S–0209

Sub. Code
23BCA1C1

B.C.A. DEGREE EXAMINATION, NOVEMBER 2025

First Semester

Computer Application

PYTHON PROGRAMMING

(CBCS 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. What are the features of python?
2. Explain array in python.
3. What is Boolean value?
4. What is the python pass statement?
5. Which operator is used for compare two strings?
6. What is the use of dir ( ) function?
7. How lists are updated in python?
8. What is meant by key-value pairs in a dictionary?
9. How to close the file in python?
10. Which method is used to write line of content to a file?

Part B (5 × 5 = 25)

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

11. (a) Explain array with example program in python.

Or

(b) Explain built in data types in python.

12. (a) Explain break statement with example program.

Or

(b) Explain continue statement with example program.

13. (a) Explain python modules.

Or

(b) Explain return statement in python functions.

14. (a) Difference between list and tuples.

Or

(b) Write any three basic list operations in python.

15. (a) How to splitting words in python files?

Or

(b) How to renaming and deleting files in python?

Part C

$(3 \times 10 = 30)$

Answer any **three** questions.

16. Explain input output statements in python.

17. Explain iterative statement in python.

18. Explain function in python with different arguments.

19. Explain dictionary functions and methods.

20. Explain reading, writing and closing process in python files.

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S–0210

Sub. Code
23BCAA1

U.G. DEGREE EXAMINATION, NOVEMBER 2025.

Computer Application

Allied – DIGITAL LOGIC FUNDAMENTALS

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

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

Answer **all** the questions.

1. Define the concept of base conversion.

2. Construct the truth table for the AND gate.

3. State the meaning of SOP form.

4. Illustrate the use of a K-map.

5. Define a multiplexer.

6. List any two applications of a decoder.

7. Define a flip-flop.

8. Differentiate between JK and D flip-flop.

9. Expand ROM and RAM.

10. Explain the function of a ring counter.

Part B (5 × 5 = 25)

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

11. (a) Construct and explain the truth tables of basic gates.

Or

(b) Summarize the applications of logic gates. (Understand).

12. (a) Demonstrate binary addition and subtraction with an example.

Or

(b) Analyze the role of adders and subtractors as arithmetic building blocks.

13. (a) Illustrate the working principle of a multiplexer with an example.

Or

(b) Classify encoders and decoders with examples.

14. (a) Develop the diagram and truth table of the RS flip-flop.

Or

(b) Explain the operation of a T flip-flop.

15. (a) Compare ripple and Mod counters.

Or

(b) Differentiate Up-Down and Ring counters.

Part C

$(3 \times 10 = 30)$

Answer any **three** questions.

16. Evaluate number systems and perform base conversions with examples.

17. Develop SOP and POS expressions using Boolean algebra with examples.

18. Design and analyze multiplexers and demultiplexers.

19. Compare and contrast different types of flip-flops with truth tables.

20. Design asynchronous and synchronous counters with examples.

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S–0211

Sub. Code
23BCA1S1

B.C.A. DEGREE EXAMINATION, NOVEMBER 2025.

First Semester

Computer Application

WEB DESIGNING

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** the questions.

1. What is the use of HTML comments?

2. Write the HTML code to change the font color of text.

3. Define GIF animation in the context of HTML.

4. What is the use of the <select> tag in HTML?

5. What is the purpose of the <style> tag in CSS?

6. Differentiate between CSS and XML.

7. What is dynamic content in DHTML?

8. Define data binding in DHTML.

9. How do you declare a function in JavaScript?

10. What is the purpose of the navigator object in JavaScript?

Part B

$(5 \times 5 = 25)$

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

11. (a) Write HTML code to align text at the center and display it in different font sizes.

Or

(b) Explain how to create and format a frame in HTML.

12. (a) Create a student registration form using HTML with combo box and text area.

Or

(b) Explain with code how to insert an image and hyperlink it in HTML.

13. (a) Explain the concept of grouping styles in CSS with example code.

Or

(b) Write code to create a webpage using XML for storing book details.

14. (a) Explain how DOM allows access and modification of HTML elements in DHTML.

Or.

(b) Write a note on event handling in DHTML with examples.

15. (a) Write a JavaScript program to check whether a given number is prime.

Or

(b) Explain with example how form validation works using JavaScript.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Write an essay on the importance of tags, attributes, and formatting in HTML with examples.

17. Discuss the steps involved in building a webpage front page using forms and multimedia.

18. Explain XML in detail and describe its importance in web designing with an example of XML data.

19. Write a detailed note on DHTML with examples of accessing CSS and positioning elements dynamically.

20. Write a JavaScript program for a calculator that performs addition, subtraction, multiplication, and division. Explain the code.

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S–0212

Sub. Code
23BCA1FC

B.C.A. DEGREE EXAMINATION, NOVEMBER 2025.

First Semester

Computer Application

STRUCTURED PROGRAMMING IN C

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** the questions.

1. What is the significance of #include in C?

2. Define identifier. Give two valid and two invalid identifiers.

3. What is the difference between break and continue?

4. Write the syntax of a switch statement.

5. Write the general form of a multidimensional array declaration.

6. How do you access element at 3rd row, 2nd column in a[5][5]?

7. What is the purpose of the return statement in a function?

8. Write two differences between built-in and user-defined functions.

9. What does the expression *(p+2) represent if p is a pointer to an array?

10. Write the syntax for declaring a pointer to a function returning int.

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

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

11. (a) Write a simple C program to find the sum of two numbers.

