S–3041

Sub. Code
23BDS1S1

B.Sc. DEGREE EXAMINATION, APRIL 2026

First Semester

Data Science

FUNDAMENTALS OF INFORMATION TECHNOLOGY

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. What is a microcomputer?

2. List any two real-life applications of computers.

3. Define a scanner.

4. Name any two output devices.

5. What is PROM?

6. What is the use of magnetic tape?

7. Define system software.

8. Name any two high-level programming languages.

9. What is batch processing?

10. Define time-sharing in operating systems.

Part B (5 × 5 = 25)

Answer **all** questions choosing either (a) or (b).

11. (a) List and explain any five characteristics of a computer.

Or

(b) Discuss the applications of computers in education and business.

12. (a) Write short notes on any three types of terminals.

Or

(b) Explain the different types of scanners.

13. (a) Describe the functions of RAM and ROM.

Or

(b) Compare hard disks and floppy disks.

14. (a) Explain the differences between machine language, assembly language, and high-level language.

Or

(b) Write short notes on spreadsheet and presentation software.

15. (a) Explain multiprocessing and multitasking in detail.

Or

(b) Describe the main features of the UNIX operating system.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Describe the different generations of computers along with their key features.

17. Explain the role of input and output devices in a computer system.

18. Discuss various data storage and retrieval methods in computing.

19. Explain different types of programming languages along with their advantages and disadvantages.

20. Describe processing techniques such as batch processing, time-sharing and multiprogramming.

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S–3042

Sub. Code
23BDS1FC

B.Sc. DEGREE EXAMINATION, APRIL 2026

First Semester

Data Science

QUANTITATIVE APTITUDE

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. Write the first five prime numbers and find their sum.

2. Simplify: $0.75 + 0.125 \times 8$.

3. The present age of a father is twice the age of his son. If the son is 15, find the father's age.

4. Express $\sqrt[3]{64}$ in simplest form.

5. A tap fills a tank in 6 hours. How much of the tank will it fill in 2 hours?

6. Find $\log_{10} 1000$.

7. How many permutations are possible with the letters of the word "CAT"?

8. A coin is tossed once. Find the probability of getting a head.

9. If January 1, 2020 was a Wednesday, what day was January 1, 2021?

10. If a clock shows 3:15, find the angle between the hour and minute hands.

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

Answer **all** questions choosing either (a) or (b).

11. (a) The HCF of two numbers is 8 and their LCM is 120. If one of the numbers is 24, find the other.

Or

(b) The average weight of 40 students is 50 kg. If the weight of the teacher is included, the average becomes 51 kg. Find the weight of the teacher.

12. (a) A man bought a pen for Rs. 50 and sold it for Rs. 65. Find the profit percentage.

Or

(b) The ratio of the ages of A and B is 5:3. If A is 25 years old, find B's age.

13. (a) Two taps can fill a tank in 20 minutes and 30 minutes respectively. How long will they take to fill the tank if both are opened together?

Or

(b) Find the simple interest on Rs. 2000 for 4 years at 5% per annum.

14. (a) Find the number of combinations of 5 objects taken 2 at a time.

Or

(b) A card is drawn from a deck of 52 cards. What is the probability of drawing a spade?

15. (a) A man buys 100 shares of face value Rs. 10 each at Rs. 12 per share. If the company pays a dividend of 15%, find the yield percent on his investment.

Or

(b) The marks obtained by students in a test are given below. Represent the data using a pie chart:

Subject	Marks
Mathematics	40
Science	30
English	20
History	10

Part C $(3 \times 10 = 30)$

Answer any **three** questions.

16. The monthly incomes of 5 families are Rs. 15,000, Rs. 18,000, Rs. 22,000, Rs. 25,000, and Rs. 30,000. Find the mean and median incomes and comment on the result.

17. A shopkeeper marks an article at Rs. 1,200 and offers a discount of 10%. If the cost, price is Rs. 900. Find the selling price, profit or loss and the profit percentage.

18. A pump can fill a tank in 9 hours. Due to a leak in the tank, it takes 10 hours to fill. How long will it take for the leak alone to empty the tank?

19. A bag contains 5 red balls, 4 blue balls and 3 green balls. Two balls are drawn at random without replacement. Find the probability that:

(a) Both are red

(b) One is red and one is blue

20. The following table shows the investments and annual incomes from shares of three people:

Person	Investment (Rs.)	Face Value (Rs.)	Market Value (Rs.)	Nominal Value
A	4,800	100	120	8
B	5,000	100	125	10
C	6,000	100	150	12

Calculate the annual income for each person and the yield percentage on their investment.

