Master of Computer Applications

MCAC202: Data Communication and Computer Networks (UC)

Unique Paper Code: 223421211

Semester II

May 2025

Year of Admission: 2024

Max. Marks: 70

Time: Three Hours

Parts of a question must be answered together

1. a) A switch uses a filtering table, and a router uses a routing table. What is the difference between these tables? [2]

b) What is the role of sampling and quantization in analog-to-digital conversion? Describe with the help of an example. [3]

c) Assume a TELNET client uses ASCII to represent characters, but the TELNET server uses EBCDIC to represent characters. How can the client log into the server when character representations are different? [2]

NVT

d) Distinguish between an HTTP persistent and an HTTP non-persistent connection. Explain the differences clearly with the help of an example. [3]

2. a) Define the type (unicast, multicast, or broadcast) of the following Ethernet destination addresses: [3]
4A:30:10:21:1O:1A
47:20:1B:2E:08:EE
FF:FF:FF:FF:FF:FF

b) An Ethernet MAC sublayer receives 42 bytes of data from the upper layer. How many bytes of padding must be added to the data? [2]

c) Describe Code Division Multiple Access (CDMA) channelization protocol in your own words with the help of an example. [5]

3. a) Describe the structure of an IPv4 datagram, showing various fields along with their function, with the help of a diagram. [5]

b) Describe various strategies that can be used for the transition from IPv4 to IPv6 addresses. [5]

4. a) Assume a packet is made of only four 16-bit words $(A7A2)_{16}$, $(CABF)_{16}$,$(903A)_{16}$, and $(A123)_{16}$. Find the traditional checksum that uses a small number of bits (16) to detect errors in a message of any size. [3]

b) A block of addresses is granted to a small organization. Given that one of the addresses is 205.16.37.35/28. Find the first address, the last address, and the number of addresses in the block. [3]

c) An organization is granted a block of addresses with the beginning address 14.24.74.0/24. The organization needs to have three subblocks of addresses to use in its three subnets: one subblock of 10 addresses, one subblock of 60 addresses, and one subblock of 120 addresses. Design the subblocks. [4]

5. a) Using 5-bit sequence numbers, what is the maximum size of the send and receive windows for each of the following protocols? [3]

   i) Stop-and-Wait
   ii) Go-Back-*N*
   iii) Selective-Repeat

b) We can define the bandwidth-delay product in a network as the number of packets that can be in the pipe during the round-trip time (RTT). What is the bandwidth-delay product in each of the following situations? [3]

   i) Bandwidth: 1 Mbps, RTT: 20 ms, packet size: 1000 bits
   ii) Bandwidth: 10 Mbps, RTT: 20 ms, packet size: 2000 bits
   iii) Bandwidth: 1 Gbps, RTT: 4 ms, packet size: 10,000 bits

c) Assume PPP(POINT-TO-POINT PROTOCOL) is in the authentication phase, what is exchanged as payload between the nodes if PPP is using [4]

   i) PAP
   ii) CHAP

6. a) Describe the format of a TCP segment header with the help of a diagram, listing its components along with their sizes, and functions. [4]

b) The following is part of a TCP header dump (contents) in hexadecimal format. [6]

E2930017 00000001 00000000 500207ff 00000000

   i) What is the source port number?
   ii) What is the destination port number?
   iii) What is the sequence number?
   iv) What is the acknowledgment number?
   v) What is the length of the header?
   vi) What is the window size?

7. Write short notes on each of the following: [10]

   a) Secure Shell (SSH)
   b) Domain Name System (DNS)
   c) Multihoming in SCTP
   d) Half-close in TCP