Reg. No.

I Semester B.C.A. Degree Examination, May/June - 2022
COMPUTER SCIENCE
Discrete Structures
Paper : CA - C1T
(NEP 2021 Onwards Scheme)

Time : 2½ Hours   Maximum Marks : 60

Instructions to Candidates:

Answer any **four** questions for each part.

PART - A

Answer any **Four** questions. Each question carries **2** marks.   (4×2=8)

1. Define Power set with an example.
2. Give an example of a relation, which is reflexive and transitive but not symmetric.
3. Construct a truth table for $\sim(p \vee q)$.
4. Define
   i. Diagonal matrix.
   ii. Symmetric matrix.
5. Find 'x' if $[2x \quad 3]\begin{bmatrix} 1 & 2 \\ -3 & 0 \end{bmatrix}\begin{bmatrix} x \\ 3 \end{bmatrix} = 0$.
6. Draw a disconnected graph with 8 vertices and 2 components.

PART - B

Answer any **Four** questions. Each question carries **05** marks.   (4×5=20)

7. Show that $\sim(p \wedge q)$ and $(\sim p \vee \sim q)$ are logically equivalent.
8. Define
   a. One - to - one.
   b. On - to.
   c. Inverse

Explain with example.   (2+3=5)

[P.T.O.

9. In how many ways can 6 men and 6 women be seated in a row if

    i. Any person may sit next to any other.

    ii. Men and women must occupy alternate seats.   (3+2=5)

10. Show The system   (5)

$x + y + z = 4$

$2x + y - z = 1$ is consistent solve the system.

$x - y + 2z = 2$

11. a. Find a matrix A such that AB = C, where $B = \begin{bmatrix} 3 & 4 \\ 6 & 2 \end{bmatrix}$ and $C = \begin{bmatrix} 2 & 8 \\ 9 & 4 \end{bmatrix}$.

    b. Prove that every connected graph with n vertices and (n-1) edges is a tree.(3+2=5)

12. a. Define isomorphism of two graphs.

    b. Show that k_4 is planar.   (2+3=5)

PART - C

Answer any **Four** of the following. Each question carries **08** marks.   (4×8=32)

13. a. Explain principles of counting.

    b. Using the principle of mathematical induction prove that $7^n - 3^n$ is divisible by 4.   (3+5=8)

14. a. Suppose that in a certain examination, 200 students appear for mathematics, 50 appear for physics, 100 appear for chemistry, 20 appear for mathematics and physics, 60 appear for mathematics and chemistry, 35 appear for physics and chemistry, while 245 appear for mathematics on physics on chemistry. Determine the number of students appear

    i. For all the three subjects.

    ii. Exactly for one of the subjects.

    Also construct the Venn Diagram.

    b. Show that in any group of two or more people, there are always two people with exactly the same number of friends inside the group.   (6+2=8)

15. a. Consider the following conditional satement "If S is an equilateral triangle then S is an isosceles triangle", write the converse, inverse and contra - positive of the statement.   (4)

    b. Find 'n' if $(n-1)P_3 : (n+1)P_3 = 5:12$.   (4)

16. Show that the matrix $A = \begin{bmatrix} 5 & 3 & 1 \\ 2 & -1 & 2 \\ 4 & 1 & 3 \end{bmatrix}$ satisfies the equation. $A^3 - 7A^2 - 5A + 13I = 0$.

(4+4=8)

17. a. Find the adjoint of the matrix $A = \begin{bmatrix} 1 & 4 & 0 \\ -1 & 2 & 2 \\ 0 & 0 & 2 \end{bmatrix}$ and hence A^{-1}.

b. Draw a Simple graph with vertex - connectivity 2, edge connectivity 3 and minimum degree 4. (5+3=8)

18. a. i. Define a walk, trial and path.

ii. Show that every walk in a graph contains a path.

b. Show that G is Euler if and only if every vertex of G is even. (5+3=8)

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