Or

(b) Explain constants in C with suitable examples.

12. (a) Write a program to display the multiplication table of a number using a 'for loop'.

Or

(b) Demonstrate the switch statement with a program to print the name of the weekday.

13. (a) Write a program to find the maximum element in an array of 10 integers.

Or

(b) Illustrate initialization of a 2D array with an example.

14. (a) Write a function to compute the sum of digits of a number.

Or

(b) Explicate recursion with an example program (factorial or Fibonacci).

15. (a) Write a program to demonstrate pointer arithmetic using an array.

Or

(b) Illuminate how pointers are used with structures in C with an example.

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

Answer any **three** questions.

16. Explain the structure of a C program in detail with a flow diagram.

17. Discuss decision-making statements with examples.

18. Define multidimensional arrays. Illustrate declaration, initialization, and accessing of a 3D array.

19. Write a program using a function to compute the GCD of two numbers.

20. Write a program to find the largest element in an array using pointers.

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S–0213

Sub. Code
23BCA2C1

B.C.A. DEGREE EXAMINATION, NOVEMBER 2025.

Second Semester

Computer Application

OBJECT ORIENTED PROGRAMMING CONCEPTS USING C++

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** the questions.

1. What are the advantages of OOPS?

2. Write the syntax of goto statement.

3. How to declare objects in C++?

4. Write a simple syntax friend functions.

5. Explain the binary operators in C++.

6. Explain the abstract class in C++.

7. Write the new and delete operators' syntax.

8. Give a short note on memory models.

9. Simply explain the file stream classes.

10. What is string attributes?

Part B (5 × 5 = 25)

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

11. (a) Write the simple program for if... else statement.

Or

(b) Explain the inline functions program with syntax.

12. (a) Briefly explain the array of objects.

Or

(b) Write a note and define the member functions.

13. (a) Write a short note on overloading unary operators.

Or

(b) Give a note on multilevel inheritance.

14. (a) Explain the array of classes.

Or

(b) Explain the importance of dynamic objects.

15. (a) Write a simple program for templates used in C++.

Or

(b) Briefly explain the random access operations.

Part C

$(3 \times 10 = 30)$

Answer any **three** questions.

16. Explain decision making statements with syntax.

17. Describe the overloading member functions with example program.

18. Explain the different types of inheritance with syntax.

19. Elaborately explain the pointers derived classes and base classes.

20. Write the program for sequential read and write operations in C++.

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S–0214

Sub. Code
23BCAA2

U.G. DEGREE EXAMINATION, NOVEMBER 2025

Computer Application

Allied – RESOURCE MANAGEMENT TECHNIQUES

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. Write two applications of operations research.

2. Mention any two limitations of operations research.

3. What are the methods used to obtain initial basic feasible solution?

4. What is balanced transportation Problem?

5. Write the mathematical formulation of an assignment problem.

6. What is an assignment problem?

7. Give any two characteristics of sequencing problem.

8. What is idle time on a machine?

9. Define Total float.

10. Mention the formula to find the expected time and variance of an activity.

Part B (5 × 5 = 25)

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

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

Or

(b) Solve the following L.P.P by the graphical method

Max $Z = 3x_1 + 2x_2$

Subject to

$-2x_1 + x_2 \leq 1$

$x_1 \leq 2$

$x_1 + x_2 \leq 3$

and $x_1, x_2 \geq 0$

12. (a) Solve the following transportation problem and find the initial feasible solution using VAM.

		Destination				
		A	B	C	D	Supply
Source	1	11	20	7	8	50
	2	21	16	20	12	40
	3	8	12	18	9	70
	Demand	30	25	35	40	

Or

(b) Find the initial basic feasible solution of the following transportation problem by North-West Corner rule.

	1	2	3	4	5	Available
A	4	3	1	2	6	80
B	5	2	3	4	5	60
C	3	5	6	3	2	40
D	2	4	4	5	3	20
Required	60	60	30	40	10	200

13. (a) The assignment cost of assigning any one operator to any one machine is given in the following table. Find the optimal assignment by Hungarian Method.

Operators

Machine	I	II	III	IV
A	10	5	13	15
B	3	9	18	3
C	10	7	3	2
D	5	11	9	7

Or

(b) Consider the problem of assigning five jobs to five persons. Find the optimal assignment. The assignment costs are given as follows :

Job

Person	1	2	3	4	5
A	8	4	2	6	1
B	0	9	5	5	4
C	3	8	9	2	6
D	4	3	1	0	3
E	9	5	8	9	5

14. (a) There are five jobs, each of which must go through the two machines A and B in the order AB. Processing times are given below :

Job :	1	2	3	4	5
Machine A :	5	1	9	3	10
Machine B :	2	6	7	8	4

Determine a sequence for the five jobs that will minimize the total elapsed time.

Or

(b) Discuss the principal assumptions of sequencing problem.

15. (a) Draw the event-oriented network for the following data :

Event No :	1	2	3	4	5	6	7
Immediate Predecessors :	–	1	1	2, 3	3	4, 5	5, 6

Or

(b) Explain various time estimates in PERT.

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

Answer any **three** of the following questions.

