suppose the frame 1101101011111 is to be transmitted from a sender to receiver. Calculate the transmitted frame using cyclic redundancy check (CRC) algorithm using the generator polynomial $G(x) = x^4 + x + 1$. [CO6]

c. Calculate the efficiency of pure and slotted ALOHA channels. [CO6]

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