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**I Semester B.C.A. Degree Examination, January/February - 2025****COMPUTER SCIENCE****Discrete Structures****(SEP Scheme)****Time : 3 Hours****Maximum Marks : 80****Instructions to Candidates:**

Answer All the Sections.

**SECTION - A****I. Answer any Ten questions. Each question carries 2 mark.****(10×2=20)**

1. Find the intersection  $A \cap B$  and set difference  $A - B$  if  $A = \{1, 3, 5, 7, 9\}$  and  $B = \{2, 3, 4, 5, 6, 8\}$ .
2. Construct a truth table for  $\sim(p \vee q)$ .
3. Find  $A^{-1}$  if  $A = \begin{bmatrix} 6 & 3 \\ 2 & 4 \end{bmatrix}$ .
4. Find the value of
  - a)  $4P_3$
  - b)  $6C_3$
5. Define Equivalence Relation.
6. Define Unit Matrix with example.
7. If  $A = \begin{bmatrix} 2 & -1 \\ 4 & 0 \end{bmatrix}$  and  $B = \begin{bmatrix} 5 & 2 \\ -3 & 2 \end{bmatrix}$  find  $3A - 2B$ .
8. What is a minimum cost spanning tree?
9. Define the terms
  - a) Graph
  - b) Loop

**[P.T.O]**



10. Define Binary Tree with example.

11. Define:

- a) Walk
- b) Path

12. Define complete graph. Draw  $K_5$  graph.

**SECTION - B**

**II. Answer any Six questions. Each question carries 5 marks.**

**(6×5=30)**

13. Find  $n$ , if  ${}^n P_2 = 12$ .

14. Define:

- a) One - to - one function.
  - b) On - to function
- With example.

15. Show that the preposition  $\sim (p \leftrightarrow q) \equiv \sim [(p \rightarrow q) \wedge (q \rightarrow p)]$ .

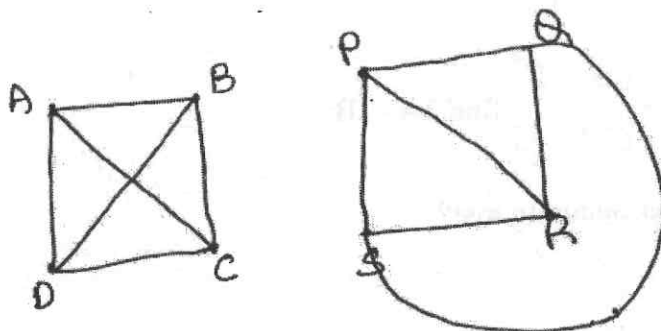
16. Prove by Mathematical Induction  $1^2 + 2^2 + 3^2 + \dots + n^2 = \frac{n(n+1)(2n+1)}{6}$ ,  $\forall$  positive integer  $n$ .

17. Find the Inverse of the matrix  $\begin{bmatrix} 1 & 0 & -1 \\ 3 & 4 & 5 \\ 0 & -6 & -7 \end{bmatrix}$ .

18. Solve the system of equations

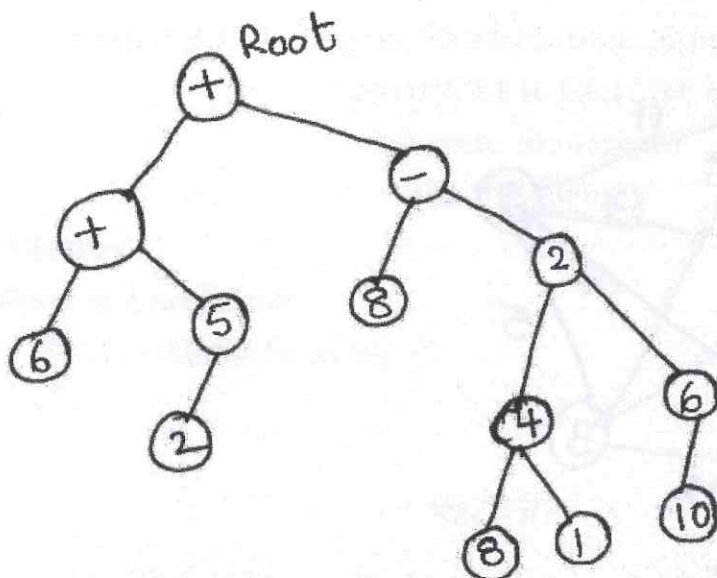
$$\begin{aligned} x + y + z &= 7 \\ 2x + 3y + 2z &= 17 \\ 4x + 9y + z &= 37 \end{aligned}$$

19. Examine whether the following graphs are Isomorphic (or) not.





20. Traverse the following tree in Preorder, Postorder and Inorder.



### SECTION - C

III. Answer any Three questions. Each question carries Ten marks. (3×10=30)

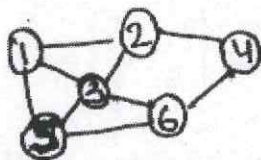
21. Consider the function  $f$  &  $g : R \rightarrow R$  defined by  $f(x) = x^2 + 5$  and  $g(x) = 5x - 2$ . Find the composite function

a)  $f \circ g$

b)  $g \circ f$

22. Define Permutation. How many 4 digits numbers can be formed with the digits 0, 1, 2, 3, 5? (Repetition not being allowed). How many of these are greater than 2000?

23. What is a Hamilton Circuit? Check whether the following graph contains Hamiltonian Circuit. Justify your answer.



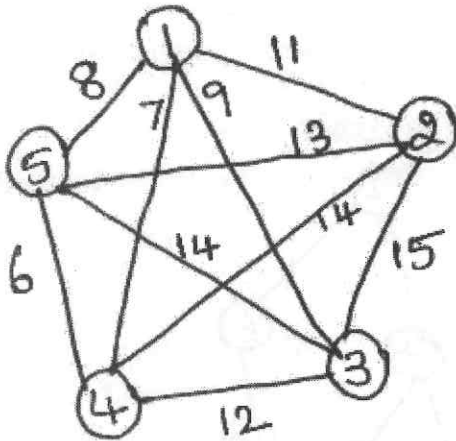
24. Define Binary Search Tree. Construct binary search tree.

56, 38, 10, 65, 72, 44, 50

[P.T.O]



25. Find the minimum weight spanning tree by PRIM's algorithm.



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