

NATIONAL INSTITUTE OF TECHNOLOGY, JAMSHEDPUR

MID SEMESTER EXAMINATION (FEBRUARY 2023)

SEMESTER: 2<sup>ND</sup> (2022 Batch)

BRANCH: M.C.A

TIME: 2 Hours

SESSION: 2022 - 2023

CREDIT: 4

FULL MARKS: 30

Subject: CA3202 Data Structures

INSTRUCTIONS:

- 1) Answer **ALL** questions.
- 2) Marks of the question and part thereof are indicated in the right hand margin.
- 3) Missing data, if any, may be assumed suitably.
- 4) All the sub-part of a particular question should be written in order.

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- Q1.(a) Write a complete program in C/C++ to implement circular queue using array. [5]  
(b) Write an algorithm to transform the given infix expression to its equivalent prefix expression. Apply this algorithm to convert the following infix expression into equivalent prefix form using stack in tabular format:  
$$A \wedge B * C - D + E / F / (G + H)$$
 [5]
- Q2.(a) Write a complete menu-driven program in C/C++ to implement multiple stacks using array. [6]  
(b) What is a priority queue? How do you represent it? [4]
- Q3.(a) Write functions in C/C++ of a singly linked list for the following: [5]  
(i) insert a node at an intermediate position of the list.  
(ii) delete a node from the end of the list.  
(b) What are the different methods available for determining the total running time of an algorithm? Explain with the help of suitable examples. [5]

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**NATIONAL INSTITUTE OF TECHNOLOGY, JAMSHEDPUR**

**MID SEMESTER EXAMINATION (MARCH 2022)**

SEMESTER: 2<sup>ND</sup> (2021 Batch)  
BRANCH: M.C.A  
TIME: 2 Hours

SESSION: 2021 - 2022  
CREDIT: 4  
FULL MARKS: 30

Subject: **CA3202 Data Structures**

**INSTRUCTIONS:**

- 1) Answer **ALL** questions.
- 2) Marks of the question and part their of are indicated in the right hand margin.
- 3) Missing data, if any, may be assumed suitably.
- 4) All the sub-part of a particular question must be written in order.

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- Q1.(a) Write a complete menu-driven program in C/C++ to implement stacks using array or linked list. . [5]
- (b) Write an algorithm to transform the given infix expression to its equivalent postfix expression. Apply this algorithm to convert the following infix expression into equivalent postfix form using stack in tabular format:  
$$A * (B + D) / E - F * (G + H/K)$$
 [5]
- Q2.(a) Let a and b denote two positive integers. Consider a function F is defined recursively as follows:  
$$F(a, b) = 0 \quad \text{if } a < b$$
$$F(a, b) = F(a - b, b) + 1 \quad \text{if } b \leq a$$
  - (i) Find the value of F(14, 3).
  - (ii) What does this function do? Find F(5861, 7). [3]

(b) Write the functions in C/C++ for insertion and deletion operations on a Deque. [5]

(c) What are the applications of queues? [2]

Q3.(a) What do you mean by function pointer? Give suitable example. [3]

(b) What is a doubly linked list? Write a menu-driven program in C/C++ to create and display nodes in a doubly linked list. [5]

(c) How do determine the running time of an algorithm? Give suitable example. [2]

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2<sup>nd</sup> Sem  
End Sem

**NATIONAL INSTITUTE OF TECHNOLOGY, JAMSHEDPUR**

**END SEMESTER EXAMINATION (APRIL 2023)**

SEMESTER: 2<sup>ND</sup> (2022 Batch)  
BRANCH: M.C.A  
TIME: 3 Hours

SESSION: 2022 - 2023  
CREDIT: 4  
FULL MARKS: 50

Subject: **CA3202 Data Structures**

**INSTRUCTIONS:**

- 1) Answer **ALL** questions.
- 2) Marks of the question and part their of are indicated in the right hand margin.
- 3) Missing data, if any, may be assumed suitably.
- 4) Before attempting the question paper be sure that you have got the correct question paper.
- 5) All the sub-part of a particular question must be written in sequence.

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- Q1 (a) How do you represent a Deque? Write a complete program in C/C++ to perform insertion and deletion operations on a Deque. [7]
- (b) Evaluate the following prefix expression using stack method:  
- / \* 2 \* 5 + 3 6 5 2 [3]
- Q2 (a) What is a doubly linked list? Write a complete menu-based program in C/C++ to create and display doubly linked list. [7]
- (b) What are the different ways of representing polynomial in data structure? Give suitable examples. [3]
- Q3 (a) Write a program in C/C++ to implement queues using stacks. [6]
- (b) Construct an AVL tree step-wise by inserting following elements in the order of their occurrence:  
50, 40, 35, 58, 48, 42, 60, 30, 33, 25 [4]
- Q4 (a) What do you mean by collision? Explain the various techniques to resolve a collision. Which technique do you think is better and why? [6]
- (b) How are graphs represented inside a computer's memory? Which method do you prefer and why? [4]
- Q5 (a) What are the applications of B-tree? Construct a B-tree of order 5 by inserting the following keys in order into an empty B-tree:  
1, 7, 6, 2, 11, 4, 8, 13, 10, 5, 19, 9, 18, 24, 3, 12, 14, 20, 21 and 16 [5]
- (b) What is heap? Apply heap sort algorithm to arrange the following list of numbers in ascending order:  
25, 35, 18, 9, 46, 70, 48, 23, 78, 12, 95 [5]

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END SEM 2023



**NATIONAL INSTITUTE OF TECHNOLOGY, JAMSHEDPUR**  
**Department of Computer Applications**  
**SPRING END SEMESTER (OPEN BOOK) EXAMINATION, JULY 2021**

