R0292	Sub. Code
	557101

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2023

First Semester

Artificial Intelligence and Data Science

PRINCIPLES OF DATA SCIENCE AND ANALYTICS

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 1 = 10)

Answer **all** the following objective questions by choosing the correct option.

1. Data science is the process of diverse set of data through _____. (CO1, K1)

   (a) Analysing data (b) Processing data

   (c) Organizing data (d) All of the above

2. Which of the following are the Data Sources in data science? (CO1, K1)

   (a) Structured (b) Unstructured

   (c) Both (a) and (b) (d) None of the above

3. Show the three main measures of central tendency. (CO2, K2)

   (a) Mean (b) Median

   (c) Mode (d) All of the above

4. Amongst which of the following is/are the types of Linear Regression. (CO2, K2)

(a) Simple Linear Regression

(b) Multiple Linear Regression

(c) Both (a) and (b)

(d) None of the mentioned above

5. Identify what does the positive correlation indicate? (CO3, K3)

(a) An inverse relationship between the variables

(b) No relationship between the variables

(c) As one variable increases, the other variable tends to increase

(d) As one variable increases, the other variable tends to decrease

6. _____ is the standard error of estimate measure in regression analysis. (CO3, K3)

(a) The strength of the relationship between two variables

(b) The probability of Type I error in regression analysis

(c) The degree of multicollinearity in a regression model

(d) The average deviation of actual data points from the regression line

7. Mention the role of boolean logic in NumPy arrays (CO4, K6)

(a) Creating colorful visualizations of data

(b) Applying mathematical operations to arrays

(c) Performing element-wise comparisons and filtering based on conditions

(d) Simulating random numbers in arrays

8. _____ is the primary function of a pivot table in Pandas. (CO4, K6)

(a) Generating random data

(b) Storing data in a tabular format

(c) Performing data aggregation and reshaping for analysis

(d) Converting data to a JSON format

9. _____ library is commonly used for data visualization in Python? (CO5, K5)

(a) PyCalc (b) DataPlotter

(c) Matplotlib (d) DataViz

10. Determine the primary advantage of using Seaborn for data visualization tasks? (CO5, K5)

(a) Extremely fast execution of data visualizations

(b) Limited customization options for visualizations

(c) Integration with Matplotlib for complex plots

(d) Creating informative and attractive statistical graphics with minimal code

Part B (5 × 5 = 25)

Answer **all** the questions not more than 500 words each.

11. (a) List and explain the key benefits of utilizing data science in various industries. (CO1, K1)

Or

(b) Describe the difference between categorical and numerical data types in the context of data analysis. (CO1, K1)

12. (a) Show the differences between descriptive, diagnostic, predictive and prescriptive analytics. (CO2, K2)

Or

(b) Explain the concept of the Central Limit Theorem (CLT) and its significance in statistics. (CO2, K2)

13. (a) Construct the correlation coefficient (r) and its possible range of values. (CO3, K3)

Or

(b) Explain the concept of the standard error of estimate in the context of regression. (CO3, K3)

14. (a) Elaborate the purpose and advantages of using NumPy arrays for data manipulation. (CO4, K6)

Or

(b) Discuss common techniques for handling missing data in Pandas Data Frames. (CO4, K6)

15. (a) Interpret Why Matplotlib is commonly used for data visualization tasks? (CO5, K5)

Or

(b) Explain how to customize the appearance of plots and add annotations in Matplotlib. (CO5, K5)

Part C ($5 \times 8 = 40$)

Answer **all** the questions not more than 1000 words each.

