

Data Structures and Algorithms

Assignment 02

Marks 30

Instructions

Work on this assignment individually.

Absolutely NO collaboration is allowed. Any traces of plagiarism would result in a ZERO marks in this assignment and possible disciplinary action.

Solve all the questions carefully, you can solve them on a simple page instead of taking printouts of this document.

Only **handwritten solution** will be accepted.

Attach your document (image, PDF or in any other digital format) with an Email and send it to the following respective recipient till **Monday, March 29, 2021**.

DO NOT compress/zip your solution.

The email must be sent from your **official PUCIT email id**, otherwise it will not be accepted and will be marked **ZERO**.

The subject of the email should be the exact name of the **assignment** i.e. **Assignment 02**.

| Degree | Recipient Email | Subject of Email |
|----------------|--|------------------|
| BSIT Morning | dsaubt03@gmail.com | Assignment 02 |
| BSIT Afternoon | dsaubt04@gmail.com | |

5 MARKS will be DEDUCTED if submission instructions are not followed.

No submissions will be considered after due date.

Name: _____

Roll #: _____

Question # 01

[10]

Suppose, an array **A[0 ... 74]** where 0 and 74 are starting and ending indices respectively is stored in a memory whose starting address is **100**. Assume that the word size for each element is **2-bytes**. Then obtain the following

- How many number of elements are there in the array A?
- How much memory is required to store the entire array?
- What is the memory address of **A[60]**?
- What is the memory address of **15th** element?
- What index is mapped against the memory address **205**?

Question # 02

[04]

A three dimensional array **A[u₁][u₂][u₃]** stored in a **row major order** with base address **100**. The dimensions **u₁**, **u₂** and **u₃** are **8**, **5** and **4** respectively. You are required to calculate the address of location **A[i][j][k]**, where **i**, **j** and **k** are **5**, **2** and **3** respectively. Also suppose that each cell occupies **2-bytes** in memory. *Show all your work to get full (or any) marks.*

Question # 03

[04]

A three dimensional array **A[u₁][u₂][u₃]** stored in a **column major order** with base address **100**. The dimensions **u₁**, **u₂** and **u₃** are **8**, **5** and **4** respectively. You are required to calculate the address of location **A[i][j][k]**, where **i**, **j** and **k** are **5**, **2** and **3** respectively. Also suppose that each cell occupies **2-bytes** in memory. *Show all your work to get full (or any) marks.*

Question # 04

[04]

Given a **3-column** representation of a **sparse matrix**

| | | |
|---|---|---|
| 5 | 6 | 8 |
| 0 | 1 | 3 |
| 0 | 5 | 1 |
| 1 | 3 | 9 |
| 2 | 2 | 2 |
| 2 | 3 | 4 |
| 3 | 0 | 7 |
| 3 | 4 | 5 |
| 4 | 1 | 2 |

Show the content of **original matrix**.

Question # 05

[08]

A **polynomial** is an algebraic expression consisting of variables, coefficients and exponents of variables that can be combined using addition, subtraction, multiplication and division. The **highest exponent** of the variable indicates the **degree** of a polynomial. A **degree n** polynomial looks like the following

$$a_0x^0 + a_1x^1 + a_2x^2 + \dots + a_{n-1}x^{n-1} + a_nx^n$$

For Example,

$3x^3 + 7x^2 + 18x$ is a degree three polynomial because the highest power of variable **x** is **3**.

$3x^2 + 7x^1 + 18x^0$ is a degree two polynomial because the highest power of variable **x** is **2**.

Give an idea how a polynomial can be represented using a **one-dimensional** array? Clarify your idea by representing few example polynomials in **one-dimensional** array.

NOTE: - No submission will be accepted after the DUE DATE.

B E S T O F L U C K