I Semester B.C.A. Degree Examination, February/March 2024
(NEP) (F+R)
COMPUTER SCIENCE
Discrete Structures

Time : 2½ Hours   Max. Marks : 60

Instruction : Answer **any 4** questions from **each** Section.

SECTION – A

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

1) Find the Union A∪B and set differences A – B if A = {3, 4, 5}, B = {3, 4, 6, 7, 9, 10}.

2) Define Equivalence Relation.

3) If A = {a, b, c}, B = {c, d} find A×B and A×A.

4) Define unit matrix with example.

5) Find adjoint of $\begin{bmatrix} 1 & 5 \\ 7 & 4 \end{bmatrix}$.

6) Define the terms : 1) Graph   2) Loop.

SECTION – B

II. Answer **any four** questions. **Each** question carries **five** marks.   (4×5=20)

7) Prove that for any three prepositions p, q, r show that
   $p \rightarrow (q \wedge r) \equiv [(p \rightarrow q) \wedge (p \rightarrow r)]$.   5

8) In a class of 45 students , 29 likes to play cricket and 21 likes to play hockey. Also each student like to play atleast one of the two games. How many students like to play both cricket and hockey ?   5

9) Let A = {1, 2, 3, 4, 6} Let R be the relation on A defined by {(a, b)/a, b ∈ A, and b is exactly divisible by a}.

   1) Write R in roaster method.
   2) Find the domain of relation R.
   3) Find the range of relation R.
   4) Find inverse of a relation (R⁻¹).   5
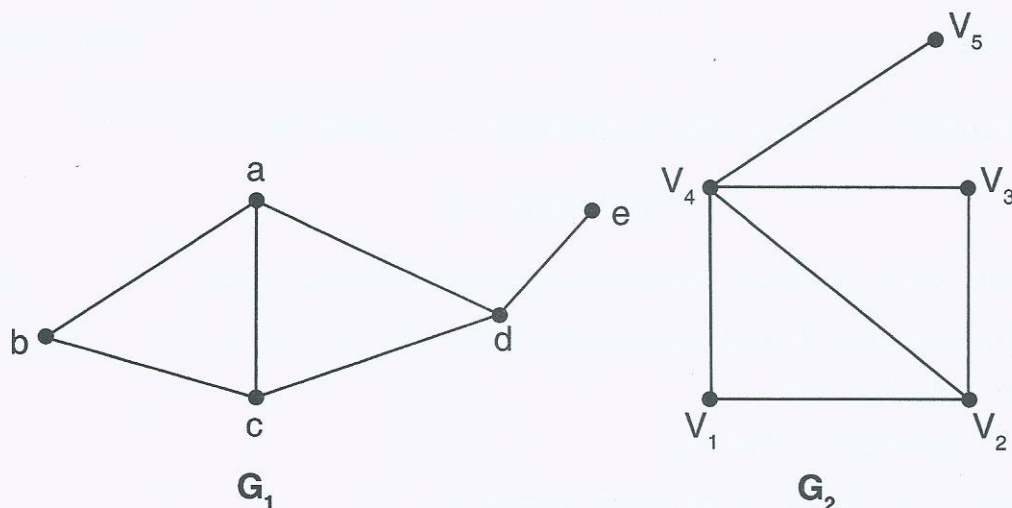
10) Solve by Cramer's Rule.

   $5x + 3y = 1; 3x + 5y = -9.$ **5**

11) Define isomorphism of a graphs. Verify that the two graphs shown below
    are isomorphic or not.   **5**

G_1 G_2

12) Find inverse of $A = \begin{bmatrix} 1 & 0 & -1 \\ 3 & 4 & 5 \\ 0 & -6 & -7 \end{bmatrix}$.   **5**

SECTION – C

III. Answer **any four** questions. **Each** question carries **eight** marks.   **(4×8=32)**

13) a) Consider $f : R \rightarrow R$ given by $f(x) = 2x + 3$ show that f is invertible. Find
        inverse of f.   **4**

    b) Write the converse, inverse and contraposition of the statement.
        "If x is less than 1 then x is a prime number".   **4**

14) Using Mathematical induction prove that

    $$1^2 + 2^2 + 3^2 + \cdots + n^2 = \frac{n(n+1)(2n+1)}{6}.$$ **8**

15) a) How many 3 digits numbers can be formed by using the digits 1 to 9 if
        no digits are repeated ?   **4**

    b) Find the coefficient of $x^6 y^3$ in the expansion of $(x + 2y)^9$. **4**

16) a) Solve by Matrix Method.

$5x + 2y = 4$; $7x + 3y = 5$ **4**

b) If $A = \begin{bmatrix} 2 & 3 \\ 1 & -4 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & -2 \\ -1 & 3 \end{bmatrix}$ verify $(AB)' = B'A'$.   **4**
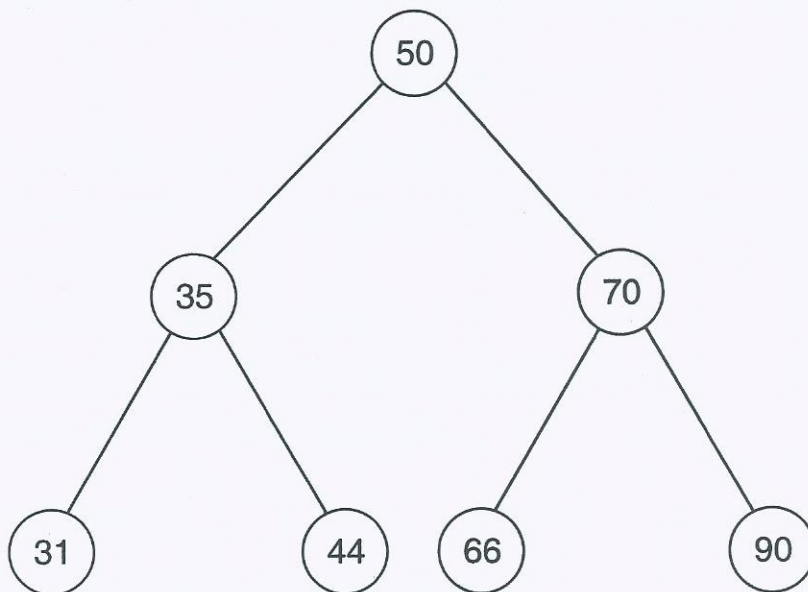
17) a) Define Handshaking Lemma with example.   **3**

b) Find in order, pre order, post order traversal of the following tree.   **5**

18) Obtain the minimum cost spanning tree for the following graph using Kruskal's Algorithms.   **8**

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