16. (a) Explain the objectives and key steps involved in exploratory data analysis (EDA), including data visualization and summary statistics. (CO1, K1)

Or

(b) Define a normal distribution and explain its characteristics. (CO1, K1)

17. (a) Illustrate the role of data visualization in aiding decision-making processes. (CO2, K2)

Or

(b) Explain the components of a box plot and how it is used to represent data. (CO2, K2)

18. (a) Construct the concept of multiple regression and its application in modeling relationships involving more than two variables. (CO3, K3)

Or

(b) Discover the method of least squares and how it is used to determine the regression line. (CO3, K3)

19. (a) Elaborate structured arrays in NumPy and explain when they are useful. (CO4, K6)

Or

(b) Discuss the common data operations and manipulations in Pandas with examples. (CO4, K6)

20. (a) Explain the concept of three-dimensional plotting and when it is useful. (CO5, K5)

Or

(b) Explain the capabilities and applications of the Basemap toolkit in Matplotlib for geographic data visualization. (CO5, K5)

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R0293	Sub. Code
	557102

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2023

First Semester

Artificial Intelligence and Data Science

RELATIONAL DATABASE MANAGEMENT SYSTEM

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 1 = 10)

Answer **all** the questions.

1. Collection of information stored in database at particular instance of time is called as ———— (CO1, K1)

   (a) Instance of Database

   (b) Database Schema

   (c) Data Structure

   (d) Objects in Database

2. In an E-R diagram an entity set is represent by a (CO1, K1)

   (a) rectangle (b) ellipse

   (c) diamond box (d) circle

3. Which of the following is used to denote the selection operation in relational algebra? (CO2, K1)

   (a) Pi (b) Sigma

   (c) Lambda (d) Omega

4. The clause Alter table in SQL can be used to (CO2, K2)

(a) add an attribute

(b) delete an attribute

(c) alter the default values of an attribute

(d) all of the above

5. Which join refers to join records from the write table that have no matching key in the left table are include in the result set (CO3, K1)

(a) Left outer join (b) Right outer join

(c) Full outer join (d) Half outer join

6. Choose the incorrect statement (CO3, K2)

(a) A relation in 2NF must also be in 1NF

(b) A relation in 3NF must also be in 2NF

(c) A relation in 3NF must also be in BCNF

(d) A relation in BCNF must also in 3NF

7. The ———— schedule is a type of schedule where one transaction is executed completely before starting another transaction. (CO4, K2)

(a) Serial (b) Non-serial

(c) Serializable (d) Non-serializable

8. The primary purpose of a lock in concurrency control is (CO4, K1)

(a) to prevent transactions from executing

(b) to allow transactions to execute without any restrictions

(c) to synchronize access to shared data items

(d) to terminate transactions in case of a failure

9. Which of the following is an indexing method? (CO5, K1)

(a) Primary (b) Clustering

(c) Secondary (d) All of the above

10. Which of the following is true? (CO5, K1)

(a) B + tree allows only the rapid random access

(b) B + tree allows only the rapid sequential access

(c) B + tree allows rapid random access as well as rapid sequential access

(d) B + tree allows rapid random access and slower sequential access

Part B ($5 \times 5 = 25$)

Answer **all** the questions not more than 500 words each.

11. (a) Compare and Contrast database Systems and file systems. (CO1, K3)

Or

(b) List and explain various Data models used for database design. (CO1, K2)

12. (a) What are the integrity constraints? What is the purpose of it? (CO2, K1)

Or

(b) Discuss the two types of relational calculus in DBMS. (CO2, K3)

13. (a) Discuss the usage of following constructs in SQL (CO3, K3)

(i) Correlated Nested Query

(ii) Triggers.

Or

(b) Define BCNF with suitable example. (CO3, K3)

14. (a) What is Transaction? Explain ACID properties of transaction. (CO4, K3)

Or

(b) Explain remote backup systems in detail. (CO4, K3)

15. (a) Compare and Contrast primary and secondary index. (CO5, K3)

Or

(b) Discuss the characteristics of Big Data Analytics in detail. (CO5, K3)

Part C ($5 \times 8 = 40$)

Answer **all** the questions not more than 1,000 words each.

