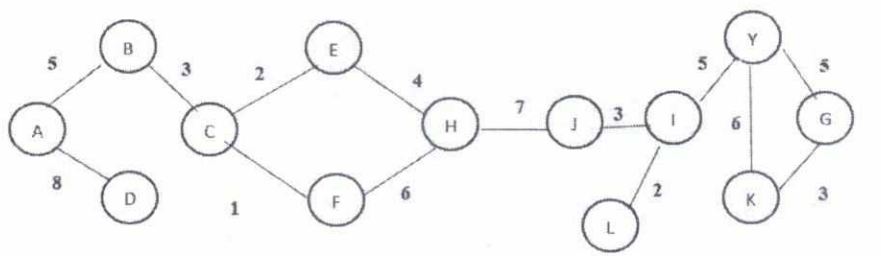
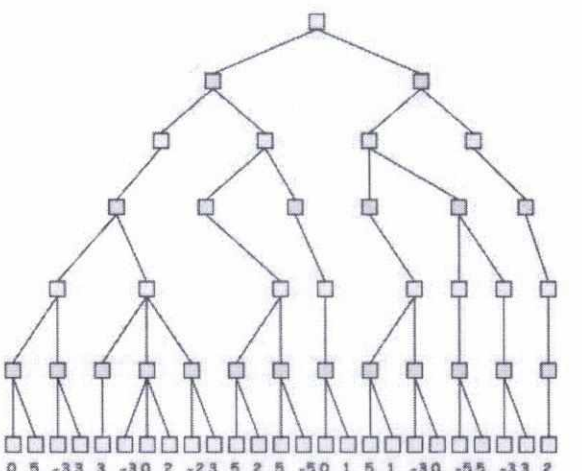
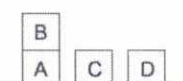
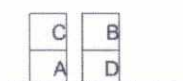


*Thapar Institute of Engineering and Technology, Patiala*  
Department of Computer Science

## UCS411: Artificial Intelligence

Faculty: Dr. Anu Bajaj

*Note: All questions are compulsory*

<p>Q1</p>	<p>a) For the following graph perform bi-directional traversal with starting nodes as A and G. Show each step of the traversal.</p>  <p>b) Solve the following with alpha beta pruning</p> 	<p>10</p>
<p>Q2</p>	<p>a) Give state space representation of missionaries and cannibals problem with initial state, intermediate states, goal states and rules/operators.</p> <p>b) For the following examples, determine their type of their task environments in terms of: Agents, Deterministic, Episodic, and Static in TABULAR form. Examples: 1) Image Analysis 2) Interactive English Tutor 3) Crossword-Puzzle 4) Medical Diagnosis 5) Chess with a clock (answer in tabular form)</p>	<p>10</p>
<p>Q3</p>	<p>Generate a sequence of actions to achieve the goal from the start using Goal stack planning.</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>start</p> </div> <div style="text-align: center;">  <p>goal</p> </div> </div>	<p>20</p>

Q4	<p>a) Consider the following dataset and use the K-Nearest Neighbor (KNN) to compute the weight of the test instance given in the dataset (set <math>k=3</math>, distance=Euclidean). (10Marks)</p> <table border="1"> <tr> <th>Sr. No.</th><th>Height</th><th>Age</th><th>Weight</th></tr> <tr><td>1</td><td>5</td><td>45</td><td>77</td></tr> <tr><td>2</td><td>5.11</td><td>26</td><td>47</td></tr> <tr><td>3</td><td>5.6</td><td>30</td><td>55</td></tr> <tr><td>4</td><td>5.9</td><td>34</td><td>59</td></tr> <tr><td>5</td><td>4.8</td><td>40</td><td>72</td></tr> <tr><td>6</td><td>5.8</td><td>36</td><td>60</td></tr> <tr><td>7</td><td>5.3</td><td>19</td><td>40</td></tr> <tr><td>8</td><td>5.8</td><td>28</td><td>60</td></tr> <tr><td>9</td><td>5.5</td><td>23</td><td>45</td></tr> <tr><td>10</td><td>5.6</td><td>32</td><td>58</td></tr> <tr> <td>Test Instance</td><td>5.5</td><td>38</td><td>Weight?</td></tr> </table> <p>b) Consider the following of car theft. The attributes are color, type, origin, and the class attribute stolen which can be either yes or no. Using Naïve Bayes algorithm classify the car "Red Domestic SUV".</p> <table border="1"> <tr> <th>Example</th><th>Color</th><th>Type</th><th>Origin</th><th>Stolen</th></tr> <tr><td>1</td><td>Red</td><td>Sports</td><td>Domestic</td><td>Yes</td></tr> <tr><td>2</td><td>Red</td><td>Sports</td><td>Domestic</td><td>No</td></tr> <tr><td>3</td><td>Red</td><td>Sports</td><td>Domestic</td><td>Yes</td></tr> <tr><td>4</td><td>Yellow</td><td>Sports</td><td>Domestic</td><td>No</td></tr> <tr><td>5</td><td>Yellow</td><td>Sports</td><td>Imported</td><td>Yes</td></tr> <tr><td>6</td><td>Yellow</td><td>SUV</td><td>Imported</td><td>No</td></tr> <tr><td>7</td><td>Yellow</td><td>SUV</td><td>Imported</td><td>Yes</td></tr> <tr><td>8</td><td>Yellow</td><td>SUV</td><td>Domestic</td><td>No</td></tr> <tr><td>9</td><td>Red</td><td>SUV</td><td>Imported</td><td>No</td></tr> <tr><td>10</td><td>Red</td><td>Sports</td><td>Imported</td><td>Yes</td></tr> </table>	Sr. No.	Height	Age	Weight	1	5	45	77	2	5.11	26	47	3	5.6	30	55	4	5.9	34	59	5	4.8	40	72	6	5.8	36	60	7	5.3	19	40	8	5.8	28	60	9	5.5	23	45	10	5.6	32	58	Test Instance	5.5	38	Weight?	Example	Color	Type	Origin	Stolen	1	Red	Sports	Domestic	Yes	2	Red	Sports	Domestic	No	3	Red	Sports	Domestic	Yes	4	Yellow	Sports	Domestic	No	5	Yellow	Sports	Imported	Yes	6	Yellow	SUV	Imported	No	7	Yellow	SUV	Imported	Yes	8	Yellow	SUV	Domestic	No	9	Red	SUV	Imported	No	10	Red	Sports	Imported	Yes	10
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Q5	<p>a) Consider the following information about John, Mary, Frank, Jane, sports, and friendships.  Golfers like swimmers. Skiers like golfers. Mary likes John. John is a skier. Frank is a golfer. Jane is a swimmer. If X Likes Y, and Y Likes Z, then X Likes Z.</p> <p>i) Use the predicates likes/2, golfer/1, swimmer/1, skier/1, mary/0, john/0, frank/0, and jane/0 to translate the above information in PROLOG clauses. The clauses should be ordered exactly according to the order of the above sentences.</p> <p>ii) Assuming your clauses are in the database in the proper order, show PROLOG's response to the following query. (Ask for every solution and explain your answer carefully.) ?-likes(mary, X).</p> <p>b) With diagram explain the architecture of Expert Systems.</p>	10
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