Code: 20A05301T

SS

B.Tech II Year II Semester (R20) Regular & Supplementary Examinations August/September 2023

ADVANCED DATA STRUCTURES & ALGORITHMS

(Computer Science & Engineering)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

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1		Answer the following: (10 X 02 = 20 Marks)	
	(a)	Define Big-Oh (O) asymptotic notation and give an example.	2M
	(b)	Define time complexity and space complexity.	2M
	(c)	What are the applications of B-Trees?	2M
	(d)	Differentiate AVL trees and Binary search trees.	2M
	(e)	What are the applications of Red-Black trees?	2M
	(f)	What is the self-balanced binary search tree? Give an example.	2M
	(g)	Write the process of Divide and conquer and write the control abstraction.	2M
	(h)	Analyze the time complexity of Merge sort.	2M
	(i)	Compare and contrast Greedy method and dynamic programming method.	2M
	(j)	Define NP-Hard and NP-Complete problems.	2M

PART – B

(Answer all the questions: 05 X 10 = 50 Marks)

2	(a)	Solve the following recurrence relation using substitution method; $T(n) = c \quad n = 1,$ $= T(n/2) + n \quad n > 1.$	5M
	(b)	Illustrate the characteristics of an algorithm. How it can be analyzed?	5M
		OR	
3	(a)	Compute the Time Complexity of matrix addition algorithm by using frequency count method.	5M
	(b)	Define the term Algorithm and discuss the criteria for an algorithm.	5M
4	(a)	Why B-Trees over Binary trees.	4M
	(b)	Consider an example data and explain process of insertion and deletion on B-trees of height 4.	6M
		OR	
5		Write algorithms for the following operations on BST. (i) Insertion, (ii) Deletion, (iii) Search, (iv) Display.	10M
6		Can we do better than AVL or Red-Black trees with SPLAY trees? Justify it.	10M
		OR	
7	(a)	When do you perform the rehashing? Explain with an example.	5M
	(b)	Discuss various types of hash functions & Examine ideal characteristics of a hash function.	5M

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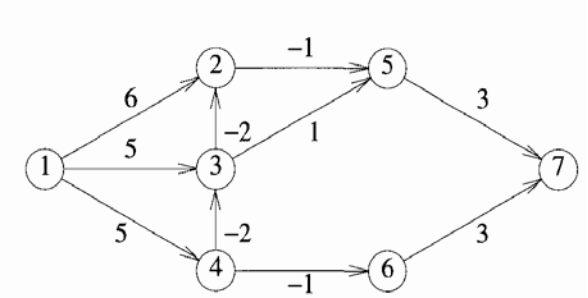
8 (a) Present and explain an algorithm for finding maximum and minimum using divide and conquer method with an example. 5M

(b) Analyse the time complexity of merge sort and quick sort for a sorted array. 5M

OR

9 What is the solution generated by the Job Scheduler when n = 7, (P_1, P_2, P_3, P_4, P_5, P_6, P_7) = (3, 5, 20, 18, 1, 6, 30) and (d_1, d_2, d_3, d_4, d_5, d_6, d_7) = (1, 3, 4, 3, 2, 1, 2). 10M

10 Use Bellman and Ford algorithm to compute shortest paths from node 1 to every other node in the following graph. 10M



OR

11 Illustrate the graph coloring problem and Draw the portion of the state space tree for m-coloring, when n = 4 and m = 3. 10M

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Code: 20A05301T

R20

B.Tech II Year I Semester (R20) Supplementary Examinations August/September 2023

ADVANCED DATA STRUCTURES & ALGORITHMS

(Common to CSE (CS), IT, CSE, CSE (AI), CSE (AI&ML), AI&DS, CSE (IOT), CSE (DS and CS&D)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

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1 Answer the following: (10 X 02 = 20 Marks)

(a) Define Omega notation. 2M

(b) Write the pseudo code for finding the factorial of given number. 2M

(c) Define Binary search tree. 2M

(d) How is an AVL tree better than a binary search tree? 2M

(e) What are Splay trees? 2M

(f) Define Collision. 2M

(g) Derive the worst-case complexity of the Quick sort algorithm. 2M

(h) In how many passes does the Quick sort technique sorts the following sequence; 2M
3, 27, 4, 11, 45, 39, 2, 16, 56.

(i) Give the state space tree for 4 – coloring problem. 2M

(j) Give the statement of Reliability design problem. 2M

PART – B

(Answer all the questions: 05 X 10 = 50 Marks)

2 (a) Compare time complexity with space complexity. 5M

(b) What is the time complexity of following function fun ()? 5M

```
int fun(int n)
{
    for (int i = 1; i <= n; i++)
    {
        for (int j = 1; j < n; j += i)
        {
            Sum = Sum +i*j;
        }
    }
    return(Sum);
}
```

OR

3 (a) Explain the method of determining the complexity of procedure by the step count approach. Illustrate with an example. 5M

(b) Write the pseudo code for expressing algorithms. 5M

4 (a) Create a binary search tree with the input given below: 5M
98, 2, 48, 12, 56, 32, 4, 67, 23, 87, 23, 55, 46.

(b) Write algorithm to delete an element from binary search tree. 5M

OR

5 Create an AVL tree using the following sequence of data: 10M
16, 27, 9, 11, 36, 54, 81, 63, 72.

6 (a) List the merits and demerits of a splay tree. 5M

(b) Discuss the properties of a red-black tree. Explain the insertion cases. 5M

OR

Contd. In page 2

7		Consider a hash table of size 10. Using linear probing, insert the keys 72, 27, 36, 24, 63, 81, 92, and 101 into the table.	10M
8	(a)	Write Divide – And – Conquer recursive Merge sort algorithm.	5M
	(b)	State the Greedy Knapsack Problem. Find an optimal solution to the Knapsack instance n = 3, m = 20, (P1, P2, P3) = (25, 24, 15) and (W1, W2, W3) = (18, 15, 10).	5M
		OR	
9	(a)	Write and explain recursive binary search algorithm.	5M
	(b)	Explain the greedy technique for solving the Job Sequencing problem.	5M
10		State n-queens problem and Explain 8-queens problem using backtracking.	10M
		OR	
11	(a)	Explain the methodology of Dynamic programming. List the applications of Dynamic programming.	5M
	(b)	Discuss the time and space complexity of Dynamic Programming traveling salesperson algorithm.	5M

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