D–8028

Sub. Code
51811

DISTANCE EDUCATION

DIPLOMA IN ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING EXAMINATION, MAY 2025.

First Semester

FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE

(CBCS 2021 Calendar Year Onwards)

Time : Three hours Maximum : 75 marks

PART A — ($10 \times 2 = 20$ marks)

Answer ALL the questions.

1. What is AI technique?

2. Give two real-life applications of AI.

3. Elucidate on generate-and-test search.

4. Mention any two advantages of Best-First search.

5. Define the term "representation and mapping" in knowledge representation.

6. What do you mean by Frame problem in AI?

7. How does simple facts represented in using predicate logic?

8. What is matching in knowledge representation?

9. Mention the different types of learning in AI.

10. Define analogy-based learning.

PART B — ($5 \times 5 = 25$ marks)

Answer ALL questions, choosing either (a) or (b).

11. (a) Classify the different types of AI techniques.

Or

(b) Discuss the various application areas of AI.

12. (a) Describe Hill Climbing and its types with examples.

Or

(b) What is problem reduction? Explain its importance in heuristic search.

13. (a) Explain the different approaches to knowledge representation in AI.

Or

(b) Compare and contrast semantic networks and frames in knowledge representation.

14. (a) Discuss the significance of ISA relationship in knowledge representation.

Or

(b) Compare and contrast procedural and declarative knowledge.

15. (a) What is rote learning? Explain its advantages and disadvantages.

Or

(b) Discuss the importance of formal learning theory in AI.

PART C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. Summarize different types of search strategies and their advantages in problem-solving.

17. Explain Best-First search in detail with example. Discuss its merits and demerits.

18. Describe the different knowledge representation techniques.

19. Examine the concept of computable functions and predicates in predicate logic.

20. Explain neural network learning in detail with examples and its importance in AI.

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D–8029

Sub. Code
51812

DISTANCE EDUCATION

DIPLOMA IN ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING EXAMINATION, MAY 2025.

First Semester

RELATIONAL DATABASE MANAGEMENT SYSTEM (RDBMS)

(CBCS 2021 Calendar Year Onwards)

Time : Three hours Maximum : 75 marks

PART A — ($10 \times 2 = 20$ marks)

Answer ALL the questions.

1. Define data model.

2. List the various components involved in storage manager with its purpose.

3. State the differences among an entity, an entity type, and an entity set.

4. Define strong entity set with an example.

5. State the various constraints involved in relational model.

6. State the use of projection operation with an example.

7. State tuple relational calculus with its notation.

8. State the use of CHECK constraints with example.

9. What undesirable dependencies are avoided when a relation is in 3NF?

10. What is multivalued dependency?

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

11. (a) Compare DDL vs DML with examples.

Or

(b) Sketch and explain the various states of transaction in RDBMS.

12. (a) With illustration example the cardinality of relationship in ER diagram.

Or

(b) Explain the special features of the ER model with appropriate examples.

13. (a) Write a note on destroying/altering tables and views.

Or

(b) Write a note on querying relational data.

14. (a) With example, explain the various join operations in relational algebra.

Or

(b) Consider the following schema and express the queries in tuple relational calculus.

Schema :

	a	*b*	*c*	*m*	
Student	ID	Name	Major		Major is a FK to Dept in course
	d	*c*	*f*		
Course	Dept	Num	Title		Dept is a FK to Abbrev in Dept
	g	*h*	*i*		
Dept	Abbrev	Name	Office		
	j	*k*	*l*	*m*	
Enroll	SID	Dept	Num	Date	SID is a FK to ID in Student : Dept-Num is a FK to Dept-Num in Course

15. (a) Write a note on the DDL commands with examples.

Or

(b) Explain the join operations using SQL.

PART C — ($3 \times 10 = 30$ marks)

Answer any THREE questions.

16. Sketch and explain the database system structure.

17. Consider a MAIL_ORDER database in which employees take orders for parts from customers. The data requirements are summarized as follows:

(a) The mail order company has employees, each identified by a unique employee number, first and last name, and zip code.

(b) Each customer of the company is identified by a unique customer number, first and last name and zip code.

Each part sold by the company is identified by a unique part number, a part name, price and quantity in stock.

(c) Each order placed by a customer is taken by an employee and is given a unique order number.

Each order contains specified quantities of one or more parts. Each order has a date of receipt as well as an expected ship date. The actual ship date is also recorded.

Design an Entity-Relationship diagram for the mail order database.

18. Discuss in detail the types of various constraints in RDBMS with examples.

19. Considering the relation R(A, B, C, D, E) and the following functional dependencies, answer the questions. FD1 : A $\rightarrow$ BC FD2 : BC $\rightarrow$ AD FD3 : D $\rightarrow$ E.

    (a) List all the candidate keys

    (b) What is the highest normal form that R satisfies and why?

    (c) If R is not already at least in 3NF, then normalize R into 3NF and show the resulting relation(s) and their candidate keys. Your decomposition should be both join-lossless and dependency-preserving. If R is already in 3NF, just list the candidate keys of R.