16. (a) Explain the basic architecture of a database management system with a neat block diagram. (CO1, K3)

Or

(b) Design a database using ER model to store IPL match details based on the requirements given below. (CO1, K4)

(i) Player will have id, name, country and price

(ii) Team will have short name, name, owner and homeground.

(iii) Each team Will have at least one player

(iv) Each player plays for at most one team

(v) Each team plays match against atleast one other team, on specified date, time and ground. Winner of the match should be recorded.

The ER diagram should specify entity sets, relationship sets, participation details, cardinality ratio, primary key and weak entity sets (if any).

17. (a) Elaborate the steps involved in logical database design. (CO2, K5)

Or

(b) Interpret the basic SQL relational algebra operations with example. (CO2, K4)

18. (a) Explain different types of joins with suitable examples. (CO3, K3)

Or

(b) Let us assume a table User_Personal as given below: Make the normalization to 3NF. Show the steps. (CO3, K5)

User1D	U_email	Fname	Lname	City	State	Zip
MA12	Mani@ymail.com	MANISH	JAIN	BILASPUR	CHATISGARU	458991
PO45	Pooja.g@gmail.com	POOJA	MAGG	KACCH	GUJRAT	832212
LA33	Lavle98@jj.com	LATHA	DUTT	RAIPUR	CHATISGAME	853578
CH99	Cheki9j@ih.com	CHIMAL	BEDI	TRICHY	TAMILNADU	632011
DA74	Danu58@g.com	DANY	JAMES	TRICHY	TAMILNADU	645018

19. (a) What is the need for concurrency control in DBMS? With the help of examples explain various problems that can occur due to concurrency? (CO4, K3)

Or

(b) Explain any two Time stamp based protocol in detail. (CO4, K4)

20. (a) Explain the types of file organizations with suitable examples. (CO5, K3)

Or

(b) Discuss about characteristics of Big data and its applications. (CO5, K3)

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R0294	Sub. Code
	557103

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2023

First Semester

Artificial Intelligence and Data Science

PYTHON PROGRAMMING

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A $(10 \times 1 = 10)$

Answer **all** the questions objective by choosing the correct option.

1. Which one of the following is the correct extension of the Python file? (CO1, K1)

   (a) .py (b) .python

   (c) .p (d) none of these

2. What do we use to define a block of code in Python language? (CO1, K1)

   (a) Key (b) Brackets

   (c) Indentation (d) None of these

3. Which of the following is not a keyword in Python language? (CO2, K2)

   (a) val (b) raise

   (c) try (d) with

4. Which of the following functions is a built-in function in python language? (CO2, K3)

(a) val() (b) print()

(c) fprint() (d) None of these

5. What is the method inside the class in python language? (CO3, K3)

(a) Object (b) Function

(c) Attribute (d) Argument

6. What is the return type of the hash Code() method in the Object class? (CO3, K4)

(a) Object (b) int

(c) long (d) void

7. What does NumPy stand for? (CO4, K4)

(a) Numerical Python (b) Natural Python

(c) Numeric Program (d) Nonlinear Python

8. What is the default data type of NumPy arrays? (CO4, K5)

(a) int 32 (b) float 64

(c) Object (d) None of the above

9. What is Matplotlib? (CO5, K2)

(a) A programming language

(b) A data visualization library

(c) A database management system

(d) An operating system

10. Which of the following is not a type of Matplotlib plot? (CO5, K5)

(a) Line plot (b) Scatter plot

(c) Pie chart (d) Bar chart

Part B (5 × 5 = 25)

Answer **all** questions not more than 500 words each.

