ST. CLARET COLLEGE LIBRARY Bengaluru-13 AUTONOMOUS

Roll No:
Date: __/__/____

St. Claret College

Autonomous, Bengaluru

UG END SEMESTER EXAMINATION-MAY 2026
BCA II SEMESTER
CA 2425: STATISTICS FOR AI & ML

TIME: 3 hours. 12 **MAX. MARKS: 80**

This paper contains FOUR printed pages and FOUR parts

Instructions:
1. **Verify and ensure that the question paper is completely printed.**
2. **Any discrepancies or questions about the exam paper must be reported to the COE within 1 hour after the examination.**
3. **Students must check the course title and course code before answering the questions.**

PART-A

Answer ALL questions. Each answer carries ONE mark. **[1 x 10 = 10]**

1. Which of the following is an example of a mental object in knowledge representation?
   a. Car b. Building c. Belief d. Tree
2. Forward chaining is a reasoning technique that:
   a. Starts from the goal and works backward b. Uses random search
   c. Starts from known facts and applies rules to infer new facts d. Ignores rules
3. Which of the following is a measure of dispersion?
   a. Mean b. Median c. Mode d. Variance
4. Which type of data is measured on a numerical scale?
   a. Categorical data b. Qualitative data c. Numerical data d. Nominal data
5. Which of the following best describes correlation?
   a. Difference between two variables b. Measure of central tendency
   c. Relationship between two variables d. Spread of data
6. What is the output of the following code?

```
d = {'a': 1, 'b': 2}
d.update({'b': 3})
print(d['b'])
```

   a. 1 b. 2 c. 3 d. Error
7. Which of the following is used to remove an element at the end of a list?
   a. pop() b. popitem() c. drop() d. clear()
8. Which function is used to read a CSV file in Pandas?
   a. pd.read() b. pd.read_csv() c. pd.load_csv() d. pd.file_read()
9. In Pandas, what does df.head() do?
   a. Displays the last 5 rows of a Data Frame b. Displays the column names
   c. Displays the first 5 rows of a Data Frame d. Displays summary statistics
10. Seaborn is mainly used for:

a. Numerical computation
b. Statistical data visualization
c. Data storage
b. Model training

PART-B

Answer any FIVE questions. Each answer carries TWO marks. **[2x 5= 10]**

11. What is meant by ontological engineering?
12. Differentiate between forward chaining and backward chaining.
13. The mean score of a statistics exam is 75 and the standard deviation is 10. A student scores 90.
    a. Calculate the Z-score for the student.
    b. Interpret what the calculated Z-score indicates about the student's performance relative to the class.
14. a = [1, 2, 3, 4, 5, 0, -1, -2]. Write the python syntax to filter the negative numbers from the list.
15. State the difference between del and clear() methods.
16. Create a Pandas Series from a list [10, 20, 30, 40] and display it.
17. Differentiate between a bar plot and a count plot.

PART-C

Answer any FOUR questions. Each answer carries FIVE marks. **[5 x 4 = 20]**

18. Explain the resolution method in Artificial Intelligence. How is it used for problem solving? Illustrate with an example.
19. a. Define median and mode.
    b. For the dataset: 3, 5, 7, 7, 9, 10, 15. Calculate the median and mode.
    c. Explain when median is preferred over mean.
    d. Draw neat, labeled graphs representing both the skewed distribution.
20. Write a Python program to create a dictionary of student names and marks (Create a list).
    a. Add a new student
    b. Update marks of an existing student
    c. Retrieve marks using a key
    d. Delete a student record.
21. a. Differentiate between lists and dictionaries. Explain their characteristics and give suitable examples.
    b. Write a Python program to perform the following operations on a list of numbers:
    [1, 2, 3, 4, 5, 6]. Write a user defined function to find the sum of all elements in the list.
22. Consider the array:

```
array([[2, 4, 6, 8],
       [1, 3, 5, 7]])
```

    a. Print the first row.
    b. Print the last column.
    c. Calculate the maximum and minimum values in the array.
    d. Find the number of elements and dimensions of the array.
    e. Reshape the array into a 4 × 2 matrix.

23. Explain the below pandas functions

a. Shape b. head() c. tail() d. info () e. describe()

PART-D

Answer any FOUR questions. Each answer carries TEN marks. **[10x 4 =40]**

24. Case Study: Smart E-Learning System: An AI-based adaptive e-learning platform is designed to personalize learning for students. The system stores knowledge about students, courses, topics, assessments, and learning resources.

- A student is enrolled in a course
- Each course contains multiple topics
- Topics are linked to learning resources like videos and quizzes
- Based on a student's performance, the system recommends new topics

Analyze the above case study and answer the following:

a. Identify any two classes and two relationships used in the ontology.
b. Explain how OE helps in knowledge organization and reasoning in this system.
c. Give one example of a rule that can be applied in this system.

25. A factory claims that the average weight of its packaged products is 500 grams. A random sample of 120 packages shows an average weight of 490 grams with a standard deviation of 20 grams.
    a. Clearly state the Null and Alternative Hypothesis.
    b. Perform an appropriate hypothesis test at 5% significance level. (Mention whether it is one-tailed or two-tailed and justify.)
    c. Explain Type I error, Type II error, and P-value in the context of this problem.
    d. If the factory wants to compare weights from two different machines, which statistical test would you suggest and why?
26. a. Define and differentiate between Qualitative and Quantitative data with suitable examples.
    b. Explain the difference between Discrete and Continuous data with examples.
    c. Describe the 2 levels of measurement in categorical data: Ordinal and Nominal.
    d. Classify the following variables into appropriate data types and justify your answer:
    Gender, Number of students in a class, Temperature in °C and Customer satisfaction rating (1–5)
27. Answer the following sub-questions using lambda, map(), filter(), and reduce() functions in Python.
    a. Write a lambda function to square a number and display the square of 5.
    b. Use map() with a lambda to create a new list containing the square of each number in the list.
    c. Use filter() with a lambda function to extract only even numbers from the list.
    d. Use filter() with a lambda function to get all numbers greater than 5 in a list.
    e. Use reduce() with a lambda function to find the sum of all numbers in the list.
28. Consider the below dataset and answer the questions:

Product ID	Product	Category	Price	Stock
1	Laptop	Electronics	60000	10
2	Phone	Electronics	30000	25