

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION- 2023

B. Tech-VII Semester (CSE/IT)

COURSE CODE (CREDITS): 18B1WCI742 (2)

MAX. MARKS: 35

COURSE NAME: Artificial Intelligence

COURSE INSTRUCTORS: Dr. Nancy Singla, Dr. Diksha Hooda

MAX. TIME: 2 Hours

Note: (a) All questions are compulsory.

(b) Marks are indicated against each question in square brackets.

(c) The candidate is allowed to make suitable numeric assumptions wherever required for solving problems

- Q1. (a) Consider a simple thermostat that turns on a furnace when the temperature is at least 3 degrees below the setting, and turns off a furnace when the temperature is at least 3 degrees above the setting. Is a thermostat an instance of a simple reflex agent, a model-based reflex agent, or a goal-based agent? Justify your answer with reasons. [2+3] [CO1]
- (b) Suppose you know a farmer. He tells you that despite working hard in the fields, his crop yield is deteriorating. How can AI help him?
- Q2. (a) What are the main assumptions made by the Naive Bayesian classifier? [2+8]
- (b) Consider the following dataset to predict whether we can pet an animal or not. [CO2]

	Animals	Size of Animal	Body Color	Can we Pet them
1	Dog	Medium	Black	Yes
2	Dog	Big	White	No
3	Rat	Small	White	Yes
4	Cow	Big	White	Yes
5	Cow	Small	Brown	No
6	Cow	Big	Black	Yes
7	Rat	Big	Brown	No
8	Dog	Small	Brown	Yes
9	Dog	Medium	Brown	Yes
10	Cow	Medium	White	No
11	Dog	Small	Black	Yes
12	Rat	Medium	Black	No
13	Rat	Small	Brown	No
14	Cow	Big	White	Yes

Use Naïve Bayes algorithm and show all the precomputations to predict if an animal can be pet or not for the following test data.

test = (Cow, Medium, Black)

- Q3. 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: [2+2+2
+2+2]
[CO5]

Color	Flavor	Edibility
Red	Grape	Yes
Red	Cherry	Yes
Green	Grape	Yes
Green	Cherry	No
Blue	Grape	No
Blue	Cherry	No

Consider H denotes the entropy.

- (a) What is $H(\text{edibility})$?
 (b) What is $H(\text{edibility} | \text{color})$?
 (c) Which feature (color or flavor) has the larger mutual information with edibility?
 (d) Draw the decision tree for predicting edibility that maximizes the information gain.
 (e) Using your decision tree, what would you predict for the edibility of a blue, blueberry flavored candy?
- Q4. (a) What is the difference between Supervised, Unsupervised and Reinforcement learning? [2+3]
[CO4]
 (b) What is the bias-variance trade-off and why is it crucial in model selection and evaluation?
- Q5. We are looking to develop a machine-learning algorithm to predict whether someone will pay a loan back or not. [1+2+2]
[CO4]
 (i) What is the positive class?
 (ii) What would a recall of 75% mean?
 (iii) What would a precision of 85% mean?