Semester End Examination
Masters of Computer Applications
MCAC 204: Data Communication and Computer Networks
Unique Paper Code: 223401204
Semester II
May-2023
Year of admission: 2021

Max. Marks: 70

Time: 3 hours

Instructions: Parts of a question should be answered together.

1. a. A small retail store plans to establish a network infrastructure for its Point of Sale (POS) system. The store has a main cash register, which will be connected to several POS terminals located at different checkout counters. The store owner wants a reliable, easy-to-manage network supporting their business operations. Which network topology would you recommend for this scenario? Justify your answer with the help of a suitable diagram. **5 marks**

   b. Compare and contrast Amplitude Shift Keying (ASK), Phase Shift Keying (PSK), and Frequency Shift Keying (FSK) modulation techniques. Give an example of a situation where you would using these techniques, and why? **5 marks**

2. a. A client-server application is transferring data over a wireless network. The client sends packets to the server using the Go-Back-N protocol. However, due to the nature of the wireless network, some packets are lost or corrupted in transmission. How can the Go-Back-N protocol help to ensure reliable data transfer in this scenario, and what are the potential drawbacks of using this protocol in a wireless network? Which protocol can be used to mitigate these drawbacks? **7 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**

3. a. Identify the network ID, broadcast address, first usable IP, and last usable IP on the subnetwork to which node 200.150.1.15/26 belongs. **3 marks**

   b. The power of a signal is 10 mW, and the power of the noise is 1 μW; what are the SNR and SNR_{dB}? **3 marks**

   c. Enumerate the steps involved in pulse code modulation (PCM). **4 marks**

4. a. Outline the working of the stop-and-wait protocol of the Data Link layer with the help of a suitable diagram. **5 marks**

   b. Consider a wired local area network with 100 stations and a hub on a shared medium. Will ALOHA be useful in such a scenario? If no, which protocol may be best suited in such a scenario? **5 marks**

5. a. Suppose you are designing a digital communication system that uses error-correcting codes to detect and correct transmission errors. You are considering using a Hamming code with a minimum Hamming distance of 3. How many errors can this code detect and correct for a message of length 8 bits? How did you arrive at your answer? **4 marks**

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

6. a. Suppose you are designing a digital communication system that requires high data transmission rates and low error rates over a long distance. Which line coding scheme would you choose and why? Describe the advantages and disadvantages of this scheme compared to other line coding schemes. **5 marks**

b. Differentiate between 1-persistent, 0-persistent, and p-persistent methods used in CSMA protocol. **5 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**