16. Solve the following LPP by graphical method.

Minimize $Z = 3x_1 + 5x_2$

Subject to :

$-3x_1 + 4x_2 \leq 12$

$x_1 \leq 4$

$2x_1 - x_2 \geq -2$

$x_2 \geq 2$

$2x_1 + 3x_2 \geq 12$

and $x_1, x_2 \geq 0$

17. A company has three plants at locations A, B, C which supply to warehouse located at D, E, F, G and H. Monthly plant capacities are 800,500 and 900 units respectively. Monthly warehouse requirements are 400, 400, 500 and 800 units respectively. Unit transportation costs (in Rs.) are given below. Determine an optimum distribution for the company in order to minimize the total transportation cost.

		To				
		D	E	F	G	H
From	A	5	8	6	6	3
	B	4	7	7	6	5
	C	8	4	6	6	4

18. There are five men are available to do five different jobs. From past records, the time (in hours) that each man takes to do each job is known and given in the following table :

		Jobs				
		I	II	III	IV	V
Men	A	2	9	2	7	1
	B	6	8	7	6	1
	C	4	6	5	3	1
	D	4	2	7	3	1
	E	5	3	9	5	1

Find the assignment of men to jobs that will minimize the total time taken.

19. There are four jobs 1, 2, 3 and 4 are to be processed on each of the five machines A, B, C, D and E in the order A B C D E. Find the total minimum elapsed time of no passing of jobs is permitted also find the idle time for each machine.

Machines	Jobs			
	1	2	3	4
A	7	6	5	8
B	5	6	4	3
C	2	4	5	3
D	3	5	6	2
E	9	10	8	6

20. The following table indicates the details of a project. The durations are in days. 'a' refers to optimistic time, 'm' refers to most likely time and 'b' refers to pessimistic time duration.

Activity :	1-2	1-6	2-3	2-4	3-5	4-5	6-7	5-8	7-8
a :	3	2	6	2	5	3	3	1	4
m :	6	5	12	5	11	6	9	4	19
b :	15	14	30	8	17	9	27	7	28

(a) Draw the network and find the expected time and variance of each activity.

(b) Find the Critical Path and determine the expected time to complete the project.

(c) What is the probability to complete the project in 41 days?

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S–0215

Sub. Code
23BCA2S1

B.C.A. DEGREE EXAMINATION, NOVEMBER 2025.

Second Semester

Computer Application

FUNDAMENTALS OF INFORMATION TECHNOLOGY

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** the questions.

1. Differentiate between Data and Information.

2. What are the characteristic of a Computer?

3. Difference between Header and Footer.

4. List the uses of Mail Merge.

5. Differentiate between a worksheet and a workbook.

6. Write the steps to create border in a table in MS Excel.

7. Define Animation.

8. What is transition in PowerPoint?

9. Define Internet.

10. List any two browsers.

Part B

$(5 \times 5 = 25)$

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

11. (a) Define software. Explain various types of software with example.

Or

(b) Describe any two input devices.

12. (a) Point out the steps involved in saving a file in MS word.

Or

(b) Discuss the procedure to use bullets and numbering.

13. (a) Mention the steps for copying and pasting formula in MS-Excel.

Or

(b) Enumerate the different ways for changing column width in excel worksheet.

14. (a) Describe the creation of Power point slide.

Or

(b) Write down the steps for inserting picture in Power point slide presentation.

15. (a) Discuss the role of the Internet in Education.

Or

(b) Brief note on Search Engine.

Part C

$(3 \times 10 = 30)$

Answer any **three** questions.

16. Give a brief note on various components of computer.

17. Discuss the various alignments and text formatting in MS Word.

18. Summarize any five functions in Excel with an example.

19. Outline the various power point presentation views.

20. Enumerate the advantages and disadvantages of online shopping.

S–0216

Sub. Code
23BCA2S2

B.C.A. DEGREE EXAMINATION, NOVEMBER 2025.

Second Semester

Computer Application

MULTIMEDIA SYSTEMS

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** the questions.

1. What is meant by Hypermedia?

2. What is the characteristics of a computer?

3. Define Sound.

4. What is digitization of the sound?

5. What is meant by Video Capture Board?

6. List any four animation file formats.

7. List the hardware specifications for Multimedia.

8. Define software.

9. What is meant by Bid Proposals?

10. "Scheduling can be difficult for multimedia projects"- Justify with two reasons.

Part B

$(5 \times 5 = 25)$

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

11. (a) List any five uses of multimedia.

Or

(b) Discuss briefly the attributes of font.

12. (a) Write notes on adding Sound to Multimedia Projects.

Or

(b) Give a brief note on MIDI.

13. (a) Discuss how to create animation in multimedia project.

Or

(b) Describes the principles of animations.

14. (a) Discuss the various requirements to make Multimedia.

Or

(b) Write a note on the job of project manager.

15. (a) Discuss the role of design in multimedia.

Or

(b) Brief note on scheduling the multimedia projects.

Part C

$(3 \times 10 = 30)$

Answer any **three** questions.

16. Discuss using text in Multimedia.

17. Elaborate on various audio file formats used in multimedia.

18. Discuss the general principles and factors that apply to creating computer animations for multimedia presentations

19. Explain how multimedia hardware and software is used in a multimedia environment.

20. Summarize the process of making multimedia projects.

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S–0217

Sub. Code
23BCAA3

U.G. DEGREE EXAMINATION, NOVEMBER 2025.