Roll Number: \_\_\_\_\_

Name of Student: \_\_\_\_\_

**SEMESTER: 2<sup>nd</sup> (2020 Batch)**

**COURSE: M.C. A**

**TIME: 3 Hours**

**DATE of EXAM: 25/07/2021**

**SESSION: 2020 - 2021**

**CREDIT: 4**

**M. MARKS: 50**

**NAME OF FACULTY: Dr. D.K.  
Shaw/Dr. Mudassir Rafi**

Subject: **CA3202 Data Structures**

**INSTRUCTIONS:**

- 1) Answer all questions.
  - 2) All questions carry equal marks.
  - 3) Missing data, if any, may be assumed suitably.
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**Question 1:**

- a) Differentiate between Linear and non-linear data structures. Explain with examples. (3)
- b) What do you mean by Sparse Matrix? Derive the single dimensional memory representation for an *Upper Triangular Matrix*. (1+3)
- c) Write two disadvantages of Linked List over array. How you can represent the following polynomial using Linked List. (1+2)

$$5x^4 - 8x^3 + 2x^2 + 4x + 9$$

**Question 2:**

- a) Write an algorithm to copy one stack to another assuming (2.5+2.5)
  - i. The stack is implemented using array.
  - ii. The stack is implemented using Linked List.
- b) In a circular queue represented by an array, how you can specify its "front", "rear" and MAX-QUEUE-SIZE in terms of its elements? Write all the steps clearly to convert a postfix expression into prefix. (2.5+2.5)

**Question 3:**

- a) Write the complete algorithm for Quick sort. Sort the following array of integers using Quick sort. (3+3)  
22, 33, 11, 44, 77, 90, 40, 60, 99, 55, 88
- b) Build a binary tree for the given in-order and pre-order traversals:  
In-order: E A C K F H D B G  
Pre-order: F A E K C D H G B (4)

**Question 4:**

- a) How a tree is different from graph? Construct an expression tree for the following arithmetic expression  
 $A \ B \ C \ * \ + \ D \ E \ / \ F \ - \ G \ * \ +$  (2+3)
- b) You have been given a string **COR\*O\*NAV\*\*\*IR\*\*\*US\*\*\***.

**END SEM 2021**

Consider the stack data structure, supporting two operations push

and pop. Suppose that for the above sequence, each letter (such as C) corresponds to a push of that letter onto the stack and each asterisk (\*) corresponds a pop operation on the stack. Show the sequence of values returned by the pop operations. Also write the pseudocode for the above implementation. (5)

**Question 5:**

a) Construct a BST step-wise whose elements are inserted in the following order:

40, 50, 55, 60, 70, 30, 15, 20, 10, 35, 45, 25, 65.

Write the post order and preorder sequences of the resulting tree.

(3+2)

b) What is an AVL tree? Construct an AVL tree for the following set of elements to be inserted in the order of their occurrence:

50, 60, 70, 15, 10, 30, 20, 35, 25, 40, 80.

(5)

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NATIONAL INSTITUTE OF TECHNOLOGY, JAMSHEDPUR

END SEMESTER EXAMINATION (MAY 2017)

SEMESTER: 2<sup>ND</sup> (2016 Batch)  
BRANCH: M.C.A  
TIME: 3 Hours

SESSION: 2016 - 2017  
CREDIT: 4  
FULL MARKS: 40

Subject: CA32105 Data Structures

INSTRUCTIONS:

- 1) Answer ALL questions.
- 2) Marks of the question and part thereof are indicated in the right hand margin.
- 3) Missing data, if any, may be assumed suitably.
- 4) Before attempting the question paper be sure that you have got the correct question paper.
- 5) All the sub-part of a particular question must be written in order.

Q1. (a) What is a circular linked list? Write a complete program to create and display the nodes in a circular linked list. [5]

(b) Write a function to add two polynomials/sparse matrices using linked list. [3]

(c) What are the areas in which data structures are applied extensively? [2]

Q2. (a) Write a recursive function to evaluate the Ackerman's function which is defined as follows:

$$\begin{aligned} A(m, n) &= n + 1 && \text{if } m = 0 \\ A(m, n) &= A(m-1, 1) && \text{if } m \neq 0 \\ A(m, n) &= A(m-1, A(m, n-1)) && \text{if } m \neq 0, n \neq 0. \end{aligned} \quad [2]$$

(b) Write an algorithm to evaluate the postfix expression. Apply this algorithm to evaluate the following postfix expression:

$$6 \ 2 \ 3 \ + \ - \ 3 \ 8 \ 2 \ / \ + \ * \ 2 \ ^ \ 3 \ + \quad [3]$$

(c) Write a complete menu-based program in C/C++ to implement a linear queue using linked list. [5]

Q3. (a) What is an expression tree? Construct an expression tree for the following expression by mentioning all the necessary steps:

$$(A + B * C) - ((D * E + F) / G) \quad [3]$$

(b) Write a function to create a complete binary tree using pointers with structure declaration. [3]

(c) Explain different types of rotation mechanisms used in an AVL tree with most appropriate examples. [4]

Q4. (a) When does collision occur in hashing? Explain the various techniques available for resolving collisions. [5]

(b) What is a heap? Construct a heap and heap sort using top-down approach for the following list of numbers: 40, 80, 35, 90, 45, 50, 70. [5]

OR

Apply quick sort algorithm to sort the following list of numbers in ascending order:

$$25, 29, 36, 32, 38, 44, 40, 54. \quad [5]$$

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END SEM 2017