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S–3043

Sub. Code
23BDS2C1

B.Sc. DEGREE EXAMINATION, APRIL 2026

Second Semester

Data Science

PYTHON PROGRAMMING

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. List any four features of Python.
2. What is a reserved keyword in Python? Give two examples.
3. What is the purpose of the else block in a loop?
4. Define function arguments with an example.
5. What is the role of the __ name __ variable in Python modules?
6. What is the use of the datetime module in Python?
7. Define a constructor in Python.
8. What is method overriding in object-oriented programming?
9. What is the purpose of manually raising an exception using raise?
10. What does the match() function do in regular expressions?

Part B (5 × 5 = 25)

Answer **all** questions choosing either (a) or (b).

11. (a) Explain the various types of quotes used in Python with examples.

Or

(b) Describe the different types of operators in Python.

12. (a) Write a Python program to check if a number is even or odd using if-else.

Or

(b) Write a program to display the multiplication table of a number using a loop.

13. (a) Explain how to create and use a user-defined module in Python.

Or

(b) What are namespaces? Explain local and global scope with examples.

14. (a) Write a Python class to represent a BankAccount with deposit and withdraw methods.

Or

(b) Explain the concept of polymorphism with a simple example in Python.

15. (a) What are assertions in Python? Write a program using assertions.

Or

(b) Write a Python program to search for all occurrences of a word in a string using findall().

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Describe Python data types: Number, String, List, Tuple, Set, and Dictionary. Give one example of each.

17. Write a Python program to calculate the sum of digits of a number using a while loop.

18. Write a program to create a module that calculates the area and perimeter of a circle, and import it in another script.

19. Define encapsulation and data hiding. Illustrate with a class-based example in Python.

20. What are regular expressions? Write a Python program to extract phone numbers from a text using regex.

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S–3044

Sub. Code
23BDS2S1

B.Sc. DEGREE EXAMINATION, APRIL 2026

Second Semester

Data Science

OPEN SOURCE SOFTWARE TECHNOLOGIES

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. What is Linux?

2. List two advantages of using open-source software.

3. Where can Linux be used? Mention two examples.

4. Name any two standard files in Linux.

5. What is the default configuration file for Apache?

6. What is the function of SetUser and SetGroup directives?

7. What is the purpose of the DESCRIBE command in MySQL?

8. Write the command to create a database in MySQL.

9. Name two PHP functions used to connect to MySQL.

10. What is the purpose of mysqli_query() in PHP?

Part B (5 × 5 = 25)

Answer **all** questions choosing either (a) or (b).

11. (a) Explain why Linux is considered better for developers than commercial OS like Windows.

Or

(b) List and explain any five differences between open-source and commercial software.

12. (a) Explain the role and importance of the Linux kernel.

Or

(b) What are Linux distributions? Give examples and describe their features.

13. (a) How can you modify the default configuration file in Apache?

Or

(b) What is the significance of user and group settings in Apache configuration?

14. (a) Explain SHOW TABLES, USE and DESCRIBE commands in MySQL with examples.

Or

(b) What are MySQL data types? Explain any five commonly used ones.

15. (a) Write a PHP script to fetch records from a MySQL table and display them.

Or

(b) How do you delete records in MySQL using PHP? Give a code example.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Explain the structure of the Linux operating system including the kernel, file system and Unix components.

17. Describe the process of Apache web server setup and securing it using configuration files and permissions.

18. Discuss MySQL database operations: create, insert, update, delete, with command examples.

19. Explain how to handle forms in PHP and store user data into MySQL database using PHP functions.

20. Compare Linux and Unix. How are they related? Discuss their file systems and commands, structures.

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S–3045

Sub. Code
23BDS2S2

B.Sc. DEGREE EXAMINATION, APRIL 2026

Second Semester

Data Science

INTRODUCTION TO HTML

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. Define a web browser and name two popular web browsers with their functions.

2. What is an HTML tag?

3. List any two font style tags in HTML.

4. Write HTML code to display the text Data Science in italic style.

5. Differentiate between ordered list and unordered list with example.

6. Outline Hyperlink.

7. Define Caption in a table.

8. Explain rowspan.

9. Define <select> tag.

10. Define <input> element

Part B (5 × 5 = 25)

Answer **all** questions choosing either (a) or (b).

11. (a) Explain the difference between Internet, Intranet and Extranet.

Or

(b) Discuss the role of web browsers in accessing webpages with an example.

