

USN

--	--	--	--	--	--	--	--	--	--

10CS43

Fourth Semester B.E. Degree Examination, Dec.2019/Jan.2020

## Design and Analysis of Algorithms

Time: 3 hrs.

Max. Marks:100

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

### PART - A

- 1
  - a. What is an algorithm? Illustrate the important points to be noted with respect to an algorithm, with an example. (04 Marks)
  - b. Discuss the general plan for analyzing efficiency of non-recursive algorithms. (04 Marks)
  - c. Prove that if  $t_1(n) \in O(g_1(n))$  and  $t_2(n) \in O(g_2(n))$  then  $t_1(n) + t_2(n) \in O(\max\{g_1(n), g_2(n)\})$ . (06 Marks)
  - d. Write the bubble sort algorithm and show that the worst case efficiency is quadratic. (06 Marks)
- 2
  - a. What is divide and conquer technique? Write the control abstraction for the divide and conquer. (06 Marks)
  - b. Write the recursive binary search algorithm and find its average case. (08 Marks)
  - c. Sort the E, X, A, M, P, L, E in on alphabetical order using quick sort method. (06 Marks)
- 3
  - a. Explain Greedy method. (04 Marks)
  - b. Use the Kruskal's algorithm to find minimum cost spanning tree for the below graph: (08 Marks)

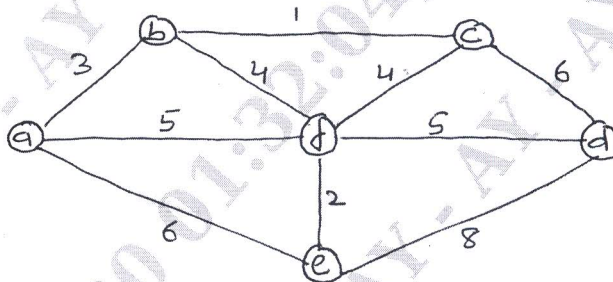


Fig.Q.3(b)

- c. What is job sequencing with deadline problem? Obtain the optimal solution for the job sequencing problem with deadlines where  $n = 4$  (number of jobs) profits  $(P_1, P_2, P_3, P_4) = (100, 10, 15, 27)$  and deadlines  $(d_1, d_2, d_3, d_4) = (2, 1, 2, 1)$ . (08 Marks)
- 4
  - a. Write the formula to find the shortest path using Floyd's algorithm. Use Floyd's method to solve all pair shortest paths problem for the diagraph with the weight matrix. (10 Marks)
 
$$\begin{bmatrix} 0 & 2 & \infty & 1 & 8 \\ 6 & 0 & 3 & 2 & \infty \\ \infty & \infty & 0 & 4 & 8 \\ \infty & \infty & 2 & 0 & 3 \\ 3 & \infty & \infty & \infty & 0 \end{bmatrix}$$
  - b. Explain the travelling salesman problem using dynamic programming with an example. (10 Marks)

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. What are the three major variations of decrease and conquer technique? Explain each with an example. (06 Marks)
- b. Write Breadth-first search algorithm. (06 Marks)
- c. Write insertion sort algorithm. Sort the list 89, 45, 68, 90, 29, 34, 17 using insertion sort. (08 Marks)
- 6 a. Briefly explain the concepts of P, NP and NP complete problem. (10 Marks)
- b. What are decision trees? Explain the concept of decision trees for sorting algorithm with an example. (10 Marks)
- 7 a. Explain how backtracking is used for solving 4-queens problem. Show the state space tree. (08 Marks)
- b. What is branch and bound algorithm? How is it different from backtracking. (06 Marks)
- c. Draw the state space tree for the sum of subset problem of the instance.  $S = \{5, 7, 8, 10\}$  and  $d = 15$ . (06 Marks)
- 8 a. Define the terms: speedup, asymptotic speed up, linear speed up, total work done by an algorithm and efficiency of an algorithm. (10 Marks)
- b. Apply the branch-and-bound algorithm to solve the travelling salesman problem for the following graph: (10 Marks)

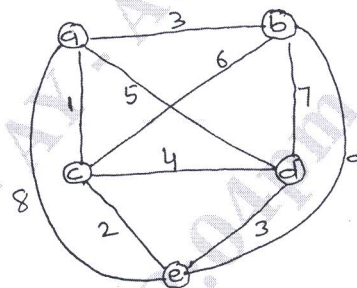


Fig.Q.8(b)

\*\*\*\*\*