PAPER ID-310680

Roll No: | | | | | | | | | | | | | |

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.

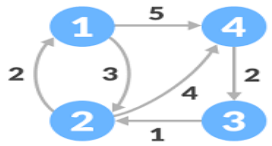
SECTION A

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 ababbabbabbababbabb when the alphabet is ∑ = {a, b}.	5	K3