11. (a) Summaries and Explain the Reserved keywords and Variables in Python. (CO1, K1)

Or

(b) Illustrate the Boolean Expressions in Python. Explain with example. (CO1, K1)

12. (a) Discuss the String Handling Functions in Python. (CO2, K3)

Or

(b) List the usage of Tuples and Dictionaries in python with examples. (CO2, K3)

13. (a) Discuss the concept of inheritance in Python with example. (CO3, K5)

Or

(b) Elaborate the object as a function argument in Python with example. (CO3, K5)

14. (a) Discuss the Arithmetic operations in NumPy arrays with examples. (CO4, K2)

Or

(b) Write python program on Matrix Addition and Multiplication using Numpy. (CO4, K3)

15. (a) Discuss the scatter plots in data visualization with example. (CO5, K4)

Or

(b) Elaborate the concepts of histograms and binnings with example. (CO5, K4)

Part C (5 × 8 = 40)

Answer **all** the questions not more than 1000 words each.

16. (a) Explain the Standard data types in Python. (CO1, K1)

Or

(b) Express the Operators in Python with example. (CO1, K1)

17. (a) Construct the User-Defined Functions in Python with example. (CO2, K3)

Or

(b) Illustrate the Control Statements in Python with example. (CO2, K3)

18. (a) Elaborate the steps involved in database connection in Python with example. (CO3, K5)

Or

(b) Develop the detailed Python code that reads and writes CSV files. (CO3, K5)

19. (a) Elaborate Aggregations in NumPy with example. (CO4, K6)

Or

(b) Discuss any two library functions in Python. (CO4, K6)

20. (a) Discuss the various techniques for visualizing errors and uncertainty in data using Matplotlib. (CO5, K6)

Or

(b) Elaborate the three dimensions plotting in Matplotlib with example. (CO5, K6)

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R0295	Sub. Code
	557104

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2023

First Semester

Artificial Intelligence and Data Science

DISCRETE MATHEMATICS

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A $(10 \times 1 = 10)$

Answer **all** the following objective questions by choosing the correct option.

1. $P \to Q \Leftrightarrow$ _____ (CO1, K1)

   (a) $\neg P \vee Q$ (b) $\neg Q \vee P$

   (c) P (d) Q

2. A formula which is equivalent to a given formula and which consists of sum of elementary products is called of _____ the given formula (CO1, K1)

   (a) CNF (b) DNF

   (c) NOR (d) NAND

3. Idempotent law is (CO2, K1)

   (a) $A = B$ (b) A' = B

   (c) $A \cap B = A$ (d) $A - B = 0$

4. A partially ordered set is called _____ if every nonempty subset of it has a least number. (CO2, K2)

(a) Poset

(b) Coset

(c) Equivalence relation

(d) Well ordered

5. For the semigroup $(N,+)$, let E be the set of all even nonnegative integers is a _____ $(E,+)$ of $(N,+)$

(CO3, K2)

(a) Subsemi group (b) Subgroup

(c) Group (d) Monoid

6. A group (G, *) in which the operation * is commutative is called _____ (CO3, K1)

(a) Permutation (b) Composition

(c) Abelian group (d) Function

7. The number of edges appearing in the sequence of a path is called the _____ of the path (CO4, K1)

(a) Vertex (b) Length

(c) Walk (d) Isomorphic

8. A graph in which weights are assigned to every edge is called a _____ (CO4, K1)

(a) Null graph (b) Point graph

(c) Digraph (d) Weighted graph

9. A perfect dice is tossed twice. The probability of getting a total of 9 is (CO5, K2)

(a) 1 (b) 0

(c) 1/9 (d) 1/36

10. Four coins are tossed. The probability of getting 2 heads and 2 tails is _____. (CO5, K2)

(a) 16 (b) 4

(c) 3/8 (d) 5/8

Part B $(5 \times 5 = 25)$

Answer **all** the questions not more than 500 words each.