12. (a) Differentiate between physical style tags and logical style tags in HTML with examples.

Or

(b) Write HTML code to create a webpage that displays three headings of different levels and one paragraph with a bold and italic word.

13. (a) Explain the structure and features of nested lists in HTML.

Or

(b) Write HTML code to create an ordered list of three programming languages and an unordered list of three web technologies.

14. (a) Explain the importance of cellpadding and cellspacing with an example HTML table.

Or

(b) Write HTML code for a student mark table with 3 rows and 3 columns, using rowspan or colspan appropriately.

15. (a) Differentiate between <frame>, <iframe>, and <frameset> with suitable examples.

Or

(b) Explain the different types of form controls in HTML with examples.

Part C (3 × 10 = 30)

Answer any **three** questions.

16. Explain the basic structure of an HTML document with a neat diagram and example code.

17. What is the difference between block-level elements and inline elements in HTML? Give examples.

18. Write an HTML program to create a personal webpage containing:

I. A heading,

II. A paragraph with bold and italic words,

III. A marquee text,

IV. An unordered list of your hobbies and

V. A hyperlink to your email.

19. Design an HTML table for a class timetable using alignment attributes.

20. Discuss the advantages and disadvantages of using frames in webpage design.

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S–3046	Sub. Code 23BDSA3

U.G. DEGREE EXAMINATION, APRIL 2026

Data Science

Allied — OPERATIONS RESEARCH

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. Define Operations Research.

2. What are the applications of O.R?

3. What is linear programming?

4. What are the assumptions of LPP?

5. Compare Slack variable and Surplus Variable.

6. How will you solve LPP graphically?

7. What is optimality test in transportation problem?

8. What do you mean by least cost method (LCM)?

9. What are the basic assumptions of game theory?

10. What is Mixed Strategy?

Part B (5 × 5 = 25)

Answer **all** the questions choosing either (a) or (b).

11. (a) Explain the scope of Operations Research.

Or

(b) Discuss about the Need of Operations Research.

12. (a) Explain the Applications of Linear Programming Problem (LPP).

Or

(b) Discuss about Formulating LPP.

13. (a) Solve the following LPP by graphical method.

Minimize $Z = 6000x_1 + 4000\,x_2$

Subject to :

$$3x_1 + x_2 \geq 40,$$
$$x_1 + 2.5x_2 \geq 22,$$
$$3x_1 + 3x_2 \geq 40$$

and $x_1, x_2 \geq 0$.

Or

(b) Explain about Simplex Method.

14. (a) State the difference between the Transportation Problem and Assignment Problem.

Or

(b) Write down the steps involved in solving Assignment problem using Hungarian Method.

15. (a) Discuss about types of Games.

Or

(b) Explain about Pure Strategy.

Part C (3 × 10 = 30)

Answer any **three** questions.

16. Explain about the Techniques of Operations Research.

17. Explain the limitations for Formulating LPP model.

18. Solve the following LPP by simplex method :

Maximize $Z = 6x_1 + 9x_2$

Subject to

$$x_1 + x_2 \leq 12$$
$$x_1 + 5x_2 \leq 45$$
$$3x_1 + x_2 \leq 30$$

and $x_1, x_2 \geq 0$.

19. Solve the problem from the Transportation Model with the North West Corner method :

	D1	D2	D3	D4	Availability
O1	6	7	8	9	60
O2	7	8	5	6	20
O3	4	3	2	7	20
Requirement	20	40	20	20	

20. Discuss the following :

(a) Saddle point

(b) Pure and mixed strategies

(c) Graphical Method.

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S–3047

Sub. Code
23BDSA4

U.G. DEGREE EXAMINATION, APRIL 2026

Data Science

Allied – INTERNET AND WEB DESIGN

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. Define WWW.

2. What are Static and Active webpages?

3. How to create a link in HTML?

4. What is the difference between <figure> tag and <img> tag?

5. How is Cell Padding different from Cell Spacing?

6. Define Heading Tags with an example.

7. What are the four components of DHTML.

8. Explain how would we embedded Style in HTML.

9. What is the role of the method attribute in HTML forms?

10. What are the different types of form input fields in HTML?

Part B (5 × 5 = 25)

Answer **all** questions choosing either (a) or (b).

11. (a) Write the features of HTML.

Or

(b) What is Search Engine? Elaborate how a Search Engine work.

12. (a) Write the tags that are used to create a link to an Image.

Or

(b) Write note on Horizontal Rule.

13. (a) Discuss the types of Lists available in HTML with example.

Or

(b) Explain the Column groups and Row groups.

