



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^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. $(3 \times 10 = 30)$

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

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

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 $n \geq 1 : 1^3 + 2^3 + 3^3 + \dots + n^3 = \left(\frac{n(n+1)}{2} \right)^2$ 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

