



Sub Name Code: DSA  
Subject Code: CS-2001  
Program Name: B.Tech  
Semester: III (Regular)  
Year - 2019

**AUTUMN END-SEMESTER SOLUTION- 2019**  
**KIIT, Deemed to be University, Bhubaneswar-24**  
**Data Structure and Algorithm**  
**CS-2001**

**Time: 3 Hours**

**Full Mark: 50/60**

**Answer any SIX questions.**

**Question paper consists of four sections-A, B, C, D.**

**Section A is compulsory.**

**Attempt minimum one question each from Sections B, C, D.**

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable and all parts of a question should be answered at one place only.

SECTION A	
Q1.	[1×10 =10] or [2×10 =20]
a	<b>Define an Abstract Data Type (ADT). Give any two examples.</b>
b	<b>Write a function to find out the number of nodes of degree one, two, and zero in a binary tree.</b>
c	<b>Name the data structure used for recursion. Explain with an example.</b>
d	<b>What is a polynomial? How it can be represented using array and linked list? Compare both the representation.</b>
e	<b>How many number of binary tree can be constructed from the following set of tree traversal? Draw all trees.</b>
f	<b>Differentiate between linear queue and circular queue. List any two application of queue ADT.</b>
g	<b>Write a function to copy the content of one stack ADT to another stack ADT without using any additional user defined stack ADT.</b>
h	<b>What is expression tree? Write the steps followed to construct an expression tree from the following expression.</b>
i	<b>Write the two limitation of applying binary search algorithm on a data structure. Write and justify the time complexity of binary search algorithm.</b>

j	Suppose FIRST and LAST represents the address of start node and last node in a double linked list. Write a function to convert the double linked list into a double circular linked list.
SECTION B	
Q2.	
a	<p>What is the advantages of binary search tree over binary tree? Write non-recursive functions for the following operations for a binary search tree</p> <p>i) Traverse the tree in pre-order [4+4]</p> <p>ii) Traverse the tree in level-order</p>
b	What are the limitations of a sparse matrix? How to represent a sparse matrix using a header linked list. Write a function to multiply two sparse matrices represented using header linked list.
Q3.	[4+4]
a	What is heap? Discuss with example, how priority queue can be implemented using heap.
b	Define hashing. What is a collision in hashing? Explain with an example. Write a function to store data in the hash table, avoiding collision by using chaining- a collision resolution method.
SECTION C	
Q4.	[4+4]
a	<p>For a given set of records, analyze the efficiency of processing the records by storing the data in binary search tree, AVL tree and B-tree. Construct an AVL and B-tree for the following set of values.</p> <p>15, 10, 8, 12, 14, 25, 30, 20, 18, 35</p>
b	<p>Write the pseudo code/function to perform the following sorting algorithms. Analyze its best case and worst case time complexity.</p> <p>i) Insertion sort</p> <p>ii) Quick Sort</p>
Q5.	[4+4]
a	Write a function to check whether the parenthesis and curly braces present in a given infix expression are in correct order or not. Use ADT for the implementation.

b	Suppose the student information i.e. <roll no, name, CGPA> are stored using binary search tree. Write a function/pseudo code to delete all the information of a student with CGPA < 5.0.
Q6.	[4+4]
a	<p>Suppose the bank customer information i.e. &lt; customer ID, customer name, customer address, account type, and account balance are stored using a header circular linked list. The header node contains the bank name to which the customer belongs to. One linked list are maintained for each bank. Write pseudo code/ function to perform the following operations:</p> <p>i ) Print the customer details for a given bank</p> <p>ii) Print the customers' details with low balance (less than 5000) for a given bank.</p> <p>iii) Delete the detail of all customers with balance 0 for a given branch.</p>
b	“A graph is an acyclic tree.” (True/ False) List the applications of graph data structures. What are the different ways to represent graph ADT in memory? Write a function to represent a graph ADT using an efficient data structure.
SECTION D	
Q7.	[4+4]
a	Suppose the mobile locations of different persons are represented by nodes in a graph. Write a pseudo code/ algorithm to find the nearest mobile phones present for a given mobile location. Then, find the subsequent neighbors' as per user's requirement.
b	Two binary trees are identical if the same elements are present at the same position. Write a function to check whether two given binary trees are identical or not.
Q8.	[4+4]
a	<p>Suppose a computer system has one processor to execute different tasks. Each task has a time of execution. Each task is assigned with a priority number depending upon the type of task: <i>Local Printing (Lowest Priority -1)</i>, <i>Web Applications (Priority-2)</i>, <i>I/O interfacing (Highest Priority -3)</i>. Every time a task is generated, its execution time and priority number are entered and stored.</p> <p>Which data structure can efficiently maintain task waiting for the processor? Write functions for insertion and deletion operations for the tasks with the following conditions.</p> <p>i) A task will be processed first with minimum execution time.</p> <p>ii) A task will be processed first with highest priority.</p>

b	<b>Design a solution to evaluate a postfix expression. Identify the appropriate data structure used for the evaluation. The expression contains one and two digit numbers. The possible operators are '+', '-', '/', '*', and '%'. Write a function for the evaluation.</b>