



Name:

Enrolment No:

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, May 2022

Course: Artificial Intelligence
Program: B.Tech CSE LL.B (Hons.) (Cyber Law / IPR)
Course Code: CSEG3005

Semester: VI
Time : 03 hrs.
Max. Marks: 100

Instructions: Attempt all Questions

SECTION A
(5Qx4M=20Marks)

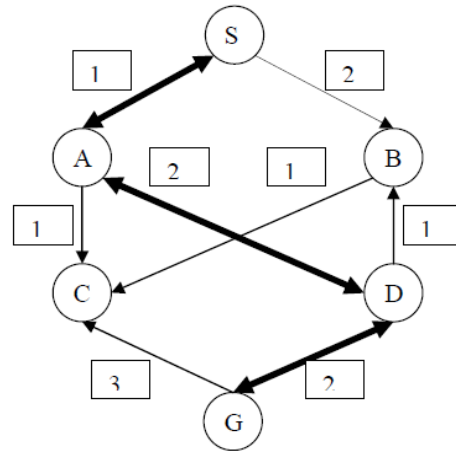
S. No.		Marks	CO
Q 1	Show the unifier and the result of resolution for: $P(x, f(x)) \vee \neg P(g(y), y)$ $P(g(f(A)), f(w)) \vee \neg P(f(w), w)$	04	CO1
Q 2	Consider the game tree shown below. The top node is a max node. The labels on the arcs are the moves. The numbers in the bottom layer are the values of the different outcomes of the game to the max player. <div style="text-align: center;"> <p>Max</p> <p>Min</p> <p>Max</p> <p>2 3 1 2 4 6</p> </div> <p>Using alpha-beta pruning, consider the nodes from right to left, which nodes are cut off? Mention the nodes that are not examined.</p>	04	CO2
Q 3	There are 5 people in John's family. All are having different issues with one another. Due to this, before being pictured in any photograph, they must have the following constraints to be satisfied: 1. John's father will not stand immediate position with John. 2. John's mother will not stand with her daughter	04	CO3

	<p>3. John must stand between two ladies</p> <p>4. John's brother in law should not stand next to John's father</p> <p>Drive a methodology by which they can have a group photograph.</p>																							
Q 4	Illustrate the Robot Behavior estimation with suitable diagram.	04	CO4																					
Q 5	<p>How Artificial Intelligence is related to human based nature? Develop PEAS description for the following task environment:</p> <ul style="list-style-type: none"> Shopping for used AI books on the Internet 	04	CO1																					
<p>SECTION B</p> <p>(4Qx10M= 40 Marks)</p>																								
Q 6	<p>A candy manufacturer interviews a customer on his willingness to eat a candy of a particular color or flavor. The following table shows the collected responses:</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Color</th> <th>Flavor</th> <th>Edibility</th> </tr> </thead> <tbody> <tr> <td>Red</td> <td>Grape</td> <td>Yes</td> </tr> <tr> <td>Red</td> <td>Cherry</td> <td>Yes</td> </tr> <tr> <td>Green</td> <td>Grape</td> <td>Yes</td> </tr> <tr> <td>Green</td> <td>Cherry</td> <td>No</td> </tr> <tr> <td>Blue</td> <td>Grape</td> <td>No</td> </tr> <tr> <td>Blue</td> <td>Cherry</td> <td>No</td> </tr> </tbody> </table> <p>a) What is H (edibility color)?</p> <p>b) Which feature (color or flavor) has the larger mutual information with edibility? Draw the decision tree for predicting edibility that maximizes the information gain.</p>	Color	Flavor	Edibility	Red	Grape	Yes	Red	Cherry	Yes	Green	Grape	Yes	Green	Cherry	No	Blue	Grape	No	Blue	Cherry	No	10	CO2
Color	Flavor	Edibility																						
Red	Grape	Yes																						
Red	Cherry	Yes																						
Green	Grape	Yes																						
Green	Cherry	No																						
Blue	Grape	No																						
Blue	Cherry	No																						
Q 7	<p>Consider the following axioms:</p> <ul style="list-style-type: none"> Anyone whom Mary loves is a football star. Any student who does not pass does not play. John is a student Any student who does not study does not pass. Anyone who does not play is not a football star. <p>Prove using resolution process that “If John does not study, then Mary does not”.</p>	10	CO3																					

