2025

(Session : 2020-23 & 2021-24)

Time : 3 hours

Full Marks : 70

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Answer from both the Sections as directed.

Section – A

Answer any **four** questions of the following : 10×4 = 40

1. What is Boolean algebra ? State and prove any four basic laws of Boolean algebra with truth table and examples.

2. What is a full adder ? Design a full adder circuit and its truth table. Deduce the expression for sum and carry too using K-map.

3. What are the basic rules of constructing a K-map ? Simplify F (A, B, C, D) = Σ (0, 2, 3, 7, 8, 10, 11, 12, 13, 15) and draw its circuit diagram using only basic gates.

4. What is a multiplexer ? Explain the working of an 8-to-1 multiplexer with a block diagram and truth table.

5. What is a counter ? Explain the working of a 3-bit binary ripple counter and 4-bit synchronous counter using J-K flip-flop.

6. What are universal gates ? Draw the circuit diagram of all the basic gates using only universal gates ?

7. What is a J-K flip-flop ? Explain its working principle with a truth table, timing diagram and logic symbol. Mention its applications in digital circuits.

8. Explain standard and canonical form. Obtain canonical SOP and POS of the expression : F = ABC + ACD + ABD

Section – B

Answer **all** questions of the following : $3 \times 10 = 30$

9. Differentiate between Minterm and Maxterm using suitable examples.

10. Discuss briefly the working of 4-bit serial-in-serial-out shift register using block diagram.

11. What are clocked sequential circuits ?

12. What is a decoder ?

13. Draw the truth table expressions and symbol of exclusive OR-gate.

14. What are signed binary numbers ?

15. State De Morgan's laws and verify them using truth tables.

16. Perform the subtraction using 2's complement method :

    A = 1010 from B = 1100

17. Convert the following decimal number into its binary equivalent : $(25.625)_{10}$.

18. Prove that $(A + B) . (\bar{A} + B) = B$.

 UG — BCA (F – 2001)

2025
(Session : 2020-23 & 2021-24)

Time : 3 hours

Full Marks : 70

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Answer from both the Sections as directed.

Section – A

Answer any **four** questions of the following : 10×4 = 40

1. For a finite dimensional vector space V (F), any two bases have same number of elements.

2. Show that every finite integral domain is a field.

3. Show that the set $R = \{a + b\sqrt{2} : a, b \in Q\}$ is a ring under the usual addition and multiplication as binary compositions.

4. Show that the vectors (2, 1,4) (1, – 1, 2) and (3, 1, – 2) form a basis of R^3.

5. Find the eigenvalues and the eigenvectors of the matrix :

$$\begin{bmatrix} 1 & 2 & 3 \\ 0 & 2 & 3 \\ 0 & 0 & 2 \end{bmatrix}$$

6. Show that the following system of linear equations is not consistent :

$x + y + z = -3$

$3x + y - 2z = -2$

$2x + 4y + 7z = 7$

7. Find the equation of the sphere through the points (4, – 1, 2) (0, – 2, 3) (1, 5, – 1) and (2, 0, 1).

8. Find the length of shortest distance between the lines $\frac{x-3}{2} = \frac{y-4}{1} = \frac{z+1}{-3}$ and $\frac{x-1}{-1} = \frac{y-3}{3} = \frac{z-1}{2}$. Also find its equation and the points where it intersect the lines.

Section – B

Answer **all** questions of the following : $3 \times 10 = 30$

9. Define subgroup of a group.

10. In the multiplicative group $G = (1, -1, i, -i)$ find the order of i.

11. Define a basis of a vector space.

12. Define quadratic form and give an example.

13. If l, m, n are direction cosines of a line, show that $l^2 + m^2 + n^2 = 1$.

14. State vector subspace with example.

15. Define linear independent of vectors.

16. Define singular and non-singular matrices.

17. Write down a matrix of order three in Echelon form.

18. Determine the relation between Cartesian and Polar spherical coordinates of a point.

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 UG — BCA (F – 2002)

2025

(Session : 2020-23 & 2021-24)

Time : 3 hours

Full Marks : 70

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Answer from both the Groups as directed.

