Course Title: Computer Networks

Department of Computer Science and Telecommunication Engineering
Year 3, Term 2, Final Examination (May 2025), Session 2020-21
Course Code: **CSTE 3201**, Full Marks: 70, Time: Four hours
*Answer any **SEVEN** of the following questions.*

1.a) What is meant by the Process-to-Process delivery in computer network. Discuss the necessity of port numbers provided by the transport layer. 3

b) An organization is granted a block of addresses with the beginning address 170.16.55.0/24. The organization needs to have 3 sub-blocks of addresses to use in its three subnets: one sub-block of 10 addresses, one sub-block of 60 addresses, and one sub-block of 120 addresses. Design the sub-blocks. 7

2.a) What is the function of MAC control layer for a full duplex switched Ethernet? 3

b) An organization is assigned the block 2000:1456:2474/48. What is the IPv6 address of an interface in the third subnet if the Ethernet physical address of the computer is (F5-A9-23-14-7A-D2)? 4

c) What do you mean by VLAN? How does VLAN tagging work? Explain. 3

3.a) Explain with example the connectionless and connection-oriented services? 3

b) An IP packet has arrived with the first 8 bits as shown: 01000010_2. Why does the receiver *discard the* packet? 2

c) Find the class of each address (give the reason of your answer). Also identify if anything is wrong. 5
i) 226.12.14.88, ii) 194.14.56.23 iii) 15.23.120.9 iv) 251.5.15.112
v) 133.11.78.57

4.a) What are the key fields in an IPv4 header and their roles? What is *fragmentation in IPv4, and why is it* needed? 3+3

b) Find out the range of assignable IP addresses for a subnet containing an IP address of 72.16.1.10 /19? Explain each step. 4

5.a) How can NAT help in address depletion? 2

b) Explain the following names of data: 1) Segment, 2) Datagram and 3) Fragment 3

c) A block of addresses is granted to a small organization. Find the first address, last address and the number of addresses in the block, if we know that one of the addresses is 16.16.55.70/26 5

6.a) A packet has arrived in which the offset value is 75, the value of HLEN is 5, and the value of the total length field is 120. What are the numbers of the first byte and the last byte? 3

b) Explain the following statement 'A switch increases the number of collision domain'. 2

c) An IPv4 packet has arrived with the first few hexadecimal digits as shown. $(45000028000100000102\ldots)_{16}$. How many hops can this packet travel before being dropped? The data belong to what upper-layer protocol? 3

d) Explain the merits of DHCP for a very large network. 2

3/7/2025

7.a) A slotted ALOHA network transmits 200-bit frames using a shared channel with a 200-kbps bandwidth. Find the **throughput** if the system (all stations together) produces 4

1. 1000 frames per second.
2. 500 frames per second.
3. 250 frames per second.

b) There is no acknowledgment mechanism in CSMA/CD, but we need this mechanism in CSMA/CA. Explain the reason. 3

c) What is the purpose of *Network Allocation Vector* (NAV) in CSMA/CA? Explain with example. 3

8.a) How does a host autoconfigure itself in ipv6?

b) Assume a host with Ethernet address $(\mathbf{F5\text{-}A9\text{-}23\text{-}11\text{-}9B\text{-}E2})_{16}$ has joined the network. What would be its global unicast address if the global unicast prefix of the organization is 3A21:1216:2165 and the subnet identifier is A245?

c) Show abbreviations for the following addresses:

1. 0000:FFFF:FFFF:0000:0000:0000:0000:0000
2. 1234:2346:3456:0000:0000:0000:0000:FFFF
3. 0000:0001:0000:0000:0000:FFFF:1200:1000
4. 0000:0000:0000:0000:FFFF:FFFF:24.123.12.6

9.a) Why is TTL included in the IP packet? 2

b) Discuss the fields of the ipv4 datagram shown below. 6

VER 4 bits	HLEN 4 bits	Service type 8 bits	Total length 16 bits
Identification 16 bits		Flags 3 bits	Fragmentation offset 13 bits
Time-to-live 8 bits	Protocol 8 bits	Header checksum 16 bits	
Source IP address (32 bits)			
Destination IP address (32 bits)			
Options + padding (0 to 40 bytes)			

c) In an IPv4 packet, the value of HLEN is 5, and the value of the total length field is $(0028)_{16}$. How many bytes of data are being carried by this packet? 2