NS-3304

B.Sc. (Honours) Com. Sci. IV Semester Examination, June–2022

DESIGN AND ANALYSIS OF ALGORITHM

(BHCS-403)

Time : Three Hours]   [*Maximum Marks : 75*

Section–A   5×3=15

Note : Attempt all questions.

1. Differentiate between Big-oh and omega notation with example.

2. Derive the time worst case complexity of merge sort.

3. Compare backtracking with branch and bound algorithm? Give two examples.

4. Distinguish between Dynamic Programming and Greedy method.

5. What does Floyd's algorithm do?

Section–B $2\times7.5=15$

Note : Attempt any **two** questions.

6. (a) What do you mean by an asymptotic notations? Write and explain different types of asymptotic notations with suitable examples.

   (b) What do you mean by an algorithm? Explain the various characteristics of a good algorithm.

7. (a) Consider a Knapsack instance :

   Number of Object $n = 4$

   Weight $Wi = \{15, 10, 9, 5\}$

   Profits $Pi = \{1, 5, 3, 4\}$

   Knapsack Capacity $M = 8$

   Use Dynamic approach to find the solution.

   (b) Explain and analyse the binary search. Also write its best case, worst case and average case complexity.

8. Explain HEAP-SORT on the array. Illustrate the operation of HEAP-SORT on the array $A = \{6, 14, 3, 25, 2, 10, 20, 7, 6\}$.
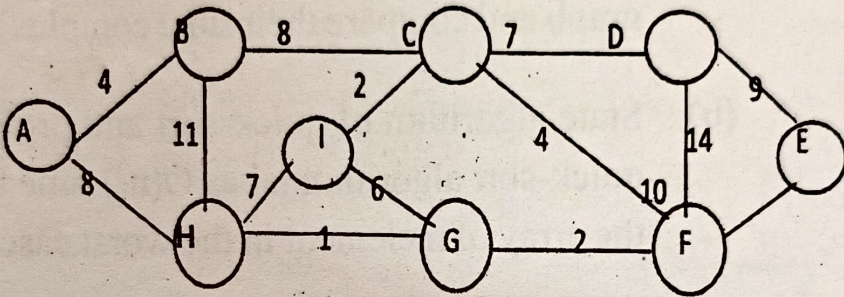
NS-3304

3×15=45

Note : Attempt any **three** questions.

9. (a) Apply Kruskal's algorithm to find minimum spanning tree.

(b) State Master's theorem and also solve the following recurrence :

$$T(n) = 4T(n/2) + n^2 \log n$$

10. Solve the following travelling salesman problem a directed graph of the following matrix :

	1	2	3	4
1	0	10	15	20
2	5	0	9	10
3	6	13	0	12
4	8	8	9	0

NS-3304

11. (a) What is a backtracking? Give the explicit and implicit constraints in n-queen's problem.

(b) Explain knapsack problem with example.

12. (a) Write the prim's algorithm to find the minimum cost spanning tree of a undirected graph and compare their time complexity.

(b) State algorithm of quick-sort and prove that quick-sort algorithm takes $O(n^2)$ time to sort the array of n element in the worst case?

13. (a) Describe branch and bound technique. How the branch and bound technique can be used to solve the travelling salesman problem?

(b) Define P, NP and NP-Complete class of problem. Write three problem which are NP-Complete.