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Fourth Semester B.E. Degree Examination, Aug./Sept. 2020
Design & Analysis of Algorithms

Time: 3 hrs.

Max. Marks:100

Note: Answer FIVE full questions, selecting at least TWO questions from each part.

PART - A

- 1 a. Define algorithm. Write Euclid's algorithm and using Euclid's algorithm solve $\text{gcd}(60, 24)$. (06 Marks)
 b. Define three asymptotic notations. (06 Marks)
 c. For a given data set 89, 45, 60, 95, 20, 34, 12. Explain Bubble sort with algorithm and time complexity. (08 Marks)

- 2 a. Explain divide and conquer technique. Write the algorithm for binary search (non-recursive method) and final average case efficiency. (10 Marks)
 b. Write recursive algorithm for merge sort. (06 Marks)
 c. Explain defective chess board. (04 Marks)

- 3 a. Explain the concept of greedy technique for Kruskal's algorithm. Obtain minimum cost spanning tree for the graph below using Kruskal's algorithm. (10 Marks)

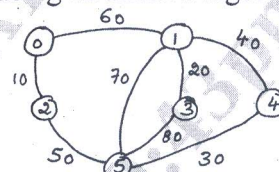


Fig. Q3 (a)

- b. Give Dijkstra's algorithm. Solve the following Dijkstra's problem assuming vertex 5 as the source. (10 Marks)

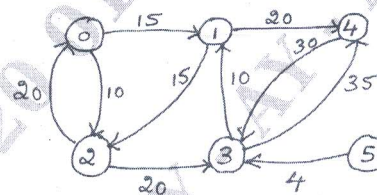


Fig. Q3 (b)

- 4 a. Give recurrence relation for knapsack problem. Solve the following knapsack instance using dynamic programming $N = 4, M = 5$.
 $(W_1, W_2, W_3, W_4) = (2, 1, 3, 2)$
 $(P_1, P_2, P_3, P_4) = (12, 10, 20, 15)$ (10 Marks)

- b. Write Warshall's algorithm. Generate transitive closure of the graph given below: (10 Marks)

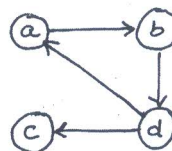


Fig. Q4 (b)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
 2. Any revealing of identification, appeal to evaluator and /or equations written eg, $42+8 = 50$, will be treated as malpractice.

PART – B

- 5 a. Write Insertion sort algorithm. For the given data set 89, 45, 68, 90, 29, 34, 17. Explain insertion sort with time complexity. (08 Marks)
- b. Explain the working of depth. First search algorithm for the graph shown in Fig. Q5 (b). (06 Marks)

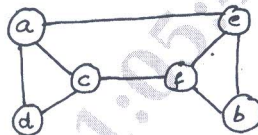


Fig. Q5 (b)

- c. Obtain topologies sorting for the given diagraph using source removal method. (06 Marks)

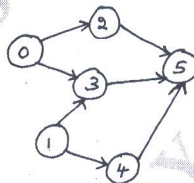


Fig. Q5 (c)

- 6 a. Define the following: (10 Marks)
- Class P.
 - Class NP.
 - NP complete problem.
 - NP hard problem.
- b. What is a decision tree? Give a decision tree for three element selection sort for arranging three items in ascending order. (10 Marks)
- 7 a. Draw the state-space tree to generate solution to 4-Queen's problem. (06 Marks)
- b. Apply backtracking method to solve subset sum problem for the instance $n = 4$, $\alpha = 15$, $S = \{3, 5, 6, 7\}$. (06 Marks)
- c. With the help of a state space tree, solve the following TSP graph by branch-and-bound algorithm. (08 Marks)

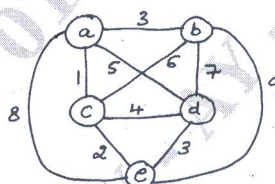


Fig. Q7 (c)

- 8 a. For the given input 5, 12, 8, 6, 3, 9, 11, 12, 1, 5, 6, 7, 10, 4, 3, 5 to the prefix computation problem and \oplus stands for addition. Perform prefix computation. (10 Marks)
- b. Give list ranking algorithm. Apply pointer jumping to given data input 5, 4, 2, 0, 3, 1 stored in array $A[1, 0.6]$ respectively. (10 Marks)