Group – A

Answer any **four** questions of the following : 10×4 = 40

1. What is Air Pollution ? Classify the different types of air pollutants and write its impact on human health.

2. Define the term 'Environment'. Give an account of biotic and abiotic components of the environment.

3. What do you understand by Waste water treatment ? Explain the various treatment process of waste water.

4. Define the term ecosystem. Explain the components and functions of forest ecosystem.

5. What do you mean by Smog ? Explain the Photochemical Smog and Sulphurous Smog.

6. Define Aquatic Ecosystem. Explain the major types of aquatic ecosystem with examples.

7. What is Water Pollution ? Describe the major water pollutants and its effects on aquatic ecosystem.

8. What is meant by term Rainwater Harvesting ? Discuss about the significance of Rain water harvesting and Watershed management.

Group – B

Answer **all** questions of the following : 3×10 = 30

9. Differentiate between Food chain and Food web.

10. What is Greenhouse effect and Ozone layer depletion ?

11. What do you mean by Acid rain and Global warming ?

12. Write a short note on Water (Pollution and Control) Act.

13. What is Biogeochemical cycle ?

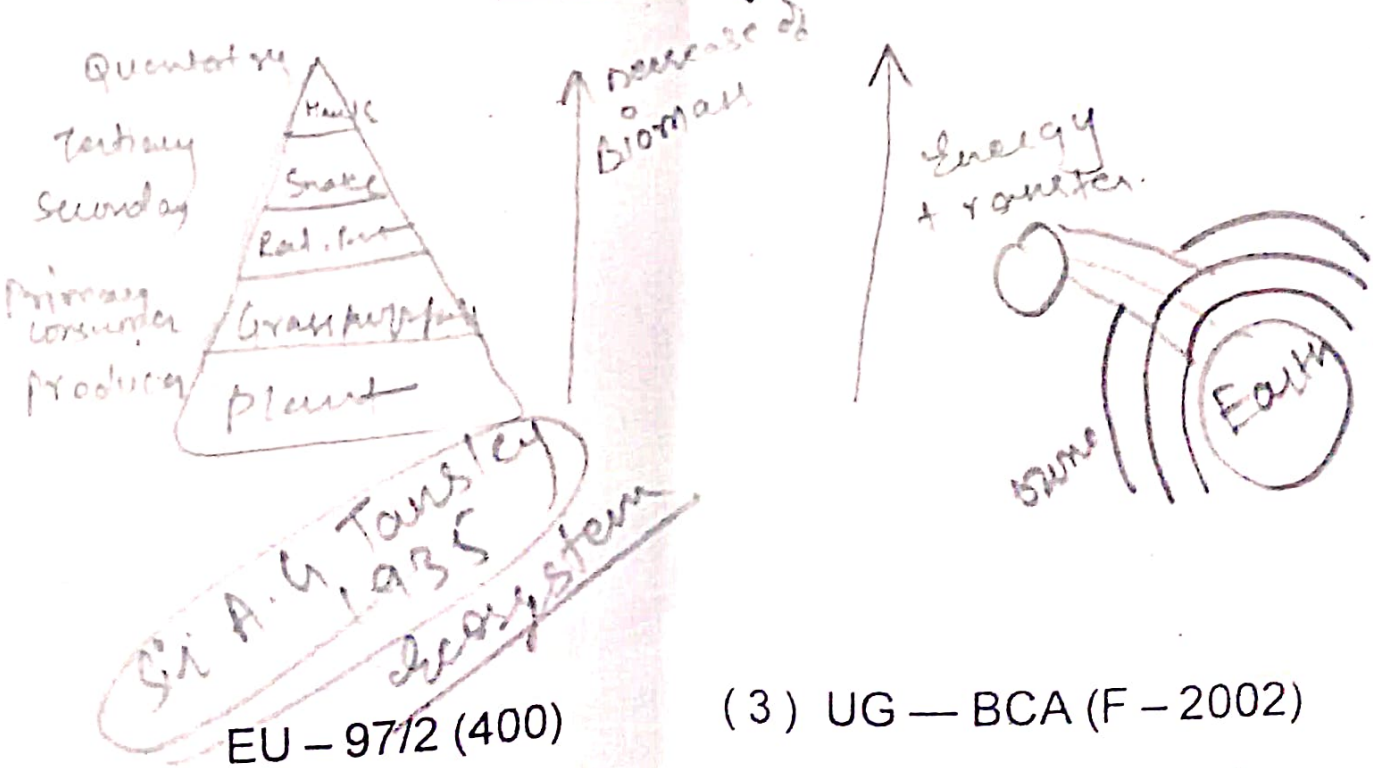
14. What is Human Rights and Value education ?

