

Time-3 hrs

**Note:-**Part-I is compulsory.

In part-II, attempt 4 questions out of 6.

**Part-I**

Q.No. 1

- Write the recurrence relation for quick sort and compute the complexity for best and worst case.
- Describe the significance of asymptotic notation.
- Explain Collapsing Find operations in sets.
- Define NP-Complete and NP-Hard problems.
- Differentiate Single source shortest path and All-pair shortest path approach.
- Describe the general LC-Search function.
- Explain implicit and explicit constraints for n-Queen problem.
- Differentiate binary search tree and optimal binary search tree with an example.
- Write a non-deterministic algorithm to sort an unsorted array.

(2\*10=20)

**Part-II**

Q.No. 2 (a) Solve the following recurrence relations using master method:-

(i)  $T(n) = T(n-5) + 1/(n+1)$

(4)

(iii)  $T(n) = 2T(n/2) + n \log n$

Q.No. 2 (b) Describe general greedy algorithm. Solve the following knapsack

problem using greedy algorithm technique:  $m=30$ ,  $(w_1, w_2, w_3, w_4) = (10, 15, 6, 9)$ ,

$(p_1, p_2, p_3, p_4) = (2, 5, 8, 1)$

(6)

Q.No.3 Write the algorithm for merge-sort and compute its time complexity. Also sort the following array using merge-sort:-

(10)

$A = \{56, 10, 23, 6, 34, 21, 45\}$

Q.No.4 (a) Schedule the following jobs in an optimized way:  $n=7$ ,

$(p_1, p_2, p_3, \dots, p_7) = (3, 5, 20, 18, 1, 6, 30)$ ,  $(d_1, d_2, d_3, \dots, d_7) = (1, 3, 4, 3, 2, 1, 2)$ . (7)

(b) Explain Principle of Optimality. (3)

Q.No.5 Write the algorithm to draw an OBST. Apply dynamic programming to draw an OBST using the following data:

	0	1	2	3	4
P(1:4)		5	20	10	5
Q(0:4)	20	10	20	5	5

(10)

Q.No.6 Write the general algorithm for iterative and recursive backtracking and also write the algorithm for graph coloring problem. (10)

Q.No.7 Solve the following travelling salesman problem using branch and bound algorithm design technique.

$\infty$	11	10	9	6
8	$\infty$	7	3	4
8	4	$\infty$	4	8
11	10	5	$\infty$	5
6	9	5	5	$\infty$

(10)