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BTECH
(SEM V) THEORY EXAMINATION 2024-25
DESIGN AND ANALYSIS OF ALGORITHM

TIME: 3 HRS

M.MARKS: 70

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

SECTION A

1. Attempt all questions in brief.

2 x 07 = 14

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	K2
f.	With a suitable example explain “Branch and Bound”.	4	K2
g.	Describe “Randomized algorithms”. List few randomized algorithms.	5	K2

SECTION B

2. Attempt any three of the following:

07 x 3 = 21

a.	Illustrate the operation of Merge –Sort on array A= (38, 27, 43, 3, 9, 82, 10). Also drive the time complexity of Merge Sort.	1	K3
b.	Define Binomial Heap. Write an algorithm for union of two binomial heaps. Also take a suitable example which clearly illustrates merging operation of two binomial heaps.	2	K2
c.	Apply the greedy single source shortest path algorithm on the graph given below.	3	K3
d.	Write Floyd’s and Warshal’s algorithm to find all pair shortest path in a graph. Discuss its time complexity.	4	K2
e.	Explain Vertex Cover Problem. Solve vertex cover problem using approximation algorithm	5	K2

SECTION C

3. Attempt any one part of the following:

07 x 1 = 07

a.	Write Quick –Sort partition algorithm. Drive best and worst case time complexity of quick sort.	1	K2
b.	Find out Upper, Lower and Average bounds for the function $f(n) = 3n+2$	1	K3

4. Attempt any one part of the following:

07 x 1 = 07

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.	2	K3
b.	Design a Binomial Heap for the following A. $A = \{7, 2, 4, 17, 1, 11, 6, 8, 15, 10, 20\}$	2	K3



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5. Attempt any one part of the following:**07 x 1 = 07**

a.	Write and explain the Kruskal's algorithm to find Minimum Spanning Tree of a graph with a suitable example.	3	K2
b.	Find the optimal solution of the fractional Knapsack problem with $n=7$ and the knapsack capacity of $m=15$. The profits and weights of the items are given below. 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	3	K3

6. Attempt any one part of the following:**07 x 1 = 07**

a.	Illustrate the N-queens problem? Draw "State Space Tree" for 4 queen's problem using backtracking.	4	K3
b.	Find the optimal solution to the 0/1 Knapsack instances with $n=4$ and Knapsack capacity $m=8$ where profits and weights as follows : $P=\{1, 2, 5,6\}$ and $W=\{2, 3, 4, 5\}$	4	K2

7. Attempt any one part of the following:**07 x 1 = 07**

a.	Explain P, NP, NP -Complete and NP-Hard complexity classes. How they are related to each other.	5	K2
b.	Write Knuth-Morris-Pratt string matching algorithm. Take a suitable example Compute the prefix function π for the pattern ababbabbababbabb when the alphabet is $\Sigma = \{a, b\}$.	5	K3