15. Define biotransformation of toxicants or pollutants.

16. What do you mean by multidisciplinary nature of environmental science ?

17. Differentiate between Biotic and Abiotic components of an ecosystem.

18. Write a short note on Ecological pyramid.



UG — BCA
(C – 2003)

2025

(Session : 2020-23 & 2021-24)

Time : 3 hours

Full Marks : 70

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Answer from both the Sections as directed.

Section – A

Answer any **four** questions of the following : 10×4 = 40

1. Explain the limitations of the traditional file-based system and discuss how the Database Management System (DBMS) addresses these limitations.

2. Describe the three-level architecture of a DBMS and explain the significance of each level in ensuring data independence and security.

3. Define Data Model. Compare relational, network and hierarchical models in detail

4. Define Relational algebra. What are different relation algebra operations in DBMS ? Explain with suitable example.

5. What is E-R diagram ? Draw the ER diagram of University Management System by taking necessary considerations.

6. What is normalization ? Discuss and compare 3NF with BCNF.

7. What is concurrency control ? Discuss various locking techniques used in the concurrency control.

8. Discuss the various categories of SQL commands and explain their roles in managing a relational database.

Section – B

Answer **all** questions of the following : 3×10 = 30

9. What is data dictionary ?

10. Define views.

11. Discuss the concept of Referential Integrity.

12. What is the cardinality of a relation in an E-R diagram ?

13. Differentiate between Candidate key and Primary key.

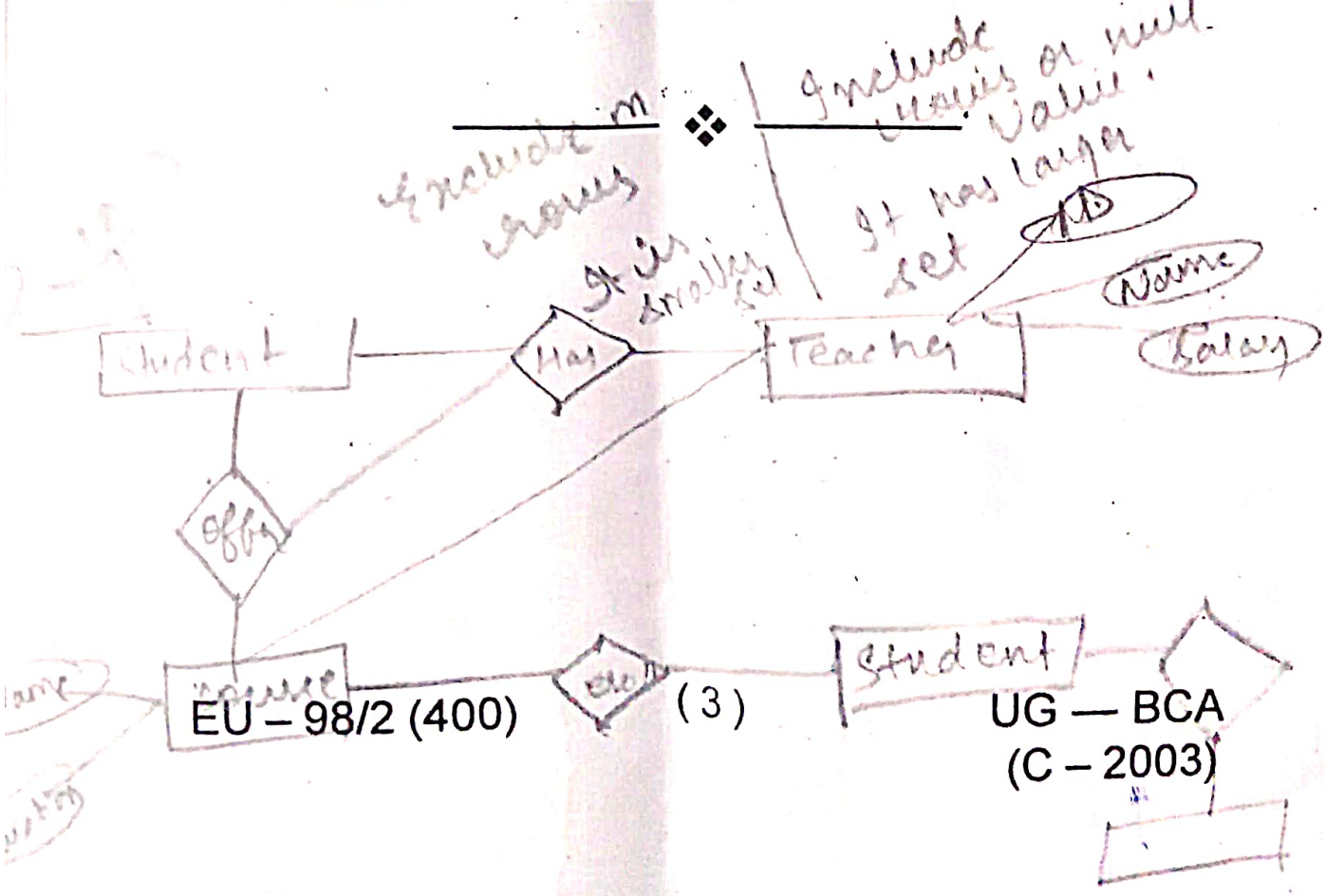
14. Define functional dependency.

15. Define ACID properties in database.

16. What is Codd's rule ?

17. Differentiate between Inner Join and Outer Join.

18. Compare and contrast the GROUP BY and HAVING clauses in SQL.



UG — BCA
(C – 2004)

2025

(Session : 2020-23 & 2021-24)

Time : 3 hours

Full Marks : 70

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Answer from both the Sections as directed.

Section – A