14. (a) Write the advantages and disadvantages of DHTML.

Or

(b) Explain Nested Framesets with example.

15. (a) Write down the main purpose of HTML forms.

Or

(b) Explain how to setup the Form and reset the button.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Discuss the file attachment facility in E-Mail.

17. Explain the various image tags in HTML.

18. Write a HTML coding for creation of Table.

19. Discuss various tags that are used to create frames in HTML.

20. Define Form tag. Design a registration page by using all Form controls.

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S–3048

Sub. Code
23BDS3C1

B.Sc. DEGREE EXAMINATION, APRIL 2026

Third Semester

DATA SCIENCE

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. Define structured data.

2. What is data science?

3. What are the operating systems on which the Python program runs?

4. What is a Boolean value?

5. Define recursive function

6. What is the purpose of the import statement?

7. What are different modes of file operation?

8. Give examples of syntax errors?

9. List the benefits of data visualization?

10. Define GUI Programming?

Part B (5 × 5 = 25)

Answer **all** questions choosing either (a) or (b).

11. (a) Explain in detail about Datafication

Or

(b) Explain the Data Analytics Life Cycle.

12. (a) What is the difference between Lists and Tuples? Give an example for their usage.

Or

(b) Explain the purpose of loop structure in a programming language.

13. (a) Explain call by value and call by reference in python.

Or

(b) Briefly explain about function prototypes.

14. (a) What is a text file? Give an example for a text file.

Or

(b) What is meant by Polymorphism?

15. (a) List the general types of data visualization.

Or

(b) List the types of Visualization Matplotlib.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Explain briefly about the Machine Learning.

17. Explain any six arithmetic operators of python with suitable examples of each.

18. Explain function and module with suitable example.

19. Explain about the different types of Exceptions in Python.

20. Explain in detail the types of pyplots using Matplotlib?

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S–3049

Sub. Code
23BDS3S1

B.Sc. DEGREE EXAMINATION, APRIL 2026

Third Semester

Data Science

E-COMMERCE

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. Define E-Commerce.

2. Give an example of an organizational E-Commerce application.

3. Describe ISP.

4. Mention any two components of the Internet.

5. What is meant by Web Architecture?

6. What is the purpose of URL?

7. Give two examples of digital tokens.

8. What is meant by electronic cash?

9. Explain Information Filtering.

10. What is meant by Internet advertising?

Part B (5 × 5 = 25)

Answer **all** questions choosing either (a) or (b).

11. (a) Explain the convergence of technologies in E-Commerce.

Or

(b) Describe any two consumer applications and two organizational applications of E-Commerce.

12. (a) Explain the role of NSFNET in the growth of the Internet.

Or

(b) Differentiate between National ISPs, Regional ISPs, and Local ISPs with examples.

13. (a) Explain the technology behind the World Wide Web.

Or

(b) Discuss the security issues related to the Web.

14. (a) Explain credit card-based electronic payment systems with advantages and risks.

Or

(b) Discuss the legal, security, and privacy issues in Electronic Data Interchange (EDI).

15. (a) Explain the characteristics and properties of software agents.

Or

(b) Discuss the role of E-Commerce catalogs and consumer data interface in Internet marketing.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Explain the anatomy of E-Commerce applications with neat diagram and examples.

17. Discuss the Internet architecture and governance structure in detail.

18. Describe the architectural framework for E-Commerce with a suitable diagram.

19. Explain in detail the different types of electronic payment systems with examples.

20. Discuss the use of advertising and marketing tools on the Internet. Explain with examples how software agents are applied in E-Commerce.

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S–3050

Sub. Code
23BDS3S2

B.Sc. DEGREE EXAMINATION, APRIL 2026

Third Semester

Data Science

ENTERPRISE RESOURCE PLANNING

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. What is the need for ERP in enterprises?

2. Name two ERP vendors.

3. Define information mapping in ERP.

4. State one limitation of system integration.

5. What are the functional modules of ERP?

6. Define integration in ERP.

7. What is object-oriented architecture in ERP?

8. Name one key pre-implementation task.

9. Mention one future directive in ERP.

10. What is the role of organizational culture in ERP implementation?

Part B (5 × 5 = 25)

Answer **all** questions choosing either (a) or (b).

11. (a) Explain the benefits and limitations of ERP packages.

Or

(b) Describe the structure of ERP systems.

12. (a) Differentiate between system integration and enterprise integration.

Or

(b) Explain the role of a common enterprise database.

13. (a) Discuss the ERP marketplace and its changing dynamics.

