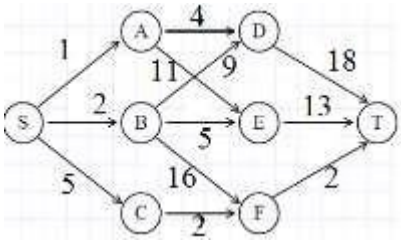
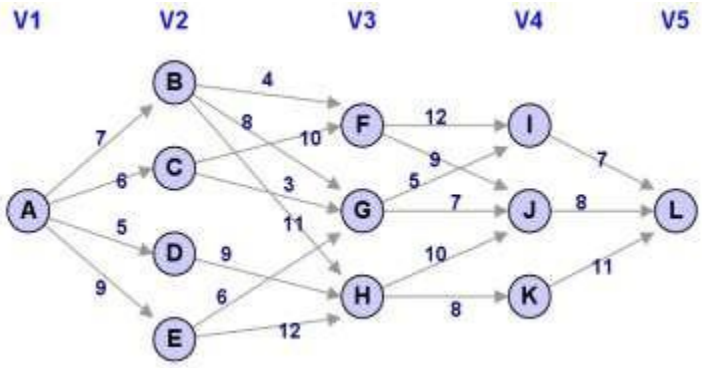
Module-4: Dynamic Programming

Question Bank

Introduction			
1	Briefly explain the concept of dynamic programming with example.	8	Jul 17
Multistage Graph			
2	Explain multistage graph with example.	4	Jul 17, Jul18
3	Write multistage graph algorithm using **forward** approach.	6	Jul 17
4	Write multistage graph algorithm using **backward** approach.	6	Jul 18 Jan 20
5	Find the shortest path from S to T in the following multistage graph using dynamic programming. Use forward approach to solve the problem. 	8	
6	Find the shortest path from A to L, in the following multistage graph, using dynamic programming. Use forward approach to solve the problem. 	8	
Transitive Closure – Warshall's Algorithm			
7	Define transitive closure. Write Warshall's algorithm to compute transitive closure. Find its efficiency.	8	Jan 18
8	Generate transitive clossure of the graph given below.	7	Jan 13

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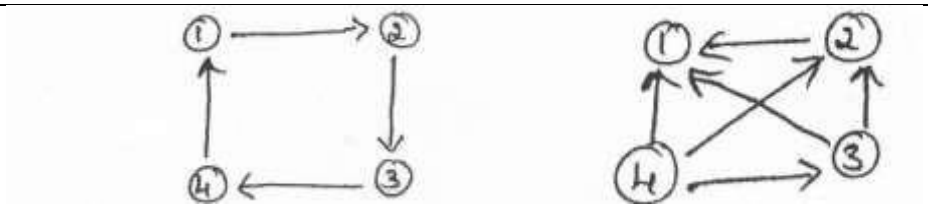
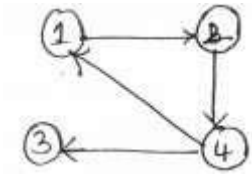
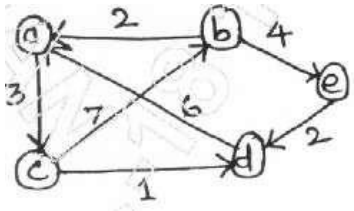
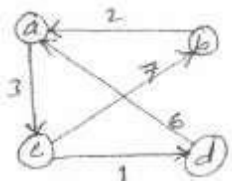
			
9	Trace the following graph using Warshalls algorithm to find transitive clossure. 	8	Jan 17 Jul 18 Jan 20
10	Define transititransitive ve clossure of a directed graph. Find the transitive clossure matrix for the graph whose adjancency matrix is given. $\begin{bmatrix} 1 & 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 1 \\ 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 1 \end{bmatrix}$	10	Jul 19
All pair shortest path - Floyds Algorithm			
11	What is dynamic programming. Explain how would you solve all pair shortest path problem using dynamic programming.	6	Jan 20
12	Apply floyds algirthm to find the all pair shortest path for the graph given below. 	8	Jan 14
13	Apply floyds algirthm to find the all pair shortest path for the graph given below.  $\begin{bmatrix} 0 & \infty & 3 & \infty \\ 2 & 0 & \infty & \infty \\ \infty & 7 & 0 & 1 \\ 6 & \infty & \infty & 0 \end{bmatrix}$	8	Jul 18