Answer any **four** questions of the following : 10×4 = 40

1. Differentiate between Procedural programming and Object oriented programming. Detail the essential features of object-oriented programming.

2. Define a conditional statement. List and explain the different forms of the IF statement, giving an example for each one.

3. Develop a program to instantiate a Student class, which will contain Roll, Name and Marks as its data members. The class must include get_data() and show_data() member functions for input and output, respectively. The program should store the records for the three student objects and subsequently print the data for all students whose marks are under 40.

4. What are constructors and destructors ? What is the utility of constructor overloading, and how is it implemented with a suitable example ?

5. Explain the fundamental difference between early binding and late binding. Provide a code demonstration of how dynamic binding is achieved specifically using virtual functions.

6. Explain the concept of operator overloading. Create a program in C++ that defines a Distance class and overloads the binary addition operator '+' to enable the summation of two Distance objects.

7. Explain the concept of generic programming. Describe the characteristics of class templates and function templates, and demonstrate their implementation with suitable code examples.

8. Write a C++ program that utilizes file handling to read all the information from the file abc.txt and then output that same information to a second file named bcd. txt.

Section – B

Answer **all** questions of the following : 10×3 = 30

9. Write a program to add N numbers using command line argument.

10. Define friend function.

11. What are static members and static member functions ?

12. Differentiate between Method overloading and Method overriding.

13. What is an abstract class and when do you use it ?

14. What are the C++ access specifiers ?

15. Define multiple inheritance.

16. What is an exception ?

17. Create a program in C++ to find out if a year is a leap year without relying on any conditional statements.

18. Define new operator in C++.