Graphic Era
HILL UNIVERSITY
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End Term (Odd) Semester Examination October 2024

Roll no.....

Name of the Course and semester: _B.Tech/5th Semester
Name of the Paper: ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
Paper Code: TCS512
Time: 3 hour
Maximum Marks: 100

Note:
(i) All the questions are compulsory.
(ii) Answer any two sub questions from a, b and c in each main question.
(iii) Total marks for each question is 20 (twenty).
(iv) Each sub-question carries 10 marks.

Q1. (10 Marks)

a. Define Artificial Intelligence (AI) and explain its main goals. How does AI differ from traditional computing approaches?
b. What is an intelligent agent? Explain the components of an intelligent agent and the various types of agents used in AI systems.
c. Explain the different types of environments in which intelligent agents operate (e.g., deterministic vs. stochastic, episodic vs. sequential). How do these environments affect the design of agents?

CO-1

Q2. (10 Marks)

a. Compare and contrast different uninformed search strategies such as breadth-first search, depth-first search, and uniform-cost search. Under what conditions would each of these be appropriate?
b. Define propositional logic. How does propositional logic differ from first-order logic? Provide examples of logical inference rules (e.g., Modus Ponens) used in propositional logic.
c. What is First-Order Logic (FOL), and how does it extend propositional logic? Discuss the key components of FOL (i.e., predicates, quantifiers, variables) and provide examples of statements represented in FOL.

CO-2

Q3. (10 Marks)

a. Consider the following data set of hours of study and test score of nine students' employees. Compute the y-intersect and slope of the best-fitting line for Linear Regression.

```
# Sample data
hours_studied = ([2, 3, 4, 5, 6, 7])
# Independent variable

test_scores = [58, 62, 68, 73, 79, 81])
#Dependent variable
```

b.
Consider the given data frame.

```
data = {
   'Name': ['Alice', 'Bob', 'Charlie', 'David', 'Emily'],
   'Age': [25, 30, None, 28, 24],
   'Gender': ['Female', 'Male', 'Male', 'Male', 'Female'],
   'Math_Score': [85, 92, 78, 88, 76],
   'Science_Score': [90, None, 85, 92, 88],
   'Passed_Exam': ['Yes', 'Yes', 'No', 'Yes', 'No']
}
```

Using pandas perform the following;
1: Create a DataFrame
2: Handle Missing Values
3: Drop rows with missing values in other columns
4: Encoding Categorical Variables
5: Display the preprocessed data

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c. Compute, Mean, Median, Mode, Range, Average Deviation, Absolute Deviation, Squared Deviation, Standard Deviation, Total Sum of Squares for the following dataset. {8, 25, 20, 10, 8, 3}. CO-3

Q4. (10 Marks)

a.

Predict the class label for a test instance with X1 = 3.8 and X2 = 3.2 using KNN with K =3.

Sl.No	GPA	No. of projects done	Award
1	2.0	3.5	A
2	4.0	1.0	B
3	3.0	2.5	A
4	5.5	2.0	B
5	6.0	3.0	A
6	1.5	4.0	A
7	3.5	5.0	B
8	4.5	4.5	B
9	2.5	2.0	A
10	5.0	5.0	B

b. What is reinforcement learning, and how does it differ from supervised learning? Explain the concepts of reward, policy, and value function in reinforcement learning, and discuss how an agent can learn optimal behavior through interaction with its environment.

c. Assume s is a collection containing 14 examples, [9+, 5-]. of these 14 examples, suppose 6 of the positive and 2 of the negative examples have Wind = Weak, and the remainder have Wind = strong. What will be the information gain on attribute wind? CO-4

Q5. (10 Marks)

a. Consider a simple two-dimensional dataset with the following data points:

Data Points:

1. (2, 3)
2. (2, 5)
3. (3, 4)
4. (4, 2)
5. (5, 3)
6. (5, 5)
7. (6, 4)
8. (6, 6)

Where ε (epsilon) = 1.5 and MinPoints = 3, Using DBSCAN form clusters and identify Core, Noise, border and outlier (if available).

b. What is the role of evaluation metrics in machine learning? Compare and contrast the metrics precision, recall, and F1-score, providing scenarios where each is most appropriate.

c. A classification model has the following confusion matrix for a test dataset:

	Predicted Positive	Predicted Negative
Actual Positive	50	10
Actual Negative	5	35

Calculate the model's accuracy, precision, recall, and F1-score. CO-5