10CS43

Fourth Semester B.E. Degree Examination, June/July 2017
Design and 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. Algorithm X (int N)
```
{
   int P = N ;
   for i ← 1 to N
   {
   print ("\n % d\t =\t % d = % d", N, i, P) ;
   P = P + N ;
   }
}
```
   i)   What does this algorithm compute?
   ii) What is the basic operation?
   iii) How many times the basic operation is executed?
   iv) What is the efficiency class of this algorithm?   (04 Marks)

   b. Define the following and give one example for each :
   i) O – notation   ii) Ω – notation   iii) θ – notation.   (06 Marks)

   c. Explain Brute Force method. Write a algorithm for selection sort method and apply it to the following list :
   66, 11, 35, 55, 44, 22. Compute time efficiency for average case.   (10 Marks)

2 a. Explain Divide and conquer technique.   (04 Marks)

   b. What is stable algorithm? Is quick sort stable? Explain with example. (06 Marks)

   c. Explain with example a sorting algorithm that uses divide and conquer technique which divides the problem size by considering position. Give the corresponding algorithm and analyze the worst case time complexity.   (10 Marks)

3 a. Explain Greedy Method. What is knapsack problem? Write the algorithm to obtain optimal solution for the knapsack problem using Greedy method, Apply the algorithm for n = 3, capacity m = 20, values: 25, 24, 15 and weights: 18, 15, 10 respectively.   (10 Marks)

   b. What is job sequencing with deadlines problem? Find the solution generated by job sequencing with deadlines problem for 7 jobs given profits: 3, 5, 20, 18, 1, 6, 30 and deadlines: 1, 3, 4, 3, 2, 1, 2 respectively.   (06 Marks)

   c. Write an algorithm to find the minimum cost spanning tree using Kruskal's method. Find minimum cost spanning tree suing Kruskal's method for the graph shown in Fig. Q3(c).
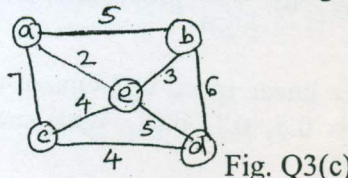

Fig. Q3(c)   (04 Marks)

4 a. Explain Dynamic programming. Generate transitive closure of the graph given in Fig. Q4 (a). **(04 Marks)**

b. Write Floyd's algorithm. Using Floyd's algorithm, find all pair shortest path for the graph given in Fig. Q4(b). **(10 Marks)**

c. Solve TSP for the graph shown in Fig. Q4(c). Using dynamic programming. **(06 Marks)**
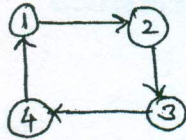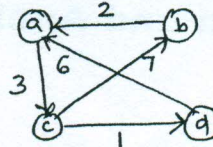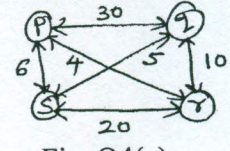

Fig. Q4(a)　　　　　Fig. Q4(b)　　　　　Fig. Q4(c)

PART – B

5 a. What are the three variations of decrease and conquer technique? **(03 Marks)**

b. Apply DFS based algorithm to solve the topological sorting problem for the graph given in Fig. Q5 (b). **(06 Marks)**
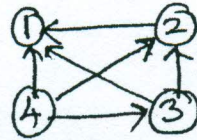

Fig. Q5(b)

c. Write BFS algorithm to check the connectivity of a given graph. **(05 Marks)**

d. Construct shift table for the Pattern : EARN and search for the same in text : FALL-MEANS-FIRST-ATTEMPT-IN-LEARNING using Horspool's algorithm. **(06 Marks)**

6 a. Define the following : i) Tractable problem　　ii) Class P　　iii) Class NP　　iv) Polynomial reduction　　v) NP complete problems. **(05 Marks)**

b. What are decision trees? Explain with example, how decision trees are used in selection sort algorithm. **(10 Marks)**

c. What is numeric analysis? Brief overflow and underflow in numeric analysis algorithm. **(05 Marks)**

7 a. What is backtracking method? Apply backtracking method to solve subset sum problem for the instance $n = 6$, $d = 30$ and $s = \{5, 10, 12, 13, 15, 18\}$. **(06 Marks)**

b. What is branch and bound method? For the given $n \times n$ cost matrix C for a job assignment problem, find the optimal solution using branch and bound method. Give complete state space tree for the assignment problem.

	Job 1	Job 2	Job 3	Job 4	
	9	2	7	8	Person a
C =	6	4	3	7	Person b
	5	8	1	8	Person c
	7	6	9	4	Person d

(10 Marks)

c. Explain approximation algorithm for NP hard problems in general. Discuss approximation algorithm for knapsack problem. **(04 Marks)**

8 a. Explain how matrix M is computed using parallel algorithm for a given graph. **(03 Marks)**

b. What is prefix computation problem? Give the algorithm for prefix computation which uses:

i) n processors　　ii) $\dfrac{n}{\log n}$ processors. Obtain the time complexities of these algorithms.

(10 Marks)

c. What is super linear speed up? Obtain the maximum speed up when P = 10, and various values of f = 0.5, 0.1, 0.01. What are the different ways of resolving read and write conflicts? **(07 Marks)**

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