**BRAC UNIVERSITY**

**Department of Computer Science and Engineering**

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| Examination: Semester Midterm  Duration: 1 Hour 15 min | Semester: Spring 2022  Full Marks: 30 |
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CSE 320: Data Communications

Answer the following questions.

Figures in the right margin indicate marks.

SET B

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| Name: | ID: | Section: |

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| **1. CO1** | a) | **Identify** each of the below scenarios to an appropriate network type (PAN, LAN, WAN, MAN). Give reasons for your choice.   * Adam is sending an audio file using WhatsApp from his mobile to his friend who is sitting beside him in a coffee shop. * In BRAC BANK Gulshan branch: IT department, employees are exchanging files among them using their network. * PCs in Ayesha Abed Library can communicate with PCs at BRAC Center (Both are in different networks). * A number of convenient stores (ex: Seven Eleven) located in a city are connected, so office staff can easily communicate with one another. | 2 |
| b) | **Illustrate** a heterogeneous network made of four WANs and five LANs. | 3 |
| **2. CO2** | a) | In which factors data rate depends on? What is the difference between bandwidth in hertz and bandwidth in bps?    Figure 1: Analog Signal (time Vs Amplitude)  In the above Figure 1, **determine** the time period and frequency of the analog signal. Also **show** the frequency domain representation of the signal if the maximum amplitude is 40v. | 2+2 |
| b) | Consider a communications channel being used by a cable modem network. The channel has use of the spectrum between 204MHz and 220MHz. The signal power is 30mW and the noise power is 3mW.   * **Interpret** the theoretical maximum capacity of the channel in bps. * Assuming the capacity of the channel could be realized, **distinguish** how many signal levels would be needed? * **Discuss** what advantage/disadvantage, if any, would there be in using half this number of signal levels. | 6 |
| **3. CO2** | a) | **Convert** the following bit stream to a signal using an appropriate encoding scheme that matches the requirements given. Write which signal encoding scheme you are using.  Data: 1 0 0 0 0 0 0 1 0 1 0 1 0 0 0 1  Requirements   * The encoding scheme must occupy a low bandwidth. Any self-synchronization and DC component problem may be ignored. * No DC component. Low bandwidth is required. Self-synchronization is ignored. | 5 |
|  | b) | The following table depicts a sampled analog signal for digital signal representation. By applying the concept of Pulse Code Modulation, assume there will be 3-bit code words for each sampled amplitude. **Show** the normalized quantized value and quantization code for the given analog signal value at different time stamps. Assume that, the sampling amplitudes are between -20V to +20V.   |  |  | | --- | --- | | Time | Analog Signal Value (V) | | 0 | 5.3 | | 1 | 12.7 | | 2 | -6.8 | | 3 | -18.4 | | 4 | 19.5 | | 10 |

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