|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | | | | |
| AIUB | **American International University- Bangladesh (AIUB)**  **Faculty of Engineering** | | | |
| **Course Name:** | Data Communication | **Course Code:** | COE 3201 | |
| **Semester:** | Spring 2023-24 | **Term:** | Final | |
| **Total Marks:** | 30 | **Submission Date:** |  | |
| **Faculty Name:** | Nowshin Alam | **Assignment:** | | 01 |

Course Outcome Mapping with Questions

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Item** | **COs** | **POIs** | **K** | **P** | **A** | **Marks** | **Obtained Marks** |
| **Q1** | **CO4** | **P.f.2.C6** | **K7** | **P1** |  | **10** |  |
| **Q2** | **CO4** | **P.f.2.C6** | **K7** | **P7** |  | **10** |  |
| **Q3** | **CO4** | **P.f.2.C6** | **K7** | **P3** |  | **10** |  |
| **Total:** | | | | | | **30** |  |

**Student Information:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Student Name:** |  | **Student ID:** |  |
| **Section:** |  | **Department:** |  |

**Marking Rubrics (to be filled by Faculty):**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Problem #** | **Excellent**  **[10-9]** | **Proficient**  **[8-7]** | **Good**  **[6-5]** | **Acceptable**  **[4-3]** | **Unacceptable**  **[2-1]** | **No Response**  **[0]** | **Secured Marks** |
| Detailed unique response explaining the concept properly and answer is correct with all works clearly shown. | Response with no apparent errors and the answer is correct, but explanation is not adequate/unique. | Response shows understanding of the problem, but the final answer may not be correct | Partial problem is solved; response indicates part of the problem was not understood clearly. | Unable to clarify the understanding of the problem and method of the problem solving was not correct | No Response/(Copied/identical submissions will be graded as 0 for all parties concerned) |
| **1** |  |  |  |  |  |  |  |
| **2** |  |  |  |  |  |  |  |
| **3** |  |  |  |  |  |  |  |
| **Comments** |  | | | | | Total marks (30) |  |

***INSTRUCTIONS:***

**Consider, your ID = AB-CDEFG-H.** If the digits of your ID form **00 in any case**, then use 10.

***Note: Copied/identical submissions will be graded as 0 for all parties concerned.***

**QUESTION 1.**

(a) A number of 4 data channels (digital), each transmitting at (A+D) Mbps, use a satellite channel of (A+D) MHz. Using FDM, design an appropriate configuration by choosing the right digital to analog modulation and properly labelling the system diagram. [5]

(b) 4 voice channels each having a bandwidth of 30 kHz need to be multiplexed using the FDM technique into a link, which ranges from 300 to 450 kHz. Choose an appropriate guard band and draw the configuration of the system. [5]

**QUESTION 2.**

(a) Using data rate management methods, perform synchronous TDM for six sources with the following data rates and draw the arrangement showing all the bit rates. [5]

* Source 1: (A+C) Mbps
* Source 2: (A +C - D/5) Mbps
* Source 3: 2(A+C) Mbps
* Source 4: (A+C) Mbps
* Source 5: (A+C)/2 Mbps
* Source 6: (A+C)/2 Mbps

(b) Draw the input and output frames for a multiplexing configuration of three lines for both synchronous and statistical TDM. Assume the unit of data is 1 bit, and the inputs for each line are:

Line X: 1, 0, 1, No data, 1, 0   
Line Y: 0, No data, 1, 1, 1, 0  
Line Z: No data, 0, 1, No data, 1, 1

For the synchronous case, add 1 extra bit for synchronization on each frame, and for the statistical case, add addresses to show which line each interleaved unit is coming from. [5]

**QUESTION 3.**

Four sources are creating **BDE** characters per second. If the interleaved unit during synchronous TDM is **(G+H)** bytes long and 1 synchronizing bit is added to each frame, **draw the configuration and the frame on the link** and find: [2+4×2]

1. the data rate of each source,
2. the duration of each frame,
3. the number of bits in each frame,
4. the data rate of the link.