

# Subject Code: KCS503

**Roll No:** 

### **BTECH**

(SEM V) THEORY EXAMINATION 2024-25

## **DESIGN AND ANALYSIS OF ALGORITHM**

#### **TIME: 3 HRS**

**M.MARKS: 100** 

Note: Attempt all Sections. In case of any missing data; choose suitably.

### **SECTION A**

1.	Attempt <i>all</i> questions in brief.	2 x 1	0 = 20				
Q no.	Question	CO	Level				
a.	With example define algorithm. List few algorithm design techniques.	1	K1				
b.	Briefly discuss the basic steps taken to design an algorithm.	1	K1				
c.	Derive the time complexity of Heap Sort.	2	K2				
d.	List the properties of Binomial Heap	2	K1				
e.	With a suitable example explain the concept of Convex –Hull Problem	3	K1				
f.	With example explain Greedy method	3	K1				
g.	Define principle of "Optimality". Give suitable example.	4	K1				
h.	With a suitable example explain "Branch and Bound".	4	K1				
i.	Describe "Randomized algorithms". List few randomized algorithms.	5	K2				
j.	Write steps to solve Travelling Salesman Problem using approximation	5	K1				
	algorithm.						
			0				
SECTION B							
2.	Attempt any <i>three</i> of the following:		$10 \ge 3 = 30$				
a.	Illustrate the operation of Merge -Sort on array A= (38, 27, 43, 3, 9, 82, 10).	1	K3				
	Also drive the time complexity of Merge Sort.	へ・					

## **SECTION B**

## Attempt any *three* of the following:

2. a. Illustrate the operation of Merge –Sort on array A= (38, 27, 43, 3, 9, 82, 10). 1 Also drive the time complexity of Merge Sort. 2 b. Insert the following given sequence of keys in an empty Red-Black tree. K3  $\{10, 18, 5, 4, 15, 17, 25, 60, 1, 9, 0\}$ Apply divide and conquer approach to solve matrix multiplication of two 3 c. K3 matrices of order more than 2X2. Also briefly explain how Strassen's Matrix Multiplication procedure reduced the time complexity of overall procedure. d. K2 Write Floyd's and Warshal's algorithm to find all pair shortest path in a 4 graph. Discuss its time complexity. Explain Vertex Cover Problem. Solve vertex cover problem using 5 K2 e. approximation algorithm

## SECTION

3.	Attempt any <i>one</i> part of the following:					
a.	Demonstrate the concept of Heapify procedure. Also Write Its Algorithm.					
b.	Write Quick -Sort partition algorithm. Drive best and worst case time	1	K2			
	complexity of quick sort.					

4.	Attempt any <i>one</i> part of the following:		
a.	Insert the following string in the initially empty tries: DOG, DONE, CAT, CAN,		
	RIGHT, DO, JUG, DAA, CA, CAME. Also make a compress tries of it.		
b.	Design a Binomial Heap for the following A.	2	K3
	A= {7, 2, 4, 17, 1, 11, 6, 8, 15, 10, 20}		



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5.	Attempt any one part of th	e foll	owir	ıg:					10 x	1 = 10
a.	Write and explain the Krus	kal's	algo	rithr	n to	find	l Mi	nimum Spanning	3	K3
	Tree of a graph with a suitab	ole ex	ampl	e.						
b.	Find the optimal solution o and the knapsack capacity o are given below.	of the of m=	frac 15. 7	tiona The p	ıl Kı profi	naps ts an	ack d	problem with n=7 eights of the items	3	K3
	Objects:	1	2	3	4	5	6	7		
	Profit (P):	5	10	15	7	8	9	4		
	Weight (w):	1	3	5	4	1	3	2		

#### 6. Attempt any one part of the following:

6.	Attempt any one part of the following:	<b>10 x</b>	1 = 10
a.	Find the optimal solution to the $0/1$ Knapsack instances with n=4 and	4	K3
	Knapsack capacity m=8 where profits and weights as follows : $P=\{1, 2,, N\}$		
	$5,6$ and W= $\{2, 3, 4, 5\}$		
b.	Illustrate the N-queens problem? Draw "State Space Tree" for 4 queen's	4	K3
	problem using backtracking.		

	problem using backtracking.			
7.	Attempt any one part of the following: A D	10 x	1 = 10	00
a.	Explain P, NP, NP -Complete and NP-Hard complexity classes. How they are	5	K2 🔿	h.v.
	related to each other.		$\langle \gamma \rangle$	
b.	Write Rabin Karp string matching algorithm. Working modulo q=11,	5	K2	
	how many spurious hits does the Rabin Karp matcher in the text T=		Ð.	
	3141592653589793, when looking for the pattern P=26.	$ \land \cdot $		
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