Computer Application

Allied – DISCRETE MATHEMATICS

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

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

Answer **all** the questions.

1. What is a Cartesian product? Give an example.

2. What is bijection?

3. Define conditional statement.

4. Construct the truth table of $p \wedge q$.

5. Define normal form.

6. What is universal quantifier?

7. Define Graph.

8. What is degree of a vertex?

9. Write the distributive law of Boolean algebra.

10. What is spanning tree?

Part B (5 × 5 = 25)

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

11. (a) Construct a Venn diagram for $A \cap (B \cup C)$.

Or

(b) Briefly explain relation and function with examples.

12. (a) What is meant by contradiction in logic? Give an example.

Or

(b) Construct the truth table for $(P \to Q) \wedge (Q \to P)$.

13. (a) Obtain Principal Conjunctive Normal Forms of $(\neg P \to R) \wedge (Q \leftrightarrow P)$.

Or

(b) Show that

$$\forall x(P(x) \to Q(x)) \wedge \forall x(Q(x) \to R(x)) \Rightarrow \forall x(P(x) \to R(x))$$

14. (a) What is adjacency matrix? Explain with examples.

Or

(b) Define simple and complete graph. Give an example with explanation.

15. (a) Write short notes on Boolean functions.

Or

(b) Find minimal spanning tree using Kruskal's algorithm with an example.

Part C

$(3 \times 10 = 30)$

Answer any **three** questions.

16. Explain the properties of relations with examples.

17. Define the following with examples.

    (a) Atomic and compound statements.

    (b) Well-formed formula.

    (c) Tautology.

18. Obtain disjunctive normal forms of a

    (a) $P \wedge (P \rightarrow Q)$

    (b) $\neg (P \vee Q) \rightarrow (P \wedge Q)$.

19. Explain isomorphism, subgraph and bipartite graph with neat diagrams.

20. Explicate the step-by-step procedure to find the minimal spanning tree using Prim's algorithm with an example.

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S–0218

Sub. Code
23BCAA4

U.G. DEGREE EXAMINATION, NOVEMBER 2025.

Computer Application

Allied – STATISTICS METHOD AND ITS APPLICATIONS

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. Define statistics.

2. What is the difference between census and sample survey?

3. Define median.

4. Write the formula for arithmetic mean.

5. What is meant by coefficient of variation?

6. Define quartile deviation.

7. What is skewness in statistics?

8. Write the formula for Karl Pearson's coefficient of skewness.

9. Define regression.

10. What is meant by regression coefficient?

Part B (5 × 5 = 25)

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

11. (a) Explain the methods of collection of statistical data.

Or

(b) Discuss the various sources of data with examples.

12. (a) Calculate the arithmetic mean for the given data:

Class:	0-10	10-20	20-30	30-40	40-505
Frequency :	5	7	12	10	6

Or

(b) Explain the merits and demerits of median.

13. (a) Explain the computation of Karl Pearson's coefficient of variation.

Or

(b) Calculate the coefficient of variation for the following data:

Mean = 50, Standard deviation = 5.

14. (a) Define and explain moments about mean.

Or

(b) Explain the significance of skewness and kurtosis in data analysis.

15. (a) Explain the properties of regression coefficients.

Or

(b) Write short notes on uses of regression analysis in business.

Part C

$(3 \times 10 = 30)$

Answer any **three** questions.

16. Explain the methods of classification and tabulation of statistical data with suitable examples.

17. From the following data, calculate the mean, median and mode:

Marks:	0-10	10-20	20-30	30-40	40-50
Frequency :	5	9	12	10	4

18. Calculate the coefficient of skewness using Karl Pearson's method from the following data:

Mean = 200, Median = 180, Standard deviation = 50.

19. Calculate both regression equations for the following data and estimate Y when X 40:

X:	20	25	30	35	40
Y :	10	15	20	25	30

20. Explain the computation of correlation coefficient using Karl Pearson's method with a suitable example.

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S–0219

Sub. Code
23BCAA5

U.G. DEGREE EXAMINATION, NOVEMBER 2025.

Computer Application

Allied – GRAPH THEORY AND ITS APPLICATIONS

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

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

Answer **all** the questions.

1. What is a subgraph?

2. Define Hamiltonian path.

3. Define connectivity.

4. What is a combinatorial graph?

5. State the four colour problem.

6. What is matching in graph theory?

7. What is incidence matrix?

8. Define Euler's circuit.

9. State the Travelling Salesman Problem.

10. Mention one real-life application of shortest path algorithm.

Part B

$(5 \times 5 = 25)$

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

11. (a) Write short notes on properties of trees.

Or

(b) Illustrate rooted and binary trees with an example.

12. (a) Differentiate between connectivity and separability.

Or

(b) Explain 1-isomorphism with a suitable diagram.

13. (a) Define and explain chromatic number with an example.

Or

(b) Explain types of directed graphs.

14. (a) Explain Kruskal's algorithm with a neat example.

Or

(b) Write notes on subgraphs and quotient graphs.

15. (a) Summarize the shortest path problem in directed graphs.

Or

(b) Discuss connected components with an example.

Part C

$(3 \times 10 = 30)$

Answer any **three** questions.

