LaTeXAssignments

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Contents

1 Assignment 1: Data Structures and Algorithms

1.1 What is Data Structures

A data structure is not only used for organizing the data. It is also used for processing, retrieving, and storing data. There are different basic and advanced types of data structures that are used in almost every program or software system that has been developed. So we must have good knowledge about data structures.

1.2 Linear Data Structures

Data structure in which data elements are arranged sequentially or linearly, where each element is attached to its previous and next adjacent elements, is called a linear data structure.

1.2.1 Static Data Structure

Static data structure has a fixed memory size. It is easier to access the elements in a static data structure.

1.2.2 Dynamic Data Structure

In dynamic data structure, the size is not fixed. It can be randomly updated during the runtime which may be considered efficient concerning the memory (space) complexity of the code.

1.3 Non Linear Data Structures

Data structures where data elements are not placed sequentially or linearly are called non-linear data structures. In a non-linear data structure, we can't traverse all the elements in a single run only.

1.4 Arrays

- An array is a collection of items stored at contiguous memory locations. The idea is to store multiple items of the same type together.

- This makes it easier to calculate the position of each element by simply adding an offset to a base value, i.e., the memory location of the first element of the array (generally denoted by the name of the array).

1.5 Linked List

A linked list is a linear data structure,in which the elements are not stored at contiguous memory locations.

2 Assignment 2: Mathematics Examination College Of Engineering Pune

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Date: 23th Nov 2022   Branch: Computer

Program: S.Y.BTech   Duration: 1 hour

Semester: III   Max marks: 20

MIS No:

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Instructions

- Write your MIS number on paper.

- Unless otherwise mentioned symbols and notations have their usual standard meaning.

- Use of any kind of electronic device is NOT allowed.

- Any essential result, formula or theorem assumed for answering of questions must be clearly stated.

- Exam Duration: 1hr

- Maximum Marks: 20M

Section I

Question I

1. Attempt the following questions:

a) Find the particular solution of the initial value problem: [CO2][**2**]

$$\tan x \frac{dy}{dx} = y$$
$$y(\frac{\pi}{2}) = (\frac{\pi}{2})$$

b)Check the whether the following differential equation is exact or non-exact and justify your answer.   [CO2][**2**]

$$(1 + \ln xy)dx + (1 + \frac{x}{y})dy = 0$$

2. Solve the following:

a.) $3x(xy - 2)dx + (x^3 + 2y)dy = 0$ [CO2][**2**]

b.) $(2\cos y + 4x^2)dx - x\sin y = 0$ [CO2][**3**]

Question II

1. Find eigenvalues and corresponding eigenvectors of A $= \begin{bmatrix} 2 & -1 \\ -1 & 2 \end{bmatrix}$. Hence,

find an orthogonal basis for R^2 [CO2][2]

2. Find the rank of matrix $\begin{bmatrix} 8 & 6 & 4 & 1 & 3 \\ 2 & 1 & -7 & 4 & 1 \\ 1 & 1 & -1 & 2 & 1 \\ 1 & -1 & 2 & 0 & 0 \end{bmatrix}$ [CO3][3]

3. State whether the following differential equations are linear or non-linear, justify and solve: [CO2][4]

    (a) $xy' + 2y = \frac{e^{3x}}{x}, x > 0$ with $y(1) = 1 + \frac{e^3}{3}$

    (b) $x^2 y \frac{dy}{dx} - xy^2 = 1$

4. Solve the Differential equation $\frac{dy}{dx} = \frac{tanx - x^2 y - 2y}{x^2 - 4x - 1 + e^x}$ [CO2][2]

5. Solve the following indefinite integral $\int x \cos x^2 dx$ [CO3][3]

3 Assignment 3

3.1 Adding Image

Figure 1: Japan

3.2 Adding Table

Table 1: Cities of Japan

Sr.No	City	District	Population
1	Tokyo	Tokyo City	3,906,753,002
2	Osaka	Yamada ken	3,206,453,779
3	Kyoto	Funigawa	2,106,330,110
4	Sapporo	Hokkaido	1,020,030,000

4 Table Examples

Study the following table and answer the questions based on it [2]

| Year | Salary | Item of Expenditure | | | |
		Fuel and Transport	Bonus	Interest of Loans	Taxes
1998	288	98	3.00	23.4	83
1999	342	112	2.52	32.5	108
2000	324	101	3.84	41.6	74
2001	336	133	3.68	36.4	88
2002	420	142	3.96	49.4	98

Table 2: Expenditures of a Company (in Lakh Rupees) per Annum Over the given Years.

1. The total amount of bonus paid by the company during the given period is approximately what percent of the total amount of salary paid during this period?

2. Total expenditure on all these items in 1998 was approximately what percent of the total expenditure in 2002?

3. The total expenditure of the company over these items during the year 2000 is?

4. The ratio between the total expenditure on Taxes for all the years and the total expenditure on Fuel and Transport for all the years respectively is approximately?

| Student | Subject (Max. Marks) | | | | | |
	Maths	Chemistry	Physics	Geography	History	Comp Sci
Ayush	90	50	90	60	70	80
Aman	99	80	80	40	80	70
Sajal	90	60	70	70	90	70
Rohit	80	65	80	80	60	60
Muskan	80	65	85	95	50	90
Tanvi	70	75	65	85	40	60
Tarun	65	35	50	77	80	80

[4] The above table gives the percentage of marks obtained by seven students in six different subjects in an examination.
The numbers in the brackets give the maximum marks in each subject.

1. What are the average marks obtained by all the seven students in Physics? (rounded off to two digit after decimal)

2. The number of students who obtained 60% and above marks in all subjects is?

3. What was the aggregate of marks obtained by Sajal in all the six subjects?

4. In which subject is the overall percentage the best?

5. What is the overall percentage of Tarun?

5 Table from CSV

Question I

Table 3: Autogenerated table from .csv file.

Roll Number	Science	Computer	Maths	History
1	81	98	51	93
2	86	85	56	89
3	63	96	62	93
4	90	99	75	94
5	67	82	82	75
6	75	97	51	74
7	86	86	55	77
8	84	83	72	74
9	96	97	92	93
10	70	90	99	78

1. What is the total marks obtained by the student in history and computer together?

2. Who scored the lowest marks in all the subjects?

3. What is the median mark of the students in mathematics?

4. What is the range of marks obtained by the students in history?

References

[1] "Digital Design" M Morris Mano, 5th Edition, 2013, Pearson Education, ISBN-10: 0-13-277420-8 / ISBN-13: 978-0-13-277420-8

[2] "Discrete Mathematics", Lipschutz, Lipson, 2nd Edition, 1999, Tata McGraw-Hill, ISBN: 007 463710X

[3] Real Number Symbol in LaTeX, $https://www.physicsread.com/latex-real-number/$

[4] "Theory of computer science", E. V. Krishnamurthy, 2004, Affiliated East Press Publications, ISBN-10: 038791255X / ISBN-13: 978-0387912554.