CBCS SCHEME

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15CS43

Fourth Semester B.E. Degree Examination, June/July 2019
Design and Analysis of Algorithm

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

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.

Module-1

1 a. What is an algorithm? Summarize the properties of an algorithm. **(04 Marks)**

b. Solve the following recurrence relation:

$x(n) = x(n/2) + n$ for $n > 1, x(1) = 1$

Assume $n = 2^k$ **(06 Marks)**

c. Algorithm Test(n)

```
// Input : A non negative integer 'n'
    s ← 0
    for i ← 1 to n do
        for j ← 1 to n do
            s ← s + i * j
    return s
```

(i) What does this algorithm compute?
(ii) What is the basic operation?
(iii) How many times the basic operation executed?
(iv) What is the efficiency class of this algorithm? **(06 Marks)**

OR

2 a. With neat diagram summarize the steps used to solve a given problem using computer. **(06 Marks)**

b. Consider the following algorithm:

```
Algorithm s(n)
{
  If (n = 1) return 1,
  Else return (s(n – 1) + n.n.n)
}
```

What does this algorithm? What is the basic operation? How many times the basic operation executed? **(04 Marks)**

c. Design a recursive algorithm for computing factorial of a number n. Set up a recurrence relation and find its efficiency. **(06 Marks)**

Module-2

3 a. Discuss how to find maximum and minimum element in an array recursively. Trace the same for the following data set 65, 70, 75, 80, 85, 60, 55, 50, 45. Also derive the worst case complexity. **(06 Marks)**

b. What is stable algorithm? Is quick sort stable explain with an example. **(04 Marks)**

c. Define decrease and conquer technique and mention all the variations with an example. **(06 Marks)**

OR

4 a. Design recursive algorithm for mergesort and derive its complexity. **(06 Marks)**

b. How would you demonstrate the steps used in Strassen's matrix multiplication. **(04 Marks)**

c. What actions would to take to perform topological sort using source removal method explain with an example. **(06 Marks)**

Module-3

5 a. Recall the concept of Greedy technique. **(03 Marks)**

b. In the weighted diagraph given below Fig.Q5(b), determine the shortest paths from vertex '0' to all other vertices. **(07 Marks)**

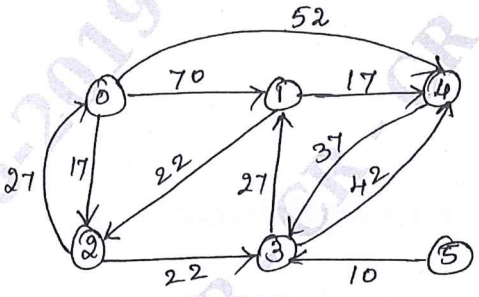

Fig.Q5(b)

c. How would you solve the following instance of knapsack problem, using greedy algorithm.

Item	1	2	3	4
Weight	4	7	5	3
Profit	40	42	25	12

Knapsack capacity M = 10. **(06 Marks)**

OR

6 a. State job sequencing with deadline. Explain algorithm for job sequencing with dead line. **(08 Marks)**

b. Obtain minimum cost spanning tree for the graph given below in Fig.Q6(b), using Prim's algorithm. **(08 Marks)**

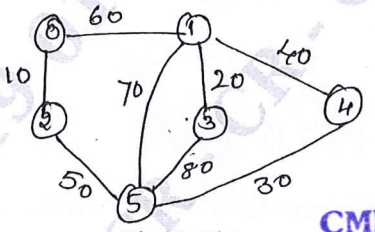

Fig.Q6(b)

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Module-4

7 a. Using Floyd's Algorithm solve the all pair shortest path problem for the graph whose weight matrix is given below. **(06 Marks)**

$$\begin{bmatrix} 0 & 10 & \infty & 40 \\ \infty & 0 & \infty & 20 \\ 50 & \infty & 0 & \infty \\ \infty & \infty & 60 & 0 \end{bmatrix}$$

b. Explain Bellman Ford algorithm. **(04 Marks)**

c. State travelling sales person problem. Solve the following using dynamic programming.

$$\begin{bmatrix} 0 & 10 & 15 & 20 \\ 5 & 0 & 9 & 10 \\ 6 & 13 & 0 & 12 \\ 8 & 8 & 9 & 0 \end{bmatrix}$$ Starting city = 1 **(06 Marks)**

OR

8 a. How would you define Dynamic programming? With an example illustrate multistage graph for forward approach. **(06 Marks)**

b. Using dynamic programming solve the following knapsack n = 4, M = 5, $(w_1\ w_2\ w_3\ w_4) = (2, 1, 3, 2)$, Profit $(P_1\ P_2\ P_3\ P_4) = (8, 6, 16, 11)$. **(06 Marks)**

c. Write Warshall's algorithm. **(04 Marks)**

Module-5

9 a. Explain back tracking method? Draw state space tree to generate solutions to 4-Queen's problem. **(06 Marks)**

b. What is branch and bound algorithm? How it is different from backtracking? **(04 Marks)**

c. Define the following :
(i) Class P
(ii) Class NP
(iii) NP complete problem. **(06 Marks)**

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OR

10 a. Apply backtracking technique to solve the instance of the sum of subset problem : S = {3, 5, 6, 7} and d = 15. **(08 Marks)**

b. Apply branch and bound algorithm to solve the traveling salesman problem for the following graph in Fig.Q10(b). **(08 Marks)**

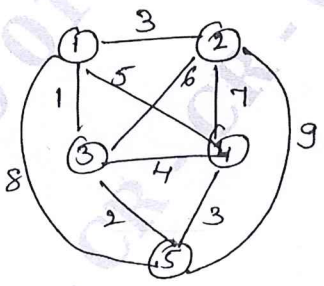

Fig.Q10(b)

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