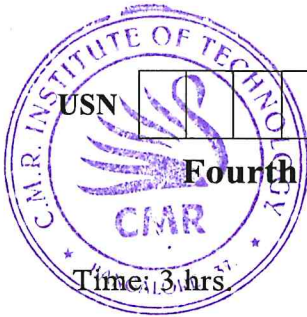


CBCS SCHEME



15CS43

Fourth Semester B.E. Degree Examination, July/August 2022 Design and Analysis of Algorithms

Max. Marks: 80

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

Module-1

- a. Define Algorithm. Explain Bigon, Omega and Theta notations used in Analyzing algorithms. (08 Marks)
b. Write an algorithm to compute $n!$ recursively, set up a recurrence relation for the algorithm's basic operation count and solve it. (08 Marks)

OR

- a. If $t_1(n) \in O(g_1(n))$ and $t_2(n) \in O(g_2(n))$, prove that $t_1(n) + t_2(n) \in O(\max\{g_1(n), g_2(n)\})$. (08 Marks)
b. Explain the general plan of mathematical analysis of non-recursive algorithm with an example. (08 Marks)

Module-2

- a. Explain Divide and conquer technique with its control abstraction. List out the advantages of divide and Conquer method. (08 Marks)
b. Sort the following elements using merge sort. Write the recursion tree. (08 Marks)

70	20	30	40	10	50	60
----	----	----	----	----	----	----

OR

- a. Write an algorithm for quick sort. Derive the worst case time efficiency of the algorithm. (08 Marks)
b. Obtain the topological sorting for the given digraph using Source Removal method. (08 Marks)

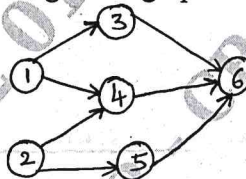


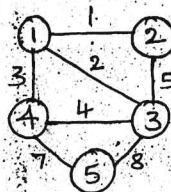
Fig. Q4(b)

(08 Marks)

Module-3

- a. What is Job Sequencing with deadline problem? Find solution generated by Jon sequencing problem with deadlines for 7 jobs given: Profits 3, 5, 20, 18, 1, 6, 30 and deadline 1, 3, 4, 3, 2, 1, 2 respectively. (08 Marks)
b. Define Minimum Cost Spanning tree. Give high level description of Prism's algorithm to find minimum cost spanning tree and find the Spanning tree for the graph shown in Fig. Q5(b). (08 Marks)

Fig. Q5(b)

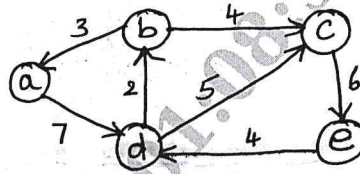


Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and/or equations written eg, 42+8 = 50, will be treated as malpractice.

OR

- 6 a. Apply Dijkstra's algorithm on Fig. Q6(a) with vertex as the source. (08 Marks)

Fig. Q6(a)

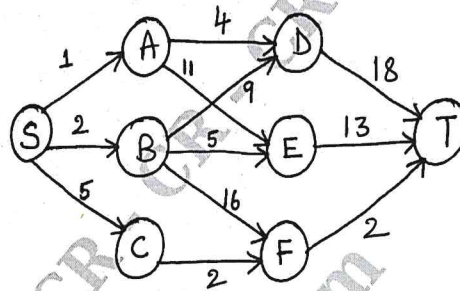


- b. Sort the following list of numbers using heap sort. 3, 10, 8, 7, 6, 9. (08 Marks)

Module-4

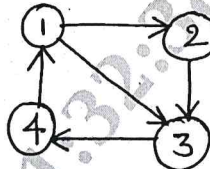
- 7 a. Explain the concept of Dynamic programming. Solve the below instance of multistage graph problem to find a minimum – cost path from S to T (Forward approach). (08 Marks)

Fig. Q7(a)



- b. With the help of Pseudo code, explain Warshall's algorithm, to find the transitive closure of a digraph. Apply it to the graph shown below : (08 Marks)

Fig. Q7(b)



OR

- 8 a. Using Floyd's algorithm, solve the all – pair – shortest – path problem for the graph whose weight matrix is as below : (08 Marks)

$$\begin{bmatrix} 0 & 2 & \infty & 1 & 8 \\ 6 & 0 & 3 & 2 & \infty \\ \infty & \infty & 0 & 4 & \infty \\ \infty & \infty & 2 & 0 & 3 \\ 3 & \infty & \infty & \infty & 0 \end{bmatrix}$$

CMRIT LIBRARY
BANGALORE - 560 037

- b. Solve the below instance of Knapsack problem using dynamic programming. Knapsack capacity is 5. (08 Marks)

Item	Height	Value
1	2	\$ 12
2	1	\$ 10
3	3	\$ 20
4	2	\$ 15

Module-5

- 9 a. Explain Backtracking method. Illustrate N queens problem using Backtracking to solve 4 – Queens problem. (08 Marks)
- b. Solve the below instance of the subset sum problem. Construct a state space tree. $S = \{5, 10, 12, 13, 15, 18\}$ and $d = 30$. (08 Marks)

OR

- 10 a. Explain the concept of branch and bound. Obtain an optimal solution to the given assignment problem. (08 Marks)

	Job ₁	Job ₂	Job ₃	Job ₄
a	10	3	8	9
b	7	5	4	8
c	6	9	2	9
d	8	7	10	5

- b. Define the following : i) Class P ii) Class NP iii) NP complete problem
iv) NP hard problem.

CMRIT LIBRARY

560 037

(08 Marks)