    (d) Is your decomposition in BCNF as well? [Yes/No]. Explain.

20. (a) List all the nontrivial functional dependencies satisfied by the following relation R(A, B, C).

A	B	C
a_1	b_1	c_1
a_1	b_1	c_2
a_2	b_1	c_1
a_2	b_1	c_3

    (b) Consider the following relation schema N({A, B, C, D}, {AB $\rightarrow$ C, C $\rightarrow$ A, D $\rightarrow$ B, AB $\rightarrow$ D}). What is the highest normal form that relation schema N is in? Justify your answer.

D–8030	Sub. Code
	51813

DISTANCE EDUCATION

DIPLOMA IN ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING EXAMINATION, MAY 2025.

First Semester

R PROGRAMMING

(CBCS 2021 Calendar Year Onwards)

Time : Three hours Maximum : 75 marks

PART A — ($10 \times 2 = 20$ marks)

Answer ALL questions.

1. What are the key features of the R programming language?

2. State the purpose of expressions in R.

3. Differentiate between "if" and "if-else" statement.

4. What is the purpose of the break statement?

5. Write a script that creates a vector of numbers from 1 to 10 and calculates their sum.

6. What are lists in R?

7. Write a program to create a matrix in R and perform basic arithmetic operations on it.

8. Define the factors in R.

9. What are the steps involved in analyzing a CSV file using R?

10. What are some common table manipulation tasks that can be performed using the MySQL package in R?

PART B — ($5 \times 5 = 25$ marks)

Answer ALL questions, choosing either (a) or (b).

11. (a) Discuss the steps involved in setting up the R environment on different platforms, addressing potential challenges and solutions.

Or

(b) What are the different data types used in R? Discuss it with an example.

12. (a) Create a program that simulates a simple calculator with basic arithmetic operations using a switch statement.

Or

(b) Explore different string manipulation techniques, such as concatenation, substring extraction, and string searching, highlighting their practical applications.

13. (a) What are Vectors in R? How to create a Vector? Explore the different operations for manipulating vectors in R.

Or

(b) What are arrays? Write a program that creates a 3×3 array with random numbers and calculates the sum of each row and column.

14. (a) What are matrices? How to access matrix elements? Write R coding.

Or

(b) How to create data frames? Explore the structure of a data frame and different methods used for extracting data from a data frame in R.

15. (a) Explain how to install and load packages in R to work with Excel files, including the necessary dependencies and functions for file importation.

Or

(b) Discuss the process of creating scatter plots in R, including data preparation, customization options, and interpretation of plot features such as trend lines and correlations.

PART C — ($3 \times 10 = 30$ marks)

Answer any THREE questions.

16. Investigate the role of operators in R programming and discuss their functions, precedence and usage in expressions.

17. Analyze the components of functions in programming, including function definition, parameters, and return values, and their role in modularizing code.

18. How to create, name, access and merge lists in R? Explain with suitable coding.

19. Discuss the process of installing and loading R packages from CRAN and other sources.

20. Discuss how to input and read XML files in R, including package installation and parsing techniques.

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D–8031	Sub. Code
	51821

DISTANCE EDUCATION

DIPLOMA IN ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING EXAMINATION, MAY 2025.

Second Semester

FUNDAMENTALS OF MACHINE LEARNING

(CBCS 2021 Calendar Year Onwards)

Time : Three hours Maximum : 75 marks

PART A — ($10 \times 2 = 20$ marks)

Answer ALL questions.

1. What is the main difference between machine learning and artificial intelligence?

2. What is meant by samples in machine learning?

3. Write a brief note on the statistical learning framework in machine learning.

4. Define cross-validation in machine learning.

5. What is the main purpose of tree pruning in decision tree classification?

6. State the primary function of a support vector machine.

7. Define unsupervised learning.

8. What is the primary goal of cluster analysis?

9. Define a Markov decision process.

10. What is an extreme learning machine?

PART B — ($5 \times 5 = 25$ marks)

Answer ALL questions, choosing either (a) or (b).

11. (a) Describe the role of features and labels in a machine-learning model.

Or

(b) What is hypothesis testing in the context of machine learning, and why is it important?

12. (a) Outline the process of training a machine learning model and how it prepares the model for testing.

Or

(b) Explain the importance of validation in machine learning and how it differs from testing.

13. (a) What are rule-based classification systems, and how do IF-THEN rules operate within them?

Or

(b) Explain how the backpropagation algorithm optimizes neural networks.

14. (a) Discuss the role of distance measures in clustering and provide examples of commonly used distance measures.

Or

(b) Outline the key principles of density-based clustering methods and provide an example algorithm.

15. (a) Explain the concept of reinforcement learning and its significance in machine learning.

Or

(b) Outline the structure and applications of recurrent neural networks.

PART C — ($3 \times 10 = 30$ marks)

Answer any THREE questions.

