AIR UNIVERSITY

Subjective Part
(To be solved on Answer Books only)

Subject: Artificial Intelligence
Class: BS-CYS-F-23
Section(s): A
Course Code: CS-344

Time Allowed: 02 Hours
Max Marks: 50
FM's Name: Afeefa Ahmad
FM's Signature:

INSTRUCTIONS

- Attempt responses on the answer book only.
- Nothing is to be written on the question paper.
- Rough work or writing on question paper will be considered as use of unfair means.

<table>
<tr><th>Q#</th><th>Question Detail</th><th>CLO</th><th>Marks</th></tr>
<tr><td>1</td><td>
Search Algorithm Analysis: (10 Marks)

You are building a GPS app that uses Uniform Cost Search to find the least-cost route from S (Start) to G (Goal). The cost between intersections is shown below:

<table>
<tr><th>Path</th><th>Cost</th><th>Path</th><th>Cost</th></tr>
<tr><td>S → A</td><td>3</td><td>A → C</td><td>6</td></tr>
<tr><td>S → B</td><td>2</td><td>B → D</td><td>3</td></tr>
<tr><td>A → D</td><td>5</td><td>C → G</td><td>4</td></tr>
<tr><td>D → G</td><td>6</td><td>B → C</td><td>8</td></tr>
</table>

Perform Uniform Cost Search step by step.
</td><td>3</td><td>10</td></tr>
<tr><td>2</td><td>
Heuristic Change Scenario:
Suppose in the 8-puzzle problem, the heuristic is changed from "number of misplaced tiles" to "sum of Manhattan distances (based on horizontal and vertical distances each tile is away from goal state)."

• Which heuristic is better suited for A* search and why?
</td><td>2</td><td>10</td></tr>
<tr><td>3</td><td>
1. How estimated cost is calculated in A* search?
○ Give an equation and briefly explain the equation elements. (5 marks)
</td><td>2</td><td>10</td></tr>
</table>

	2. A logistics company must assign three drivers (D1, D2, D3) to three delivery routes (R1, R2, R3). Each route requires a different driver, and D1 cannot take R3 due to distance constraints. **Question:** Formulate this as a Constraint Satisfaction Problem (CSP) by defining the variables, domains, and constraints. **(5 marks)**		
4	A) How does the **gradient descent** algorithm update weights in each iteration (Just write steps)? Mention the Loss/Cost function as well **(4 marks)** B) If a linear regression model has a lower **R2**, how would you interpret that result? **(4 marks)** C) Write the equation for **linear regression** model with 3 input features. Mention each part of the equation **(2 mark)**	**3**	**10**
5	A) What is the difference between **linear and logistic regression**? How many categories can logistic regression handle for the target variable? **(4 marks)** B) What metric would be suitable if false negatives are more costly than false positives? Why? **(4 marks)** C) How is the F1 score related to precision and recall? **(2 mark)**	**1**	**10**

*******GOOD LUCK*******