Q 8

For the following graph S is the Starting node. Estimate the path returned after :

- Depth first Search
- Uniform Cost Search
- A* Search



OR

The sales of a company (in million dollars) for each year are shown in the table below.

x (year)	2005	2006	2007	2008	2009
y (sales)	12	19	29	37	45

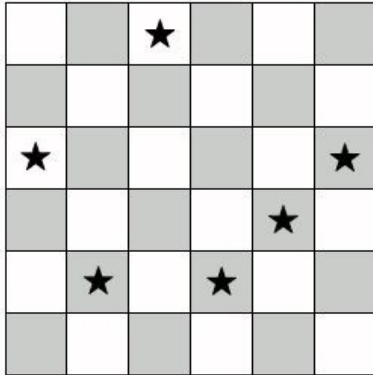
- Find the least square regression line $y = a x + b$.
- Use the least squares regression line as a model to estimate the sales of the company in 2012.

10

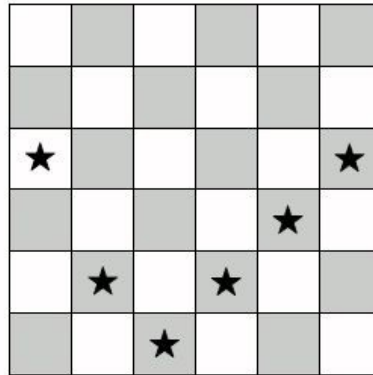
CO4

Q 9

For a 6-queens problem the value of evaluation function Eval is given as 9. If you use Simulated Annealing (currently $T=3$), and the current state and the random



current state



random next state

next state are shown below, will you accept this random next state immediately, or accept it with some probability? If it is the latter case, what is the probability?

10

CO1

SECTION-C
(2Qx20M=40 Marks)

Q 10	<p>A constraint satisfaction problem (CSP) has four variables V1, V2, V3, V4, each with domain {1, 2}. The constraints for the problem require that given any three variables exactly one must have the value 1.</p> <p>a. Explain how this problem can be represented as a CSP that uses only binary constraints. Illustrate your answer by giving a graph representing the problem.</p> <p>b. Describe how forward checking can be used to aid the search for a solution to a CSP. Illustrate your answer by showing how it applies to the problem in Part (a), for assignments V1 = 1 followed by V2 = 2.</p> <p style="text-align: center;">OR</p> <p>The following is the ruleset of a simple weather forecast expert system:</p> <ul style="list-style-type: none"> • IF cyclone THEN clouds • IF anticyclone THEN clear sky • IF pressure is low THEN cyclone • IF pressure is high THEN anticyclone • IF arrow is down THEN pressure is low • IF arrow is up THEN pressure is high <p>a) Use forward chaining to reason about the weather if the working memory contains the fact: “arrow is down”.</p> <p>b) Use backward chaining to reason about the weather if the working memory contains the fact: “clouds”. Show your answer in a similar table.</p> <p>c) Show your answer in a table naming the rules matching the current working memory (conflict set), which rule you apply, and how the working memory contents changes on the next cycle after a rule has fired.</p>	20	CO2
Q 11	<p>(a) If A and B are independent then $\sim A$ is independent of $\sim B$. Show the calculation in support of your answer.</p> <p>(b) Two students and B are both registered for a certain course. Student A attends the class 80% of the time. Student B attends the class 60% of the time. . Suppose there is also a student C who always comes to class if and only if student A or student B (or both) show up. You know that C came to class, what is the probability of A coming if you know that B showed up too?</p>	20	CO3