16. Define the following with examples.

    (a) Walks and Paths

    (b) Components

    (c) Distance and Centres.

17. What is planar graphs? Explain the different representations of planar graphs with examples.

18. Define directed graphs. Explain the different types of directed graphs with examples.

19. Discuss the step-by-step procedure for Prim's algorithm to find the shortest spanning tree with neat example.

20. Write a detailed note on graph colouring applications with examples.

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S–0220

Sub. Code
23BCAA6

U.G. DEGREE EXAMINATION, NOVEMBER 2025.

Computer Application

Allied – COMPUTER ORIENTED NUMERICAL METHODS

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

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

Answer **all** the questions.

1. Define Bisection method.

2. Write the formula for Newton-Raphson method.

3. What is Gauss-Seidel method used for?

4. Define Lagrange's interpolation formula.

5. Differentiate between forward and backward differences.

6. State any two applications of numerical differentiation.

7. What is Taylor's series method used for?

8. Define Modified Euler's method.

9. Write the formula for Trapezoidal rule.

10. What are multi-step methods in numerical analysis?

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

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

11. (a) Explain the Fixed Point Iteration method with an example.

Or

(b) Solve the equation $x^3 - x - 1 = 0$ using one iteration of the Newton—Raphson method.

12. (a) Apply Gauss-Seidel method to solve a given system of equations.

Or

(b) Explain the concept of interpolation at equal intervals with an example.

13. (a) Derive Newton's forward difference interpolation formula.

Or

(b) Using backward difference formula, find the value of y for $x = 2.5$ from given data.

14. (a) Derive the formula for numerical differentiation using interpolation polynomials.

Or

(b) Explain Simpson's 1/3 rule with an example.

15. (a) Using Modified Euler's method, solve $y' = y - x$ for one step.

Or

(b) Explain Runge-Kutta method for solving first-order ODEs.

Part C

$(3 \times 10 = 30)$

Answer any **three** questions.

16. Solve $x^3 - 4x - 9 = 0$ using Bisection method up to three iterations.

17. Apply Jacobi's method to solve a given system of linear equations and discuss convergence.

18. Use Lagrange's interpolation formula to find y at $x = 3$ from given data points.

19. Derive and apply Trapezoidal and Simpson's rules to evaluate: $\int_0^1 e^x dx$.

20. Solve the IVP $y' = x + y,\ y(0) = 1$ using Runge-Kutta 4^{th} order method for $h = 0$.

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S–0221

Sub. Code
23BCA3C1

B.C.A. DEGREE EXAMINATION, NOVEMBER 2025

Third Semester

Computer Application

DATA STRUCTURES AND ALGORITHMS

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

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

Answer **all** the questions.

1. Define Abstract Data Type (ADT).

2. Mention the difference between singly linked list and doubly linked list.

3. List any two applications of stack.

4. Convert the infix expression (A + B) * C into postfix.

5. Define AVL tree.

6. What is a threaded binary tree?

7. Define cut vertex in a graph.

8. What is topological sorting?

9. Write the difference between linear search and binary search.

10. What is hashing? Mention any two hash functions.

Part B (5 × 5 = 25)

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

11. (a) Explain the array-based implementation of a list.

Or

(b) Write short notes on polynomial manipulation using linked list.

12. (a) Write an algorithm for evaluating postfix expression.

Or

(b) Illustrate the working of a circular queue with an example.

13. (a) Describe binary tree traversals with an example.

Or

(b) Construct an expression tree for ((A + B) * (C – D)) and show inorder, preorder, and postorder traversals.

14. (a) Explain Breadth First Traversal (BFS) with example.

Or

(b) Write short notes on Euler circuits.

15. (a) Expound the insertion sort with example.

Or

(b) Discuss open addressing method in hashing.

Part C

$(3 \times 10 = 30)$

Answer any **three** questions.

16. Explain in detail the operations on circular linked lists with examples.

17. Explain in detail the conversion of infix to postfix expression with an algorithm and example.

18. Construct an AVL tree for the sequence of insertions: 10, 20, 30, 25, 28, 27, 5. Show all rotations.

19. Explain depth-first search (DFS) and topological sorting with examples.

20. Discuss the various sorting techniques and analyze their time complexities.

S–0222

Sub. Code
23BCA3S1

B.C.A. DEGREE EXAMINATION, NOVEMBER 2025

Third Semester

Computer Application

SOFTWARE TESTING

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. Define software testing.

2. List any two differences between testing and debugging.

3. State the importance of productivity in testing.

4. Explain the term path instrumentation.

5. List two advantages of transaction flow testing.

6. Differentiate between domain testing and path testing.

7. Define interface testing.

8. Summarize the role of metrics in software testing.

9. Define decision tables in logic-based testing.

10. Explain the concept of state testing with example.

Part B (5 × 5 = 25)

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

11. (a) Apply the model of bugs and types of bugs to a real-world system.

Or

(b) Demonstrate the effectiveness of different testing design styles.

12. (a) Explain path testing techniques to a given control flow graph.

Or

(b) Demonstrate the limitations of transaction flow testing.

13. (a) Clarify the domain testing strategies with suitable example.

Or

(b) Analyze the role of interface testing in ensuring system reliability.

14. (a) Apply syntax testing formats to identify defects in source code.

Or

(b) Evaluate the impact of path products and path expressions in testing.