11. (a) Show that (CO1, K3)

$$\left(\neg P \wedge \left(\neg Q \wedge R\right)\right) \vee (Q \wedge R) \vee (P \wedge R) \Leftrightarrow R .$$

Or

(b) Show that R is a valid inference from the premises $P \to Q, Q \to R$ and P. (CO1, K3)

12. (a) Show that for any two sets A and B, (CO2, K4)

(i) $A - B = A \cap \sim B$ and

(ii) $A \subseteq B \Leftrightarrow \sim B \subseteq \sim A$

Or

(b) Let $X = \{1,2,3,4\}$ and $R = \{(x, y) \mid x > y\}$. Draw the graph of R and also give its matrix. (CO2, K3)

13. (a) Let $S = \{a, b, c\}$ and let * denote binary operation on S given below. Let $P = \{1,2,3\}$ and + be a binary operation on P is given below. Show that (S,*) and (P,+) is isomorphic. (CO3, K3)

*	a	b	c
a	a	b	c
b	b	b	c
c	c	b	c

+	1	2	3
1	1	2	1
2	1	2	2
3	1	2	3

Or

(b) For any commutative monoid (M, *), then prove that the set of idempotent elements of M forms a submonoid. (CO3, K3)

14. (a) In a simple digraph, Prove that (V, E), every node of -digraph lies in exactly one strong component. (CO4, K4)

Or

(b) Suppose G is a simple connected graph with exactly two vertices that are not cut vertices, then show that G is a path. (CO4, K3)

15. (a) A bag contains 4 white and 6 black balls. Two balls are drawn at random. What is the probability that (CO5, K3)

(i) Both are white

(ii) Both are black

(iii) One white and one black?

Or

(b) Three horses A, B, C are in race. A is twice as likely to win as B and B is twice as likely to win as C. What are their respective probabilities of winning? (CO5, K3)

Part C (5 × 8 = 40)

Answer **all** the questions not more than1000 words each.

16. (a) Show that S $\vee$ R is tautologically implied by

$$(P \vee Q) \wedge (P \to R) \wedge (Q \to S)$$ (CO1, K4)

Or

(b) Show that from (CO1, K4)

(i) $(a)(\exists x)(F(x) \wedge S(x) \to (y)(M(y) \to W(y)))$

(ii) $(\exists y)(M(y) \wedge \neg W(y))$ the conclusion $(x)(F(x) \to \neg S(x))$ follows.

17. (a) Let R = {(l, 2), (3, 4), (2, 2)} and S = {(4,2), (2,5), (3,1), (l,3)}. Find R o S, S o R, R o (S o R), (R o S) o R, R o R, S o S, R o R o R. (CO2, K4)

Or

(b) Given the relation matrices R and S, find RoS, R', S', (RoS)' and show that (R0S)' = S'oR' (CO2, K4)

$$R = \begin{pmatrix} 1 & 0 & 1 \\ 1 & 1 & 0 \\ 1 & 1 & 1 \end{pmatrix} \quad S = \begin{pmatrix} 1 & 0 & 0 & 1 & 0 \\ 1 & 0 & 1 & 0 & 1 \\ 0 & 1 & 0 & 1 & 0 \end{pmatrix}$$

18. (a) The subset $H = \{[0],[1]\}$ is a subgroup of $(Z_4, +_4)$. Show that the left cosets of H in G determined by the elements of G are $\{[1],[3]\}$ and $\{[0],[2]\}$, which is a partition of Z_4. (CO3, K4)

Or

(b) Prove that every finite group of order n is isomorphic to a permutation group f degree n.

(CO3, K4)

19. (a) Narrate the steps of MINIMA algorithm. (CO4, K5)

Or

(b) In a graph G with vertices u and v, every $u-v$ walk contains a $u-v$ path. Prove. (CO4, K4)

20. (a) A husband and a wife appear in an interview for two vacancies in the same post. The probability of husband's selection is 1/7 and that of wife is 1/5. What is the probability that

(i) both of them will be selected;

(ii) only one of them will be selected;

(iii) none of them will be selected? (CO5, K5)

Or

(b) On the average, one in 400 items is defective. If the items are packed in boxes of 100, what is the probability that any given box of items will contain:

(i) no defectives;

(ii) less than two defectives;

(iii) one or more defectives;

(iv) more than three defectives. (CO5, K5)

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R0296	Sub. Code
	557552

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2023

First Semester

Artificial Intelligence and Data Science

Elective : ADVANCED JAVAPROGRAMMING

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Section A $(10 \times 1 = 10)$

Answer **all** the following objective by choosing the correct option.

