



I Semester B.C.A./B.C.A. (DS) Examination, January 2025  
(SEP Scheme) (Freshers)  
**COMPUTER APPLICATIONS**  
**Computational Discrete Mathematics**

Time : 3 Hours

Max. Marks : 80

**Instruction : Answer all Sections.**

SECTION – A

I. Answer **any 10** questions. **Each** question carries **2** marks. **(2×10=20)**

- 1) Define converse and inverse of an implication with an example.
- 2) Define tautology and contradiction.
- 3) Define identity matrix with an example.
- 4) Define pigeonhole principle.
- 5) What is  ${}^8C_2$  ?
- 6) Define the principle of inclusion and exclusion.
- 7) Define strong induction and weak induction.
- 8) Define relation and function.
- 9) Write any two types of functions.
- 10) What is a graph ?
- 11) What is graph isomorphism ?
- 12) Define Euler path.

SECTION – B

II. Answer **any 6** questions. **Each** question carries **5** marks. **(6×5=30)**

13) Prove that  $\sim[p \rightarrow (q \vee r)] \equiv p \wedge (\sim q \wedge \sim r)$ .

14) Find the inverse of the matrix  $\begin{bmatrix} 1 & 2 & 1 \\ 5 & 2 & 3 \\ 1 & 1 & 2 \end{bmatrix}$ .

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- 15) In how many ways a committee consisting of 4 men and 2 women, can be chosen from 6 men and 5 women ?
- 16) Find the coefficient of  $x^6y^3$  in the expansion of  $(x + y)^9$ .
- 17) Show that  $1 + 3 + 5 + \dots + (2n - 1) = n^2$  by mathematical induction.
- 18) Let  $f(x) = x + 2$  and  $g(x) = 2x + 1$ , find  $(f \circ g)(x)$  and  $(g \circ f)(x)$ .
- 19) Explain any 2 types of graphs with an example.

- 20) Draw the digraph corresponding to the matrix  $\begin{bmatrix} 0 & 1 & 1 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 1 & 1 & 1 \\ 0 & 2 & 0 & 0 \end{bmatrix}$ .

## SECTION – C

III. Answer **any 3** questions. **Each** question carries **10** marks.

**(3×10=30)**

- 21) a) Let  $A = \{1, 2, 3, 4, 5\}$  and  $B = \{0, 3, 6\}$ . Find

- i)  $A \cup B$   
 ii)  $A \cap B$   
 iii)  $A - B$   
 iv)  $B - A$ .

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- b) Solve the following system of linear equation by Cramer's rule.

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$$x + y + z = 8, \quad x - y + 2z = 6, \quad 3x + 5y - 7z = 14$$

- 22) a) In how many ways can the letters of the word 'LEADING' be arranged in such a way that the vowels always come together ?

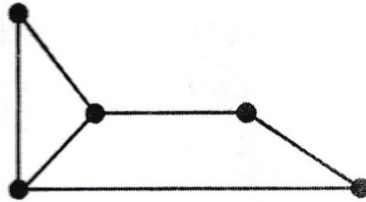
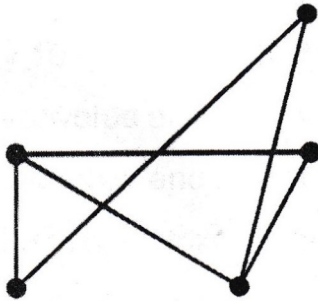
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- b) Among a group of students, 49 study Physics, 37 study English and 21 study Biology. If 9 of these student's study Maths, Physics and English, 5 study English and Biology, 4 study Physics and Biology and 3 study Physics, English and Biology. Find the number of students in the group.

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- 23) a) Show that for all integers  $n \geq 1 : 1^3 + 2^3 + 3^3 + \dots + n^3 = \left(\frac{n(n+1)}{2}\right)^2$  by mathematical induction. 5
- b) Prove that a function  $f : \mathbb{R} \rightarrow \mathbb{R}$  defined by  $f(x) = 2x - 3$  is a bijective function. 5
- 24) a) Explain about the adjacency matrix representation of graphs. Illustrate with an example. 5
- b) Show that the two graphs shown below are isomorphic. 5



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