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## **B.C.A. IVth Semester Examination, 2023**

## **DISCRETE MATHEMATICS**

**Paper : BCA-401**

*Time : 3 Hours ]*

[ M.M. : 70

**Note :-** Answer any five questions. All questions carry equal marks.

1. (a) State and prove DeMorgan's law on set.  
(b) Let  $A = \{1, 2, 3\}$  and let  $R$  and  $S$  be the relations on  $A$  such that :

$$M_R = \begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 0 \\ 0 & 0 & 0 \end{bmatrix} \text{ and } M_S = \begin{bmatrix} 0 & 1 & 1 \\ 1 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

Find :



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2. Define equivalence relation. Let R and S be relation from A to B, show that :

(i) if  $R \subseteq S$ , then  $R^{-1} \subseteq S^{-1}$

(ii)  $(R \cap S)^{-1} = R^{-1} \cap S^{-1}$

(iii)  $(R \cup S)^{-1} = R^{-1} \cup S^{-1}$

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3. Define composition function. If  $f : A \rightarrow B$  and  $g : B \rightarrow C$  be one-one and onto functions, then show that  $g \circ f$  is also one-one and onto also verify :

$$(g \circ f)^{-1} = f^{-1} \circ g^{-1}$$

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4. (a) Define permutation group. If :

$$f = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 2 & 3 & 4 & 1 \end{pmatrix}$$

and  $g = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 4 & 3 & 1 & 2 \end{pmatrix}$

then show that  $fg \neq gf$ .

7,7

(b) State and prove cancellation law of group.

5. Define Group. Show that  $\langle \{1, 2, 3, 4, 5, 6\}, X_7 \rangle$  form an abelian group. Also check is it cyclic group or not. If yes, then find its all generators.

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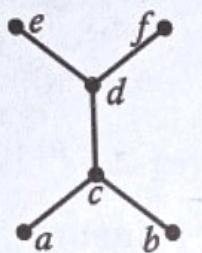
6. Define partial ordered Set. Let :

$$A = \{1, 2, 3, 4, 6, 8, 9, 12, 18, 24\}$$

be ordered by the relation ' $x$  divides  $y$ '. Find the  
Hasse diagram.

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7. (a) Write the properties of lattices also justify that  
the following representation is lattices or not :



(b) Let  $D_n$  denote the set of all positive divisors  
of  $n$ , then find the complement of each of  
element of  $D_{42}$ .

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8. Define propositions. State and prove distributive  
laws over conjunction and disjunction both.

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9. (a) Show that the proposition :

$$((p \Rightarrow q) \Rightarrow r) \Leftrightarrow ((p \Rightarrow r) \vee (q \Rightarrow r))$$

is tautology.

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(b) Consider the following :

$p$  : You take a course in discrete mathematics

$q$  : You understand logic

$r$  : You get an A on the final exam

write the simple sentences the meaning of the following :

(i)  $q \Rightarrow r$

(ii)  $(p \wedge q) \Rightarrow r$

(iii)  $\neg p \Rightarrow \neg q$

(iv)  $(p \wedge \neg q) \Rightarrow \neg r$

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10. (a) Using Boolean algebra simplify the expression :

$$(AB'C' + AB'C + ABC + AB'C)(A + B)$$

(b) Use Karnaugh map to simplify the following :

(i)  $X = A'B'C' + AB'C'$

(ii)  $X = A'B'C' + A'BC' + ABC' + AB'C$  7,7

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**B.C.A. IVth Semester (Even)  
Examination, 2023**

**BUSINESS ECONOMICS**

**Paper : BCA-402**

**[ M.M. : 70 ]**

**Time : 3 Hours ]**

**Note :- Answer any five questions. All questions carry equal marks.**

**1. Define business economics. Also discuss nature and scope of business economics.**

**2. (a) What is the most plausible objective of business firms ? Elucidate.**

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(b) A manufacturer produces 1,000 units of a certain articles at a total cost ₹ 50,000 and his sale proceeds were worth ₹ 80,000. However he invested his own capital in the business which could have earned him an interest of ₹ 5,000, the rent, for the period of production, which he could have earned, in which he is running his production unit stands at ₹ 20,000. Based on this information calculate accounting profit and economic profit ?

3. Define price elasticity of demand. Explain various degrees of price elasticity of demand. Discuss its importance in business decision-making
4. Define Supply. Explain Law of Supply through a supply schedule and supply curve.
5. Explain the Law of Returns to Scale. Explain the three kinds of returns to scale with the help of isoquants.

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6. Explain the various economies of scale and diseconomies of scale that accrue to the firm when it expands its scale of production.

D/S

7. How is the price of a commodity determined in a perfectly competitive market ? Illustrate and explain how firms under perfect competition find their equilibrium in short-run ?

8. What is price discrimination ? What are the necessary conditions of price discrimination under monopoly ? Describe the various degrees of price discrimination. Cite examples as well.

9. Give a brief description of various phases of business cycle with diagrammatic representation.

10. What are the methods of demand forecasting ? Discuss in detail the survey methods of forecasting demand. What are their advantages and limitations ?

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**B.C.A. IVth Semester (Even)  
Examination, 2023**

**COMPUTER GRAPHICS AND  
MULTIMEDIA SYSTEMS**

**Paper : BCA-403**

*Time : 3 Hours ]*

*[ M.M. : 70 ]*

**Note :-** Answer any *five* questions. All questions carry equal marks.

1. Define computer graphics with an example.  
Discuss five application areas where computer graphics plays big role.
2. Explain Cathode Ray Tube with proper diagram.  
Also differentiate Raster Scan Display and Random Scan Display.