Or

(b) Describe integration of ERP with supply chain management.

14. (a) Explain the role of consultants, vendors and employees in ERP implementation.

Or

(b) Describe ERP implementation strategies.

15. (a) Discuss ERP and internet integration.

Or

(b) Explain critical factors for ERP implementation success.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Explain the origin, evolution and conceptual model of ERP in detail.

17. Discuss system integration in ERP with emphasis on logical and physical system integration.

18. Describe ERP functional modules and explain their integration with the supply chain.

19. Explain the ERP implementation life cycle and the role of SDLC/SSAD.

20. Discuss ERP's relationship with e-commerce and how ERP can be integrated into organizational culture.

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S–3051

Sub. Code
23BDS4C1

B.Sc. DEGREE EXAMINATION, APRIL 2026

Fourth Semester

Data Science

OBJECT ORIENTED PROGRAMMING WITH JAVA

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. What are the features of Java?

2. Difference between JDK & JRE.

3. Define interface?

4. What are the types of Exception in Java?

5. What are Character Stream in Java?

6. Define String Buffer Class.

7. What is a Socket?

8. Define IP address?

9. List out the CRUD operations?

10. What is meant by Dialogue boxes?

Part B (5 × 5 = 25)

Answer **all** questions choosing either (a) or (b).

11. (a) Differentiate between a Class and an Object??

Or

(b) List out the operator in Java.

12. (a) What is Thread Synchronization?

Or

(b) Explain Packages in Java with example and write advantage of Package.

13. (a) Write short notes on: (i) Hash Table (ii) Java Networking.

Or

(b) Discuss various methods of Sting and Sting Buffer Class.

14. (a) Describe 'Socket Based Connectivity' by providing suitable example.

Or

(b) Differentiate between TCP/IP sockets and server sockets.

15. (a) Discuss the Layout Managers and their role in GUI based programs in Java.

Or

(b) How to draw lines in Java? Give an example.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. What is Object Orient Programming? Explain the basic concept of Object-Oriented Programming in detail?

17. Explain Exception Handling and its types with example.

18. Write the difference between String and StringBuffer classes.

19. Explain in detail about networking of Java highlighting Client and Server Socket and their usages.

20. Difference between AWT and Swings.

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S–3052

Sub. Code
23BDS4S1

B.Sc. DEGREE EXAMINATION, APRIL 2026

Fourth Semester

Data Science

ADVANCED EXCEL

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. What is the use of an absolute cell address?

2. Give an example of a lookup function other than VLOOKUP.

3. Mention one example of custom validation using a formula.

4. What is meant by filtering data?

5. What is the use of "Show Value As % of Row" in Pivot Tables?

6. Name two external data sources that can be linked to a Pivot Table.

7. Write the syntax of the NOW( ) function.

8. What is the purpose of auto formatting?

9. Define a data bar.

10. Name any two types of graphs supported in Excel.

Part B (5 × 5 = 25)

Answer **all** questions, choosing either (a) or (b).

11. (a) Explain how to lock and unlock specific cells.

Or

(b) Write the steps to perform an approximate match lookup.

12. (a) Explain sorting with a custom order.

Or

(b) Discuss the benefits of using templates for worksheets.

13. (a) Write the steps to create a Pivot Chart.

Or

(b) Explain how to consolidate data using the Data Consolidation feature.

14. (a) Explain how to apply conditional formatting to highlight duplicate values.

Or

(b) Describe the use of database functions with examples.

15. (a) Explain how to insert sparklines in a worksheet.

Or

(b) Write short notes on using secondary axes in combination charts.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Describe the process of creating a VLOOKUP formula to combine data from two sheets.

17. Explain how to set up different types of data validation and their applications.

18. Explain advanced Pivot Table features, including slicers and calculated fields.

19. Discuss the use of text, date, and power functions for preparing reports.

20. Describe the creation and customization of various chart types, including new Excel features.

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S–3053

Sub. Code
23BDS4S2

B.Sc. DEGREE EXAMINATION, APRIL 2026

Fourth Semester

Data Science

PHP PROGRAMMING

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A ($10 \times 2 = 20$)

Answer **all** questions.

1. Write any two advantages of using PHP over traditional CGI.

2. Name two popular PHP frameworks.

3. What is variable scope in PHP?

4. Give the syntax for defining a function.

5. Define a multidimensional array.

6. Mention any two functions for array element extraction.

7. What is the purpose of setcookie()?

8. Name two advantages of using sessions.

9. What is SQL injection?

10. List any two PHP error handling functions.

Part B (5 × 5 = 25)

Answer **all** questions choosing either (a) or (b).