1. Which is not a feature of OOP in general definitions? (CO1, K1)
   (a) Efficient Code
   (b) Code reusability
   (c) Modularity
   (d) Duplicate/Redundant data

2. Which feature of OOP indicates code reusability? (CO1, K1)
   (a) Abstraction (b) Polymorphism
   (c) Encapsulation (d) Inheritance

3. Which access specifier is usually used for data members of a class? (CO2, K2)
   (a) Protected (b) Private
   (c) Public (d) Default

4. Which of these operators is used to allocate memory to array variable in Java? (CO2, K2)

(a) malloc (b) alloc

(c) new (d) new malloc

5. Select the packages in which JDBC classes are defined? (CO3, K3)

(a) jdbc and javax.jdbc

(b) rdb and javax.rdb

(c) jdbc and java.jdbc.sql

(d) sql and javax.sql

6. Which of the following method is used to perform DML statements in JDBC? (CO3, K3)

(a) executeResult() (b) executeQuery()

(c) executeUpdate() (d) execute()

7. Which of these package is used for remote method invocation? (CO4, K4)

(a) java.applet (b) java.rmi

(c) java.gui (d) java.lang.reflect

8. Which of these methods are member of Remote class? (CO4, K4)

(a) checkIP() (b) addLocation()

(c) AddServer() (d) None of the mentioned

9. Give the abbreviation of AWT? (CO5, K5)

(a) Applet Windowing Toolkit

(b) Abstract Windowing Toolkit

(c) Absolute Windowing Toolkit

(d) None of the above

10. Which object can be constructed to show any number of choices in the visible window? (CO5, K5)

(a) Labels (b) Choice

(c) List (d) Checkbox

Section B ($5 \times 5 = 25$)

Answer **all** the questions not more than 500 words each.

11. (a) What are the basic concepts of Object-Oriented Programming (OOP)? (CO1, K1)

Or

(b) How does Java differ from C and C++? (CO1, K1)

12. (a) Discuss about method overloading in Java? (CO2, K6)

Or

(b) With suitable example explain Inheritance. (CO2, K2)

13. (a) Narrate the role of the Connection class in JDBC. (CO3, K3)

Or

(b) Illustrate SQL Exception. (CO3, K6)

14. (a) Construct the key components involved in RMI. (CO4, K3)

Or

(b) Describe the role of a stub in RMI. (CO4, K3)

15. (a) Explain AWT controls. (CO5, K3)

Or

(b) Describe the layout manager and why is it important when designing GUIs. (CO5, K3)

Section C (5 × 8 = 40)

Answer **all** the questions not more than 1000 words each.

16. (a) Describe the key features of Java's evolution. (CO1, K1)

Or

(b) Illustrate the concepts of operators and expressions in Java. (CO1, K1)

17. (a) Elaborate the concept of constructors in Java. (CO2, K6)

Or

(b) With suitable example explain the method overriding in Java. (CO2, K3)

18. (a) Elaborate the concept of metadata functions in JDBC and give an example. (CO3, K6)

Or

(b) Elucidate the role of SQL warnings in JDBC, and how can you handle them? (CO3, K4)

19. (a) Construct a high-level architecture for a distributed application using RMI, including the key components and their interactions. (CO4, K3)

Or

(b) Give detailed notes on (CO4, K3)

(i) inet address

(ii) URL

20. (a) Elaborate the general steps involved in creating a graphical user interface (GUI) using AWT in Java. (CO5, K6)

Or

(b) Develop a simple calculator using AWT controls. (CO5, K3)

———————