

NATIONAL INSTITUTE OF TECHNOLOGY, KURUKSHETRA
THEORY EXAMINATION

Month and year: **Nov. 2021**

Program: **B.Tech.-CO**

Subject: **DAA**

Maximum Marks: **50**

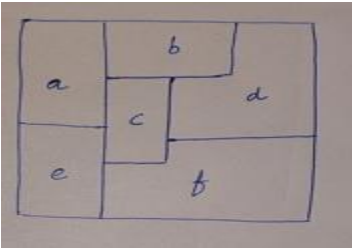
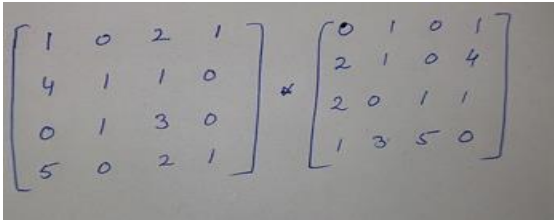
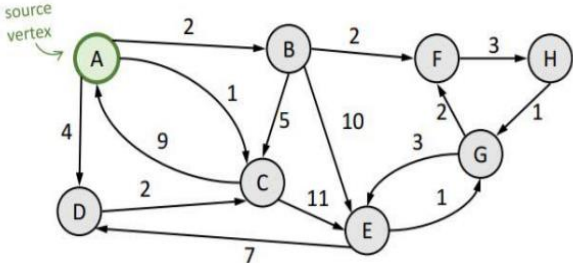
Note: All questions are compulsory.

Total no. of pages used: **2**

Semester: **3rd**

Course code: **CSPC-21**

Time allowed: **02 Hours**

Q-1.	(a). Solve the following recurrence relation using Master theorem $T(n) = 8T(n/4) + \sqrt{n}$ (b). Consider inserting the keys 5, 28, 19, 15, 20, 33, 12, 17, and 10 into hash table of length $m=9$ using closed addressing with hash function $h(k) = k \bmod m$. Also, return the triplet in the form of $\langle \text{Max, Min and Average chain length} \rangle$. (c) Consider the following map and answer the questions given below:  i. Explain how we can use the graph-coloring problem to color the map so that no two neighboring regions are colored same. ii. Use your answer from part (i) to color the map with the smallest number of colors.	3 3 4
Q-2.	(a). Solve following recurrence relation using recursion tree method. $T(n) = \begin{cases} 1 & \text{if } n = 1 \\ T(n/3) + T(2n/3) + \theta(n) & \text{if } n > 1 \end{cases}$ (b). Apply the Strassen's algorithm to compute  exiting the recursion when $n=2$, i.e. computing the products of 2-by-2 matrices by the brute-force algorithm.	6 6
Q:3	(a). Differentiate between Dijkstra's and the Bellman-Ford algorithm. Also, apply Bellman Ford algorithm on the following graph: 	10

Q-4.	(a). Explain the usefulness of B-Trees and insert the following keys in a B Tree when $m=4$: 40, 35, 22, 90, 12, 45, 58, 78, 67, 60 and then delete key 35 and 22 one after other. Note: Draw the figures depicting your B- tree immediately after insertion and deletion.	6																														
	(b). Describe the Matrix multiplication chain (MCM) problem. The following Matrix is given: A1 (3x5), A2 (6x4), A3 (4x3), A4 (5x2). Find Minimum Multiplication Cost using Matrix Chain Multiplication with the aid of Dynamic Programming in detail.	6																														
Q-5.	What do you understand by job sequencing problem? Compute the optimal sequence of job for following deadlines and return the sequence of tasks.	6																														
	<table border="1" data-bbox="448 618 1150 969"> <thead> <tr> <th>Task</th><th>Deadlines</th><th>Profit</th></tr> </thead> <tbody> <tr><td>T₁</td><td>8</td><td>24</td></tr> <tr><td>T₂</td><td>2</td><td>21</td></tr> <tr><td>T₃</td><td>3</td><td>12</td></tr> <tr><td>T₄</td><td>5</td><td>8</td></tr> <tr><td>T₅</td><td>7</td><td>5</td></tr> <tr><td>T₆</td><td>1</td><td>18</td></tr> <tr><td>T₇</td><td>4</td><td>29</td></tr> <tr><td>T₈</td><td>6</td><td>15</td></tr> <tr><td>T₉</td><td>2</td><td>35</td></tr> </tbody> </table>	Task	Deadlines	Profit	T ₁	8	24	T ₂	2	21	T ₃	3	12	T ₄	5	8	T ₅	7	5	T ₆	1	18	T ₇	4	29	T ₈	6	15	T ₉	2	35	
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