11. (a) Explain the basic structure of a PHP script.

Or

(b) Discuss PHP expressions and operators with examples.

12. (a) Describe variable functions in PHP.

Or

(b) Explain string comparison and searching in PHP.

13. (a) Compare indexed and associative arrays.

Or

(b) Explain the difference between array_merge() and array_combine() funcitons with examples.

14. (a) Describe SSL integration in PHP applications.

Or

(b) Explain cross-site scripting and its prevention in PHP.

15. (a) Discuss direct file-level manipulation in PHP.

Or

(b) Explain relational databases and SQL basics in PHP context.

Part C

$(3 \times 10 = 30)$

Answer any **three** questions.

16. Explain PHP language basics and flow control statements in detail.

17. Discuss in detail the concept of functions, including parameters, return values, and variable scope.

18. Describe object creation and usage in PHP with examples.

19. Explain form handling in PHP, including HTTP methods, state management, and security measures.

20. Write and explain a PHP script to perform CRUD operations with MySQL.

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S–3054

Sub. Code
23BDS5C1

B.Sc. DEGREE EXAMINATION, APRIL 2026

Fifth Semester

Data Science

RELATIONAL DATABASE MANAGEMENT SYSTEM

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. Define a database.

2. List any two advantages of a DBMS.

3. What is a primary key?

4. Define referential integrity.

5. What is SQL?

6. List two types of SQL commands.

7. Define a database transaction.

8. What is concurrency control?

9. What is database recovery?

10. List any two backup techniques.

Part B (5 × 5 = 25)

Answer **all** questions, choosing either (a) or (b).

11. (a) Explain the characteristics of the database approach.

Or

(b) Discuss the differences between file systems and database.

12. (a) Explain the concept of foreign key with an example.

Or

(b) Describe the entity integrity rule.

13. (a) Write short notes on DDL and DML.

Or

(b) Explain the SELECT statement with an example.

14. (a) Explain the ACID properties of a transaction.

Or

(b) Describe the need for concurrency control in databases.

15. (a) Explain the concept of checkpoints in recovery.

Or

(b) Describe forward recovery and backward recovery.

Part C (3 × 10 = 30)

Answer any **three** questions.

16. Explain the components of the DBMS architecture in detail.

17. Describe the different types of constraints in the relational model with examples.

18. Explain SQL subqueries and joins with examples.

19. Describe in detail the concurrency control techniques used in databases.

20. Explain the recovery process in detail with examples.

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S–3055

Sub. Code
23BDS5C2

B.Sc., DEGREE EXAMINATION, APRIL 2026

Fifth Semester

Data Science

MACHINE LEARNING

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. What is the goal of machine learning?

2. List two advantages of using ML models.

3. Define unsupervised learning.

4. Give two examples of regression problems.

5. What is the purpose of pruning in decision trees?

6. Define information gain.

7. What is hierarchical clustering?

8. Mention two advantages of hierarchical clustering over K-means.

9. Define policy in reinforcement learning.

10. Name two popular reinforcement learning algorithms.

Part B (5 × 5 = 25)

Answer **all** questions choosing either (a) or (b).

11. (a) Discuss the differences between traditional programming and machine learning.

Or

(b) Explain the role of training and testing datasets in ML.

12. (a) Explain the native Bayes classifier with example.

Or

(b) Write short notes on overfitting and underfitting.

13. (a) Compare decision trees and random forests.

Or

(b) Explain the CART algorithm with examples.

14. (a) Explain single-linking and complete-linkage methods in hierarchical clustering.

Or

(b) Discuss cluster validity indices.

15. (a) Explain model-based reinforcement learning.

Or

(b) Discuss temporal difference learning.

Part C

(3 × 10 = 30)

Answer any **Three** questions.

16. Discuss the types, advantages, and limitations of machine learning approaches.

17. Explain regression models and evaluation metrics in detail.

18. Describe ensemble methods for classification with examples.

19. Explain density-based clustering techniques with examples.

20. Describe reinforcement learning algorithms and their applications in robotics.

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S–3056

Sub. Code
23BDS5E1

B.Sc. DEGREE EXAMINATION, APRIL 2026

Fifth Semester

Data Science

Elective – BIG DATA ANALYTICS

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. What is data velocity?