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Question Bank

<table>
<tr><td colspan="4">Optimal Binary Search Trees</td></tr>
<tr><td>14</td><td>Define optimal Binary Serach Tree. Write a pseudocode to find an optimal binary search tree using dynamic programming.</td><td>8</td><td>Jan 18</td></tr>
<tr><td>15</td><td>Find the optimal binary search tree for the keys given below.
<table><tr><td>key</td><td>A</td><td>B</td><td>C</td><td>D</td></tr><tr><td>probability</td><td>0.1</td><td>0.2</td><td>0.4</td><td>0.3</td></tr></table></td><td>8</td><td>Jan 20
Jul 19</td></tr>
<tr><td>16</td><td>Find the optimal binary search tree for the keys A, B, C, D, E with search probabilities 0.1, 0.1, 0.2, 0.2, 0.4 respectively.</td><td>8</td><td></td></tr>
<tr><td colspan="4">Knapsack Problem</td></tr>
<tr><td>17</td><td>Solve the following instance of 0/1 knapsack problem using dynamic programming. Knapsack capacity is W=5 and n=4
<table><tr><th>Item</th><th>Weight</th><th>Value</th></tr><tr><td>1</td><td>2</td><td>12</td></tr><tr><td>2</td><td>1</td><td>10</td></tr><tr><td>3</td><td>3</td><td>20</td></tr><tr><td>4</td><td>2</td><td>15</td></tr></table>Capacity W = 5</td><td>6</td><td>Jul 17
Jul 16</td></tr>
<tr><td>18</td><td>Solve the Knapsack instance n=3, {w1, w2, w3} = {1, 2, 2} and {p1, p2, p3} = {18, 16, 6} and M=4 by dynamic programming.</td><td>4</td><td>Jan 15</td></tr>
<tr><td>19</td><td>Apply bottom up dynamic programming algorithm for the following instance of the knapsack problem. Knapsack capacity = 10.
<table><tr><th>Item</th><th>Weight</th><th>Value</th></tr><tr><td>1</td><td>7</td><td>42</td></tr><tr><td>2</td><td>3</td><td>12</td></tr><tr><td>3</td><td>4</td><td>40</td></tr><tr><td>4</td><td>5</td><td>25</td></tr></table></td><td>10</td><td>Jul 19</td></tr>
<tr><td colspan="4">Bellman-Ford Algorithm</td></tr>
<tr><td>20</td><td>Explain Bellman-ford algorithm to find shortest path from single source to all destinations for a directed graph with negative edge cost.</td><td>8</td><td>Jul 18</td></tr>
<tr><td>21</td><td>Apply Bellman-ford algorithm to the graph given below, to find shortest path to all the vertices from vertex 1.</td><td>8</td><td></td></tr>
</table>

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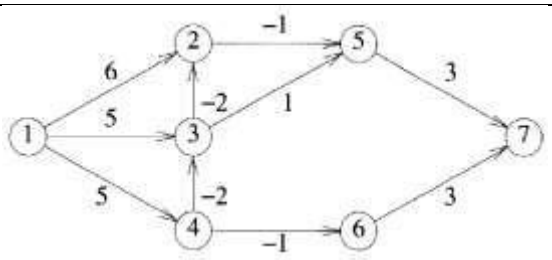
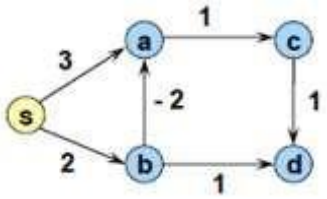
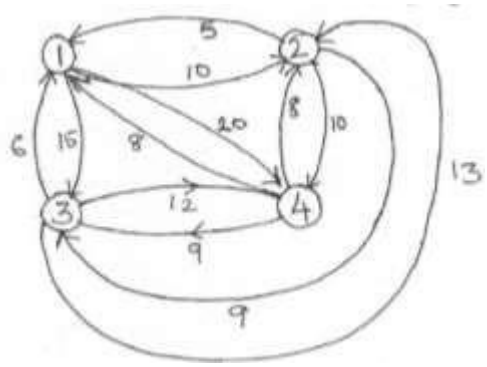
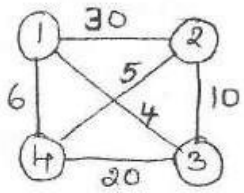
Question Bank

			
22	Apply Bellman-ford algorithm to the graph given below, to find shortest path to all the vertices from vertex s. 	8	
Travelling Salesman Problem			
23	For the given graph obtain optimal cost tour using dynamic programming. 	6	Jan 15 Jul 19
24	Solve the following TSP which is represented as a graph using dynamic programming. Start city is 1. 	6	Jul 14
25	Solve the following TSP which using dynamic programming.	8	Jan 18

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	$\begin{bmatrix} 0 & 10 & 15 & 20 \\ 5 & 0 & 9 & 10 \\ 6 & 13 & 0 & 12 \\ 8 & 8 & 9 & 0 \end{bmatrix}$ starting city 1		
26	Solve the following TSP problem using dynamic programming. The start city is 1. $= \begin{pmatrix} 0 & 2 & 9 & 10 \\ 1 & 0 & 6 & 4 \\ 15 & 7 & 0 & 8 \\ 6 & 3 & 12 & 0 \end{pmatrix}$		
Reliability Design			
27	Design a 3-stage system with device types A, B, C whose costs are 30, 15, 20 and reliability are 0.9, 0.8, 0.5 respectively. Budget available is **105**. Design a system with highest reliability.	8	
28	Design a 3-stage system with device types A, B whose costs are 30, 20 and reliability are 0.7, 0.5 respectively. Budget available is **110**. Design a system with highest reliability.	6	