**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 $\begin{bmatrix} 1 & 2 & 1 \\ 5 & 2 & 3 \\ 1 & 1 & 2 \end{bmatrix}$.

P.T.O.

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 $x^6 y^3$ in the expansion of $(x + y)^9$.

17) Show that $1 + 3 + 5 + ... + (2n - 1) = n^2$ by mathematical induction.

18) Let $f(x) = x + 2$ and $g(x) = 2x + 1$, find $(fog)(x)$ and $(gof)(x)$.

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) $B - A$.   5

   b) Solve the following system of linear equation by Cramer's rule.   5

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

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 ?   5

   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.   5
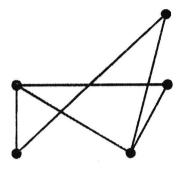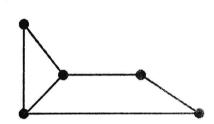
23) a) Show that for all integers $n \geq 1 : 1^3 + 2^3 + 3^3 + ... + n^3 = \left(\dfrac{n(n+1)}{2} \right)^2$ by mathematical induction.

5

b) Prove that a function $f : R \rightarrow R$ defined by $f(x) = 2x - 3$ is a bijective function.

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24) a) Explain about the adjacency matrix representation of graphs. Illustrate with an example.

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b) Show that the two graphs shown below are isomorphic.

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