15. (a) Clarify the concept of decision table testing for validating business rules.

Or

(b) List out the challenges of transition testing in large systems.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Evaluate the strengths and weaknesses of testing vs debugging in software development.

17. Assess the applicability of transaction flow testing techniques in safety-critical systems.

18. Design a comprehensive test plan using domain and path testing strategies.

19. Evaluate the role of metrics and test cases in improving software quality.

20. Propose a framework integrating decision table testing and state testing for enterprise applications.

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S–0223

Sub. Code
23BCA3S2

B.C.A. DEGREE EXAMINATION, NOVEMBER 2025

Third Semester

Computer Application

BIOMETRICS

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** the questions.

1. Define biometrics and list any two biometric traits.

2. Identify any two error measures in biometric systems.

3. Summarize the importance of performance measures in biometric authentication.

4. Define face detection in the context of biometrics.

5. Differentiate between iris recognition and retina recognition.

6. List any two applications of fingerprint biometrics.

7. Explain the term privacy concern in biometrics.

8. State the advantages of multimodal biometrics.

9. Define watermarking in biometric systems.

10. Describe the role of RFID in biometrics.

Part B (5 × 5 = 25)

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

11. (a) Apply the general architecture of a biometric system to illustrate its working.

Or

(b) List out the advantages and disadvantages of face recognition methods.

12. (a) Apply the Iris segmentation method for identifying the iris region.

Or

(b) Clarify the performance of fingerprint recognition with minutiae extraction.

13. (a) Demonstrate how privacy can be enhanced using biometrics.

Or

(b) Compare soft biometrics with traditional biometrics in terms of privacy.

14. (a) Apply multimodal biometrics using face and ear for authentication.

Or

(b) Write a note on the characteristics and advantages of multimodal biometrics.

15. (a) Demonstrate the process of image watermarking for biometric protection.

Or

(b) Examine the attacks on spatial domain watermarking techniques.

Part C

$(3 \times 10 = 30)$

Answer any **three** questions.

16. Evaluate the effectiveness of biometric systems over traditional authentication methods.

17. Assess the challenges of face recognition in video sequences.

18. Design an experimental model for fingerprint recognition using minutiae extraction.

19. Evaluate the performance of different watermarking techniques for biometric data protection.

20. Propose a framework for biometric standards and template interoperability.

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S–0224

Sub. Code
23BCA4C1

B.C.A. DEGREE EXAMINATION, NOVEMBER 2025

Fourth Semester

Computer Application

PROGRAMMING IN JAVA

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. What is Java Virtual Machine and how does it work?

2. What is a variable in Java, and how is it declared?

3. Define Packages in Java.

4. What is the use of Final Keyword in Java?

5. Define Deadlock.

6. What is the purpose of file handling in Java?

7. What are the essential methods for working with a Frame object?

8. What are event sources and event listeners?

9. What is the purpose of a Swing component hierarchy?

10. What are some common event listeners used with Swing components?

Part B (5 × 5 = 25)

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

11. (a) Explain in brief the multi-dimensional array in java with suitable example.

Or

(b) Describe in detail on Operators used in expressions.

12. (a) Write short notes on Built-in Exceptions in Java.

Or

(b) How do access modifiers affect package visibility? Explain briefly.

13. (a) What is a deadlock? How can you prevent and detect deadlocks?

Or

(b) Explain the steps involved in reading from and writing to files in Java. What are some common file operations?

14. (a) Explain briefly on the different layout managers available in AWT.

Or

(b) How can you handle mouse events (e.g., clicks, drags) and keyboard events (e.g., key presses) in AWT?

15. (a) How can you use a JScrollPane to display content that exceeds the visible area?

Or

(b) What are some common event listeners used with Swing components?

Part C

$(3 \times 10 = 30)$

Answer any **three** questions.

16. Write a simple Java program to demonstrate basic concepts like variable declaration, input/output, and control flow?

17. What is exception handling in java? Explain in detail creating own exception classes with suitable example.

18. Why is synchronization necessary in multithreaded programs? Explain the difference between synchronized methods and synchronized blocks.

19. Describe the event delegation model in AWT. How does it work?

20. Describe in detail on JFrames and JWindows.

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S–0225

Sub. Code
23BCA4S1

B.C.A. DEGREE EXAMINATION, NOVEMBER 2025

Fourth Semester

Computer Application

PHP PROGRAMMING

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. What is XAMPP?

2. Explain the scope of PHP in web development.

3. How do you write a basic PHP script?

4. What are PHP data types?

5. What is a switch statement in PHP?

6. What is the purpose of PHP functions?

7. How do you read a file in PHP?

8. What are the basic file operations in PHP?

9. What is a session in PHP?

10. How do you destroy a session in PHP?

Part B (5 × 5 = 25)

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

11. (a) Explain the steps to install XAMPP and WAMP.

Or

(b) How does PHP differ from other web development languages?

12. (a) Discuss the different operators available in PHP.

Or

(b) Describe the process of understanding and using PHP variables.

13. (a) Discuss how to create and modify arrays in PHP.

Or

(b) Describe how arrays can be processed with loops in PHP.

14. (a) Discuss the security considerations when handling file operations in PHP.

Or

(b) Explain the significance of advanced file handling in PHP.

15. (a) Describe the process of managing sessions in PHP.