16. What are the common approaches to building a machine learning model and how do they differ?

17. Compare and contrast parametric and non-parametric methods in machine learning.

18. Discuss the Random Forest algorithm and how it improves classification accuracy compared to single decision trees.

19. Examine hierarchical clustering algorithms in detail.

20. Provide a comprehensive overview of Convolutional Neural Networks.

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D–8032

Sub. Code
51822

DISTANCE EDUCATION

DIPLOMA IN ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING EXAMINATION, MAY 2025.

Second Semester

PRINCIPLES OF SOFT COMPUTING

(CBCS 2021 Calendar Year Onwards)

Time : Three hours Maximum : 75 marks

PART A — ($10 \times 2 = 20$ marks)

Answer ALL questions.

1. List out the key characteristics of soft computing.

2. What is an artificial neural network?

3. Define Adaline.

4. What is a Boltzmann Machine?

5. Define a counter propagation network.

6. Differentiate between a crisp set and a fuzzy set.

7. What are fuzzy measures?

8. What is approximate reasoning in fuzzy logic?

9. Write a short note about the genetic algorithm.

10. What is the role of the fitness function in GA?

PART B — ($5 \times 5 = 25$ marks)

Answer ALL questions, choosing either (a) or (b).

11. (a) Discuss the main difference between soft computing and hard computing.

Or

(b) Define and explain the importance of basic terminologies used in neural networks.

12. (a) Explain the backpropagation algorithm and its significance in training neural networks.

Or

(b) Discuss the Madaline network and its architecture.

13. (a) Explain the working principle of a Kohonen self-organizing network.

Or

(b) Elucidate the importance of membership functions in fuzzy logic systems.

14. (a) Examine the concept of fuzzy arithmetic and its significance.

Or

(b) Analyze the need for the decomposition of fuzzy rules and their purpose.

15. (a) Explain the process of encoding in Genetic Algorithms and discuss different encoding schemes.

Or

(b) Discuss the classification of Genetic algorithms based on their variations and methodologies.

PART C — ($3 \times 10 = 30$ marks)

Answer any THREE questions.

16. Explain the learning process in artificial neural networks.

17. Explain the architecture and working of a Bidirectional associative memory.

18. Discuss the process of defuzzification in fuzzy logic.

19. Explain how fuzzy inference works in expert systems.

20. Compare and contrast traditional algorithms with genetic algorithms.

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D–8033

Sub. Code
51823

DISTANCE EDUCATION

DIPLOMA IN ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING EXAMINATION, MAY 2025.

Second Semester

PYTHON PROGRAMMING

(CBCS 2021 Calendar Year Onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 2 = 20 marks)

Answer ALL the questions.

1. Define machine language.

2. State the use of delimiter and mention any four delimiters and its use.

3. What will be the output of following program?

```
x = 0
y = 0
if x > 0:
    y = y + 1
else:
    if x < 0:
        y = y + 2
    else:
        y = y + 5
print('Y =', y)
```

4. State the use of 'not' operator with example.

5. Compare parameter with argument in a function.

6. With example, mention the function used to calculate the length of a string.

7. Create a list using constructor with any three integer elements such as 10, 20 and 30.

8. Compare list and tuples through illustration.

9. "A Set is immutable". Do you agree with this statement? Justify your answer.

10. Define dictionary with an example.

PART B — ($5 \times 5 = 25$ marks)

Answer ALL questions, choosing either (a) or (b).

11. (a) Evaluate the below expression and write the results.

Expression
40/8
40//8
50%5
3%2
3**3

Or

(b) With illustration, outline any five built-in functions.

12. (a) Write a program to add 10 consecutive numbers starting from 1 using the while loop.

Or

(b) What will be the output of the following program?

```
i = 1
for x in range(1, 4):
    for y in range(1, 3):
        i = i + (i * 1)
print(i)
```

13. (a) A four-digit integer is entered through the keyboard. Write a function to calculate the sum of the four-digit number using recursion.

Or

(b) Write python statement to perform following :

(i) Slicing of string

(ii) Finding substring

(iii) Compare strings

(iv) Convert uppercase string to lowercase string

(v) Convert lowercase string to uppercase string.

14. (a) Write a note on python inbuilt functions that can be used with lists.

Or

(b) List the steps involved to do sorting process in a tuple. Give examples.

15. (a) Write a note on any five methods of set class in python with examples.

Or

(b) Write a program to count the frequency of characters using the get ( ) method.

PART C — ($3 \times 10 = 30$ marks)

Answer any THREE questions.

16. Write a python program to read a number through keyboard and print the reverse of the number.

17. With illustration, write a note on (a) for loop statement and (b) Break and continue statement.

18. With appropriate examples and syntax explain in detail about function in python.

19. Write a program to count the occurrences of each element within a list.

Example : Lst = [1, 23, 0, 9, 0, 23]

1 occurs 1 time

23 occurs 2 times

0 occurs 2 times

9 occurs 1 times

20. With syntax and illustrations, discuss in detail about methods of dictionary class in python.

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