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3. Discuss rotation and reflection along with their metrics in computer graphics. Prove that two reflections equal one rotation.
4. Explain Cohen Sutherland algorithm. Use the Cohen Sutherland algorithm to clip the line  $P_1(35, 10)$ - $P_2(62, 40)$  against a window A(50, 10), B(80, 10), C(80, 40) and D(50, 40).
5. Find the new coordinates of the point (3, 4) when :
- The origin is shifted to the point (1, 2)
  - The axes are rotated by an angle  $\theta$  anticlockwise, where  $\tan \theta = 4/3$ .
  - The origin is shifted to (1, -2) and the axes are rotated by  $90^\circ$  in the clockwise direction.

6. Discuss classification of hardware in computer graphics along with conceptual framework for interactive graphics.
7. What is solid modelling in computer graphics ?  
Elaborate sweep representation in detail with example.
8. Explain the production process of multimedia applications with example.
9. Write the role of Animation in computer graphics by demonstrating their important application areas. Also explain types of Animation techniques.
10. Describe scan conversion of line with an example.  
Draw a line between points  $P_1(2, 2)$  and  $P_2(5, 5)$ .

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**DATABASE MANAGEMENT SYSTEM**

**Paper : BCA-404**

Time : 3 Hours ]

[ M.M. : 70 ]

**Note :-** Answer any *five* questions. All questions carry equal marks.

1. Explain database system architecture with diagram.

Discuss any *one* data model with example.

2. Write database languages and interfaces. Explain data independence in detail.

3. Discuss different types of keys used in database.

Write basics of ER with diagram.

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4. How to reduce the ER schema to table ? Explain with example.
5. How do you write an assertions and triggers in SQL ? Discuss with proper example.
6. Differentiate data definition language and data manipulation language with commands.
7. Consider the below two tables for reference to solve the SQL queries :

**Table – Employee Details**

| <b>Emp.<br/>ID</b> | <b>Full Name</b> | <b>Manager<br/>ID</b> | <b>Date of<br/>Joining</b> | <b>City</b> |
|--------------------|------------------|-----------------------|----------------------------|-------------|
| 121                | John Snow        | 321                   | 01/31/2019                 | Toronto     |
| 321                | Walter White     | 986                   | 01/30/2020                 | California  |
| 421                | Kuldeep Rana     | 876                   | 27/11/2021                 | New Delhi   |

**Table – Employee Salary**

| <b>Emp. ID</b> | <b>Project</b> | <b>Salary</b> | <b>Variable</b> |
|----------------|----------------|---------------|-----------------|
| 121            | P1             | 8,000         | 500             |
| 321            | P2             | 10,000        | 1,000           |
| 421            | P1             | 12,000        | 0               |

- (i) Write an SQL query to fetch the count of employees working in project 'P1'.
- (ii) Write an SQL query to find the employee id whose salary lies in the range of 9,000 and 15,000.
- (iii) Write an SQL query to fetch the employees whose name begins with any two characters, followed by a text 'hn' and ends with any sequence of characters.
- (iv) Write an SQL query to fetch records that are present in one table but not in another table.
- (v) Write an SQL query to fetch the Emp Ids that are present in both the tables 'Employee Details' and 'Employees Salary'.
- (vi) Write an SQL query to uppercase the name of the employee and lowercase the city values.
- (vii) Write an SQL query to fetch employee names having a salary greater than or equal to 5,000 and less than or equal to 10,000.

8. What is meant by relational calculus ? Explain in detail.
9. What is normalization ? For a relation R with attributes (A, B, C, D, E, F, G, H) with the following functional dependencies :
- $$AB \rightarrow C$$
- $$A \rightarrow DE$$
- $$B \rightarrow F$$
- $$F \rightarrow GH$$
- Where AB is the candidate key, find the highest normal form.
10. Write transaction management, recovery, concurrency control, and security in detail.

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**B.C.A. IVth Semester (Even)  
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**SOFTWARE ENGINEERING**

**Paper : BCA-405**

*Time : 3 Hours ]*

*[ M.M. : 70 ]*

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**Note :-** Answer any *five* questions. All questions carry equal marks.

1. (i) What do you mean by SDLC ? Describe the different phases of SDLC.

(ii) Define software engineering. Differentiate it with conventional engineering.

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2. Differentiate prescriptive and evolutionary models with examples. Also discuss the advantages and disadvantages of models. 14
3. What is Software requirement specification ? Why is it required ? Explain IEEE template for SRS. 14
4. Why is UML required ? What are the architectures of UML ? 14
5. What is Coupling and Cohesion ? Explain different forms of it. 14
6. What is testing ? Compare black box and white box testing. 14
7. Define software project estimation. List and explain the steps involved in project estimation. 14
8. Define change management. Explain the process of change management. 14

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9. XYZ University has a separate division to procure computers, printers, scanners, software and other computer accessories for its schools, division, regional centres, units, cells etc. The division has a Director, Deputy Directors, Assistant Directors and other staff working for this procurement of hardware and software. The requests come from the schools, division, regional centres etc. The procurement can be done only through GeM portal. Apart from procurement they handle the Annual Maintenance Contracts (AMC), Complaints, and Renewals etc. To accomplish the above mentioned tasks, perform the following :

- (i) Develop SRS for this system.
- (ii) Identify all the modules and list their functionalities.
- (iii) Design an Entity Relationship (E-R) diagram.

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10. Explain software project management, its principles and life cycle of project management. 14