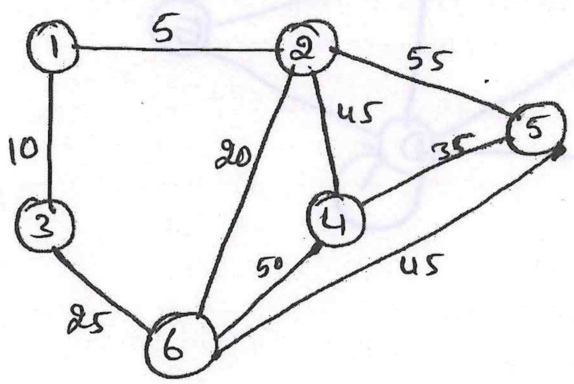
25. Find the Minimum Weight Spanning Tree by KRUSKAL's Algorithm.



Reg. No.

I Semester B.C.A. Degree Examination, December/January - 2025/26

COMPUTER APPLICATIONS

Discrete Structures

(SEP Scheme (F+R))

Time : 3 Hours **Maximum Marks : 80**

Instructions to Candidates:

Answer All the Sections.

SECTION - A

I. Answer any TEN questions. Each question carries 2 marks. **(10×2=20)**

1. Define Finite and Infinite Set.
2. Write all the subsets of $A = \{1, 2\}$.
3. Define scalar matrix with an example.
4. If $A = \{1, 2, 3, 4\}$, $B = \{3, 4, 7, 8\}$ find $A \cup B$.
5. Construct a truth table for the proposition $(p \wedge \sim q)$.
6. Evaluate 8! - 7!.
7. Find the value of $^{15}c_3$.
8. Define square matrix with example.
9. If $\begin{vmatrix} a & 5 \\ -8 & 4 \end{vmatrix} = 0$ Find a.
10. Define planar graph with example.
11. Mention any two applications of trees.
12. What is Minimum Spanning Tree?

SECTION - B

II. Answer any SIX questions. Each question carries 5 marks. (6×5=30)

13. In a class of 45 students, 29 like to play cricket and 21 like to play hockey. Also each student likes to play atleast one of the two games. How many students like to play both Cricket and Hockey. Represent the solution in Venn-diagram.

14. Show that the proposition $(P \wedge q) \wedge \sim (p \vee q)$ is a contradiction.

15. Prove by Mathematical Induction $1+2+3+......+n = \dfrac{n(n+1)}{2}$, for all $n \geq 1$.

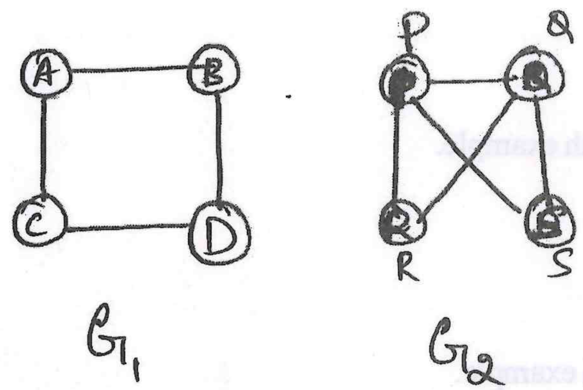
16. Show that the function $f: Q \rightarrow Q$ defined by $f(x) = 2x + 3$ is both one-one and onto. Here Q is the set of all rational numbers.

17. If $A = \begin{bmatrix} 2 & -1 \\ -1 & 2 \end{bmatrix}$ show that $A^2 - 4A + 3I = 0$.

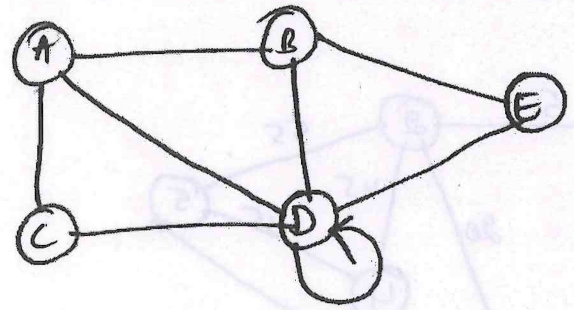
18. Solve using Cramer's Rule

$3x + 4y = -1$
$2x - y = 3.$

19. Examine wheather the following graphs are Isomorphic or NOT.



20. Represent the following graph in Adjacency Matrix.



SECTION - C

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

21. If $U = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$, $A = \{2, 3, 4, 8\}$, $B = \{1, 3, 4\}$ and $C = \{3, 4, 5, 6\}$. Verify,

a) $(A \cup B)' = A' \cap B'$.

b) $(A \cap B)' = A' \cup B'$.

22. In how many different ways can the letter of the word MISSISSIPPI be arranged. In that how many of these arrangements do the Four I's not come together.

23. Find the Inverse of $A = \begin{bmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{bmatrix}$.

24. a) Find the number of ways of selecting 9 balls from 6 Red balls, 5 White balls and 5 Blue balls. If each selection consists of 3 balls of each colour.

b) Verify Cayley Hamilton theorem for the matrix $A = \begin{bmatrix} 3 & 2 \\ 4 & 5 \end{bmatrix}$. **(5+5)**