2. List any two applications of Big Data.

3. Define reducer in MapReduce.

4. Mention any two limitations of MapReduce.

5. What is the function of the NameNode?

6. Write any two features of Hadoop 2.x.

7. Define key-value store.

8. State two use cases of NoSQL databases.

9. What is a dashboard?

10. List two advantages of data visualization.

Part B (5 × 5 = 25)

Answer **all** questions choosing either (a) or (b).

11. (a) Discuss the importance of data variety in Big Data analytics.

Or

(b) Explain structured, Semi-structured, and unstructured data.

12. (a) Write short notes on the mapper function in MapReduce.

Or

(b) Explain the role of combiners in MapReduce.

13. (a) Compare HDFS and traditional file systems.

Or

(b) Explain block replication in HDFS.

14. (a) Discuss the advantages of key-value store databases.

Or

(b) Write short notes on graph databases.

15. (a) Explain the steps in creating visual analytics using Power BI.

Or

(b) Discuss the challenges in data visualization for Big Data.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Explain the challenges and opportunities of Big Data analytics with examples.

17. Describe the complete workflow of MapReduce with a real-time application.

18. Explain the architecture of Hadoop 2.x and the role of YARN in detail.

19. Describe the types, advantages, and applications of NoSQL databases.

20. Discuss advanced visualization techniques for Big Data with case studies.

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S–3057

Sub. Code
23BDS5E2

B.Sc. DEGREE EXAMINATION, APRIL 2026

Fifth Semester

Data Science

Elective – Artificial Neural Networks

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. What is a convex set? Give a simple example.

2. State the Perception Convergence Theorem briefly.

3. Differentiate between learning with a teacher and learning without a teacher.

4. What is the credit assignment problem in learning systems?

5. Define pattern recognition in the context of neural networks.

6. What is a Single Layer Perception?

7. What is the role of the back propagation algorithm in training MLPs?

8. What is meant by a multilayer feed forward neural network with continuous perceptions?

9. Name any two building blocks of deep learning architectures.

10. What is the main purpose of convolution layers in a CNN?

Part B (5 × 5 = 25)

Answer **all** questions choosing either (a) or (b).

11. (a) Explain the architecture of an Artificial Neural Model and the role of activation functions in neural networks.

Or

(b) Differentiate between feed forward and feedback (recurrent) neural networks with examples.

12. (a) Describe Hebbian learning. How does it differ from error correction learning?

Or

(b) Explain error correction learning with an example. How is it used to train neural networks?

13. (a) What is a Single Layer Perception? Explain its architecture and role in pattern recognition.

Or

(b) Explain the concept of a linear classifier in the context of perceptions. How does it classify input patterns?

14. (a) Describe the role and function of a simple layer in a Multi-Layer Perception. How does it contribute to learning?

Or

(b) What is a Multi-Layer Perception (MLP)? Explain its architecture and significance in solving non-linear problems.

15. (a) Briefly explain the architecture and function of Deep Convolution Neural Networks (CNNs).

Or

(b) What is a Recurrent Neural Network (RNN)? Mention its key characteristics and applications.

Part C $(3 \times 10 = 30)$

Answer any **three** questions.

16. What is a non-linearly separable problem? Explain how multilayer neural networks address such problems. Describe the structure and working of a Multilayer Perception (MLP).

17. Explain the credit assignment problem. How does it affect learning in multilayer neural networks? Describe solutions to this problem.

18. Describe the Perception Learning Algorithm in detail. Provide the mathematical formulation and step-by-step procedure.

19. Explain the architecture and working of a Multi-Layer Perception (MLP). How is it different from a single-layer perception?

20. What are Deep Belief Networks (DBNs) and Restricted Boltzthann Machines (RBMs)? How are they related, and how do they function in deep learning?

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S–3058

Sub. Code
23BDS6C1

B.Sc. DEGREE EXAMINATION, APRIL 2026

Sixth Semester

Data Science

ARTIFICIAL INTELLIGENCE

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. What is a production system in AI?

2. What is the difference between Generate & Test and Hill Climbing?

3. What is knowledge representation in Artificial Intelligence?

4. What is the difference between procedural and declarative knowledge?

5. Define semantic networks in AI.

6. What is conceptual dependency?

7. What is statistical natural language processing?

8. What is hierarchical planning?

9. What is fuzzy logic?

10. What is an expert system shell?

Part B (5 × 5 = 25)

Answer **all** questions choosing either (a) or (b).

11. (a) Write short notes on Means-End Analysis and Constraint Satisfaction Problems.

Or

(b) How is a problem represented as a state space search in AI? Give an example.

12. (a) Write short notes on the implementation of search techniques: Depth First Search and Breadth First Search.