Or

(b) How can data be stored in cookies in PHP and what are the benefits?

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Discuss the importance of PHP in modern web development, including its scope and applications.

17. Discuss PHP variables, their data types and how they are used in web development.

18. Make a detailed note on loops in PHP. Write their advantages and typical use cases.

19. Discuss in detail the process of reading and writing files in PHP, including error handling and security considerations.

20. Make a detailed note on "Sessions" and "cookies" in PHP.

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S–0226

Sub. Code
23BCA4S2

B.C.A. DEGREE EXAMINATION, NOVEMBER 2025

Fourth Semester

Computer Application

CYBER FORENSICS

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. Name two types of business computer forensic Technologies.

2. What are the benefits of professional forensic methodology?

3. What is the role of back-up in data recovery?

4. What is the chain of custody in digital evidence?

5. What are the processing steps involved in preserving digital evidence?

6. What are the legal aspects of collecting computer forensic evidence?

7. What is electronic document discovery in computer forensics?

8. Define forensic identification in the context of digital evidence.

9. What are useable file formats in digital forensics?

10. Write the key steps in documenting the destruction of data?

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

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

11. (a) Describe the steps taken by computer forensics specialists during an investigation.

Or

(b) Discuss the different types of military computer forensic technologies.

12. (a) Discuss the challenges faced in evidence collection and data seizure.

Or

(b) Describe the importance of controlling contamination in the chain of custody.

13. (a) Discuss the practical considerations in computer image verification.

Or

(b) Describe the practical implementation of digital evidence preservation.

14. (a) Explain the process of electronic document discovery as a litigation tool.

Or

(b) Discuss the challenges of handling electronic evidence in forensic analysis.

15. (a) Explain the process of reconstructing past events in digital forensics.

Or

(b) Describe the importance of system testing in ensuring the integrity of digital forensic processes.

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

Answer any **three** questions.

16. Explain the overall impact of computer forensics on modern investigative practices, including its applications in various fields.

17. Discuss the comprehensive process of evidence collection, seizure, and preservation in computer forensics, emphasizing the importance of the chain of custody.

18. Evaluate the importance of duplicating and preserving digital evidence in forensics, considering both technical and legal challenges.

19. Explain the techniques used in the forensic identification and analysis of technical surveillance devices, emphasizing the role of "time travel."

20. Evaluate the methods used to reconstruct past events in digital forensics, including the handling of different file formats and network forensics.

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S–0227

Sub. Code
23BCA5C1

B.C.A. DEGREE EXAMINATION, NOVEMBER 2025

Fifth Semester

Computer Application

OPERATING SYSTEMS

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. Define an operating system.

2. What is a Process Control Block (PCB)?

3. State Peterson's algorithm.

4. Define semaphore.

5. List the four necessary conditions for deadlock.

6. What is Banker's Algorithm used for?

7. Define preemptive scheduling.

8. What is Round Robin scheduling?

9. State the difference between paging and segmentation.

10. What is demand paging?

Part B (5 × 5 = 25)

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

11. (a) Explain the life cycle of a process with a neat diagram.

Or

(b) Summarize the role of interrupts in process management.

12. (a) Illustrate Lamport's Bakery Algorithm with an example.

Or

(b) Describe the working of counting semaphores.

13. (a) Illustrate deadlock prevention strategies.

Or

(b) Compare deadlock avoidance and detection.

14. (a) Outline the different scheduling levels in operating systems.

Or

(b) Elaborate FIFO and SJF scheduling algorithms with examples.

15. (a) Describe the memory hierarchy with a neat diagram.

Or

(b) Illuminate paging and segmentation concepts with examples.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Analyze the various functions of an operating system in managing processes, memory and I/O.

17. Demonstrate the working of semaphores with a programmatic example for process synchronization.

18. Evaluate the effectiveness of Banker's algorithm in handling deadlocks with an example.

19. Examine the performance of any two CPU scheduling algorithms.

20. Assess the importance of virtual memory and compare page replacement strategies.

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S–0228

Sub. Code
23BCA5C2

B.C.A. DEGREE EXAMINATION, NOVEMBER 2025

Fifth Semester

Computer Application

ASP. NET PROGRAMMING

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** the questions.

1. What is the purpose of the Common Language Runtime (CLR)?

2. What is the difference between int and float data types?

3. Mention any two languages supported by ASP.NET.

4. What is the use of the ASP.NET IDE?

5. Give one example of a validation control in ASP.NET.

6. Write the syntax for opening a file using FileStream.

7. Define DataReader in ADO.NET.

8. Write one property of the SqlDataAdapter class.

9. What is the use of the AllowPaging property in GridView?

10. What is the difference between authentication and authorization?

Part B (5 × 5 = 25)

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

11. (a) Write a program in C# to find the largest of three numbers.

Or

(b) Explain how arrays are created and accessed in C#.

12. (a) Write about the properties and events of the TextBox control.

Or

(b) Explain the use of the Button and Label controls with examples.

13. (a) Explain different validation controls in ASP.NET with examples.

Or

(b) Write a program in C# to copy the contents of one file to another.

14. (a) Explain how to establish a database connection using SqlConnection.

Or

(b) Explain the use of DataAdapter in data manipulation.

15. (a) Explain the steps for sorting and paging in Grid View.

Or

(b) Write a program to read data from an XML file in ASP.NET.

