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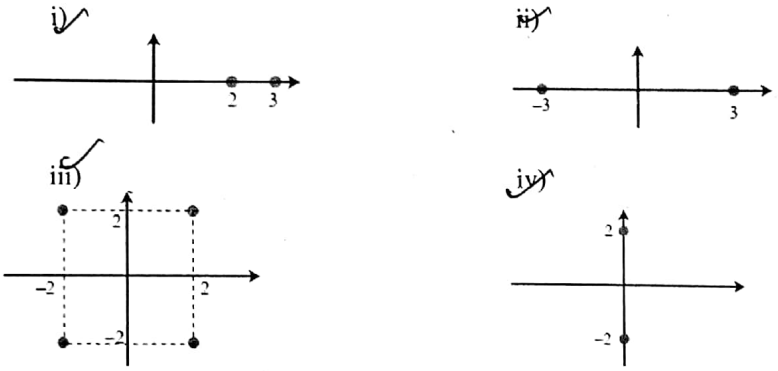
Masters of Computer Applications
MCAC 204: Data Communication and Computer Networks
Unique Paper Code: 223401204
Semester II
August-2022
Year of admission: 2021

Time: 3 hours **Max. Marks: 70**

Instructions: Parts of a question should be answered together.

1. a. What types of addresses (identifiers) are used in the following layers? **2 marks**
   i) Network layer
   ii) Data link layer

   b. For each constellation diagram, find the peak amplitude value and identify the modulation type (ASK, FSK, PSK, or QAM). Justify your answer. **3 marks**



   c. How is the flow control implemented to deal with substantially different sizes of the send and receive windows in the Go-Back-*N* protocol of the Transport layer? **5 marks**

2. a. Differentiate between the two delivery methods --- pushing and pulling, concerning flow control at the Transport layer. **3 marks**

   b. Given the dataword 101001111 and the divisor 10111, use Cyclic Redundancy Check (CRC) to generate the codeword at the sender site. Use modulo-2 arithmetic. **3 marks**

   c. Identify the network ID, broadcast address, first usable IP, and last usable IP on the subnetwork that the node 192.168.1.15/26 belongs to. **4 marks**

3. a. In a network, LANS are connected using point-to-point WANs. How many point-to-point WANs are needed to connect *n* LANs if each LAN is required to communicate with any other LAN directly? **2 marks**

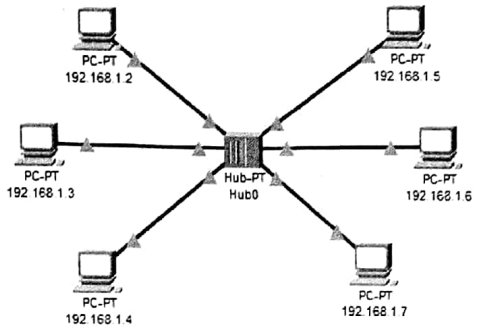
   b. A slotted ALOHA network transmits 200-bit frames using a shared channel with a 200 kbps bandwidth. Find the throughput if the system (all stations taken together) produces 1000 frames per second. **3 marks**

   c. Enumerate the steps involved in pulse code modulation (PCM). **5 marks**

4. a. What is the phase shift (in degrees) for the following? **2 marks**
   i) A sine wave with the maximum amplitude at time zero
   ii) A sine wave with zero amplitude after a 3/4 cycle and increasing afterwards

   b. What is the maximum data rate of a channel with a bandwidth of 200 kHz if we use four levels of digital signalling? **3 marks**

   c. Consider the following wired LAN with six stations and a hub on a shared medium. Will CSMA/CD be useful in such a scenario? Justify your answer. **5 marks**



5. a. Assume a page has 24 lines with 80 characters in each line. If we need to download text documents at the rate of 100 pages per second, what is the required bit rate of the channel? (1 character = 8bits) **2 marks**

   b. What should be the minimum Hamming distance if we want to detect two-bit errors? **2 marks**

   c. Differentiate between bit-stuffing and byte-stuffing used in framing with the help of suitable examples. **6 marks**

6. a. Draw a data stream 0011001110111101 for the following line coding schemes (Assume that the last signal level has been positive). **3 marks**
   i. NRZ-I (If there is no change, the bit is 0)
   ii. NRZ-L (the voltage level for 0 is positive, and the voltage level for 1 is negative)
   iii. AMI

   b. Differentiate between 1-persistent, 0-persistent, and p-persistent methods used in CSMA protocol. **3 marks**

   c. Outline the working of the stop-and-wait protocol of the Data Link layer with the help of a suitable diagram. **4 marks**

7. a. If you need to transmit 100 characters (each character encoded using 8 bits), determine the number of bits transmitted for: **3 marks**
   i) synchronous transmission
   ii) asynchronous transmission
   Also, find the redundancy percent in each case.

   b. Enumerate three phases involved in creating a virtual-circuit packet-switched network. **3 marks**

   c. How does guided media differ from unguided media? Enumerate three major classes of each of the guided and unguided media. **4 marks**