Or

(b) Compare procedural and declarative knowledge with examples.

13. (a) What are Bayesian Networks? Explain with a simple example.

Or

(b) Differentiate between weak and strong slot-filler structures. Give examples.

14. (a) Describe the components of a planning system.

Or

(b) What is nonlinear planning using constraint posting?

15. (a) Discuss the knowledge acquisition process in expert systems.

Or

(b) Briefly explain formal learning theory.

Part C (3 × 10 = 30)

Answer any **three** questions.

16. Explain the concept of Artificial intelligence and describe the different types of AI techniques.

17. Differentiate between procedural and declarative knowledge. How are rules used in knowledge representation?

18. Write a detailed note on the syntactic-semantic spectrum of representation. How does logic compare with slot-and filter structures?

19. Discuss the role of statistical techniques in natural language processing with examples.

20. Explain neutral network learning and genetic learning methods, comparing their approaches.

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S–3059

Sub. Code
23BDS6E1

B.Sc. DEGREE EXAMINATION, APRIL 2026

Sixth Semester

Data Science

Elective – COMPUTING INTELLIGENCE

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. Give the definition of state space in AI.
2. State any two limitations of Artificial Intelligence.
3. What is fuzziness in the context of fuzzy logic?
4. Define compositional rule of inference.
5. What do you understand by Adaptive Resonance Theory?
6. List any two advantages of neural networks.
7. State the usage of linear separability.
8. What is meant by ANN model?
9. Define the term crossover in genetic algorithms.
10. Mention any two advantages of genetic algorithms.

Part B (5 × 5 = 25)

Answer **all** questions choosing either (a) or (b).

11. (a) Write short notes on the Travelling Salesman Problem.

Or

(b) Explain the concept of problem formulation in AI.

12. (a) Discuss the working principle of Fuzzy Clustering.

Or

(b) Explain the concept and operations of fuzzy set.

13. (a) Briefly explain associative memory in neural networks.

Or

(b) Describe the concept of self-organizing maps with an example.

14. (a) Explain the working of Hebb's network.

Or

(b) Describe briefly McCulloch-Pitts neuron model.

15. (a) Explain the biological background of genetic algorithms.

Or

(b) Discuss the basic terminologies used in genetic algorithms.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Explain in detail the breadth-first and depth-first search techniques with examples and comparisons.

17. Discuss fuzzy logic-based classifiers and their applications in real-world problems.

18. Exemplify the architecture of backpropagation networks.

19. Describe the fundamental concepts of artificial neural networks and different architectures for ANNs in detail.

20. Explain in detail the steps in a simple genetic algorithm and discuss its role in solving optimization problems.

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S–3060

Sub. Code
23BDS6E2

B.Sc. DEGREE EXAMINATION, APRIL 2026

Sixth Semester

Data Science

Elective — ANALYTICS FOR SERVICE INDUSTRY

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. State any two benefits of adopting EHR.

2. Define phenotyping algorithms.

3. What is meant by data analytics for pervasive health?

4. Name any two mobile imaging systems used in biomedical analytics.

5. What is HRIS in the context of HR analytics?

6. List any two intuition-based analytical techniques used in HR analytics.

7. Define performance analytics.

8. State any two purposes of optimizing selection and promotion through analytics.

9. Comment on loyalty analytics.

10. Mention any two applications of guest analytics.

Part B (5 × 5 = 25)

Answer **all** questions choosing either (a) or (b).

11. (a) Explain the components of EHR.

Or

(b) Describe the barriers to the adoption of Electronic Health Records.

12. (a) Discuss the role of clinical decision support systems in healthcare analytics.

Or

(b) Write short notes on computer-assisted medical image analysis systems.

13. (a) Explain HR metrics with suitable examples.

Or

(b) Discuss the significance of HR data sources in HR analytics.

14. (a) Describe methods for evaluating employee training using analytics.

Or

(b) Explain the process of predicting employee performance using performance analytics.

15. (a) Illustrate dynamic pricing in the tourism sector with examples.

Or

(b) Describe the use of analytics in optimized disruption management.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Write short notes on the following.

    (a) Biomedical image analysis.

    (b) Genomic data analysis.

17. Discuss in detail the practical systems for healthcare analytics, including fraud detection, pharmaceutical analytics and mobile analytics.

18. Explain the evolution of HR analytics and discuss LAMP framework briefly.

19. Analyze how analytics can be used to optimize selection and promotion decisions within an organization. Discuss the benefits and potential challenges.

20. Describe the major types of payment fraud and outline the key challenges involved in their detection.

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