Part C

$(3 \times 10 = 30)$

Answer any **three** of the following.

16. Explain in detail the structure of a C# program with a suitable example.

17. Explain the architecture of ASP.NET and the use of IDE for web application development.

18. Discuss the properties and working of different validation controls.

19. Explain the architecture of ADO.NET and its components.

20. Explain the steps to implement GridView control in ASP.NET with editing and deleting options.

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S–0229

Sub. Code
23BCA5E1

B.C.A. DEGREE EXAMINATION, NOVEMBER 2025

Fifth Semester

Computer Application

Elective – DATABASE MANAGEMENT SYSTEM

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. What are the differences between data and information?

2. List out any two problems of traditional file systems.

3. Define primary key and foreign key.

4. What is an ER diagram?

5. Define First normal form.

6. Write the difference between DDL and DML.

7. Mention any two relational set operators.

8. What is a correlated subquery?

9. Define cursor in PL/SQL.

10. List out the two types of exceptions in PL/SQL.

Part B (5 × 5 = 25)

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

11. (a) Write short note on the importance of data models in DBMS.

Or

(b) Discuss on degrees of data abstraction with neat diagram.

12. (a) Explain the relational integrity rules with examples.

Or

(b) Draw an ER diagram for a college database.

13. (a) Illustrate the normalization process up to 3NF with example.

Or

(b) Write SQL queries for DDL and DML with examples.

14. (a) Explain natural join, and outer join with examples.

Or

(b) Write a note on SQL functions: numeric and string functions.

15. (a) Enumerate implicit and explicit cursors in PL/SQL with examples.

Or

(b) Write a PL/SQL block to demonstrate exception handling.

Part C

$(3 \times 10 = 30)$

Answer any **three** questions.

16. Explain in detail the evolution of data models with examples.

17. Discuss the various relational set operators.

18. Illustrate the need for higher level normal forms.

19. Write brief note on subqueries and correlated queries with examples.

20. Write a PL/SQL program to calculate student grades using cursors and exception handling.

S–0230

Sub. Code
23BCA5E2

B.C.A. DEGREE EXAMINATION, NOVEMBER 2025

Fifth Semester

Computer Application

Elective – NATURAL LANGUAGE PROCESSING

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. Define Natural Language Processing (NLP).

2. What is meant by N-gram language model?

3. Write two examples of regular expressions.

4. Define Part-of-Speech (POS) tagging.

5. What is lexical semantics?

6. Define word sense disambiguation.

7. What are the major issues in Machine Translation?

8. Expand and define NLG.

9. What is stemming? Give one example.

10. Write any two features of Information Retrieval systems.

Part B (5 × 5 = 25)

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

11. (a) Explain the role of probability in language modeling.

Or

(b) Write a note on Information theory in NLP.

12. (a) Explain finite state automata with an example.

Or

(b) Discuss the concept of context-free grammar in syntactic analysis.

13. (a) Explain ambiguity in semantics with suitable examples.

Or

(b) Write a short note on discourse coherence and structure.

14. (a) Explain the architecture of a Natural Language Generation (NLG) system.

Or

(b) Discuss the main challenges in Machine Translation of Indian languages.

15. (a) Explain the role of lexical resources in NLP with examples.

Or

(b) Write short notes on POS tagging techniques.

Part C

$(3 \times 10 = 30)$

Answer any **three** questions.

16. Discuss in detail various language models. How are they evaluated?

17. Explain in detail the morphological parsing process with examples.

18. Explain different methods of semantic analysis and word sense disambiguation.

19. Write an essay on Machine Translation: architecture, challenges, and solutions.

20. Explain Information Retrieval Systems: classical, non-classical, and alternative models with their evaluation.

S–0231

Sub. Code
23BCA5E3

B.C.A. DEGREE EXAMINATION, NOVEMBER 2025

Fifth Semester

Computer Application

Elective – INTERNET OF THINGS AND ITS APPLICATIONS

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. What is meant by Internet of Things Today?
2. Mention two directions towards the IoT Universe.
3. What is standards consideration in IoT?
4. Define IoT Value Chain.
5. What is a reference model in IoT?
6. Define IoT Reference Architecture.
7. What is Brownfield IoT?
8. Write one IoT application in Retail Industry.
9. What is IoT Governance?
10. Define IoT Privacy.

Part B (5 × 5 = 25)

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

11. (a) Explain the importance of Time for Convergence in IoT.

Or

(b) Explain the concept of Privacy and Trust in IoT.

12. (a) Explain the differences between M2M and IoT.

Or

(b) Discuss the impact of IoT Value Chains in industries.

13. (a) Explain the need for operational view in IoT systems.

Or

(b) Write about the Information View with a suitable example.

14. (a) Explain IoT applications in Future Factory Concepts.

Or

(b) Discuss IoT in Home Management with examples.

15. (a) Explain the importance of Governance in IoT.

Or

(b) Describe the use of Smartie Approach in IoT systems.

Part C

$(3 \times 10 = 30)$

Answer any **three** questions.

16. Discuss the evolution towards the IoT Universe with examples.

17. Explain the main design principles of IoT with suitable examples.

18. Discuss the IoT Reference Architecture and its layers.

19. Discuss in detail IoT applications for Industry 4.0.

20. Explain in detail the Privacy and Security issues in IoT.
