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# Daffodil International University

**Faculty of Science & Information Technology**
**Department of Computer Science and Engineering**
**Midterm Examination, Fall-2024**
**Course Code: CSE225, Course Title: Data Communication**
**Level: 2 Term: 2 Batch: 64**

**Time: 1 Hour and 30 Minutes** **Marks: 25**

## Answer ALL Questions

***[The figures in the right margin indicate the full marks and corresponding course outcomes. All portions of each question must be answered sequentially.]***

| | | | | |
|---|---|---|---|---|
| 1. | a) | Suppose, you are a network engineer at *Daffodil Computers Limited* and your responsibility to design network infrastructure for the company. The DCL has three branches in different cities, each with having 20 employees. The company wants to ensure the network is reliable, secure, scalable, and fault tolerant with near about 99% uptime. Which network topology would you choose for the company? Besides, **apply** your knowledge to determine the possible benefits and limitations of the topology and use appropriate diagram if necessary. | [3] | CO1 |
| | b) | For each of the following 2 networks, calculate the number of cables and **identify** the consequences if a connection fails.<br>a. 10 devices arranged in a mesh topology<br>b. 10 devices arranged in a star topology (not counting the hub) | [2] | |
| 2. | a) | **Relate** the following functions to the appropriate OSI layers:<br>i. How PCs connect to create a topology.<br>ii. How bits are converted into electrical signals.<br>iii. Encryption of password and usernames.<br>iv. Logging the user out from an application when user remains inactive for a long time.<br>v. Requesting sender to send less packets.<br>vi. Changing the path to reach destination if congestion occurs. | [3] | CO2 |
| | b) | Physical (MAC) and logical (IP) are the two addresses needed to transfer data among the devices of two different networks. **Compare and contrast** among these addresses. | [2] | |
| 3. | a) | **What** are the propagation time and the transmission time for a 5-MB (megabyte) message (an image) if the bandwidth of the network is 1 Mbps? Assume that the distance between the sender and the receiver is 12,000 km and that light travels at $2.4 \times 10^8$ m/s. | [3] | CO3 |
| | b) | Why we can't achieve noiseless channel in real life? Provide justification with proper calculation for SNR and $SNR_{dB}$ | [2] | |
| 4. | a) | Suppose you need to send $9D_{16}$. **Analyze** and draw the signal with the following line coding Schemes<br>i. Differential Manchester ii. NRZ (I) iii. Bipolar AMI | [3] | CO3 |
| | b) | Briefly **analyze** the division and substitution steps of Block coding. | [2] | |
| 5. | a) | Briefly **explain** the impact of different types of noises on original signal. | [3] | CO3 |
| | b) | A line has a signal-to-noise ratio of 1000 and a bandwidth of 4000 KHz. **What** is the maximum data rate supported by this line? | [2] | |