

B.C.A.- II (CBCS Pattern) Semester - III
UBCAT305 - Paper-V : Discrete Mathematics

P. Pages : 2

Time : Three Hours



GUG/S/23/11761

Max. Marks : 40

- Notes :
1. All questions are compulsory and carry equal marks.
 2. Draw neat and labelled diagrams wherever necessary.
 3. Avoid vague answers and write answers relevant and specific to questions only.

Either:

1. a) Prove that 4

i) $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$ ii) $A \cap (B - C) = (A \cap B) - C$

- b) 4

If $A = \begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 1 \\ 1 & 1 & 0 \\ 0 & 0 & 0 \end{bmatrix}$ $B = \begin{bmatrix} 1 & 1 & 0 \\ 1 & 0 & 1 \\ 0 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix}$

Compute i) $A \vee B$ ii) $A \wedge B$

OR

- c) Construct the truth table for following. 4

i) $(A \oplus B) \oplus C$ ii) $(A \uparrow B) \uparrow C$

- d) If A and B are matrices, then 4

i) $(A^T)^T = A$ ii) $(A + B)^T = A^T + B^T$

Either:

2. a) Define following. 4

- i) One to one function or Injective function.
- ii) On to function or Surjective function.
- iii) One-to-one-onto function
- iv) One to one into function

- b) Let $a = \{a, c, e\}$ and $U = \{a, b, c, d, e, f, g\}$. Compute the following function values: 4

i) $f_A(a)$ ii) $f_A(g)$
iii) $f_A(e)$ iv) $f_A(t)$

OR

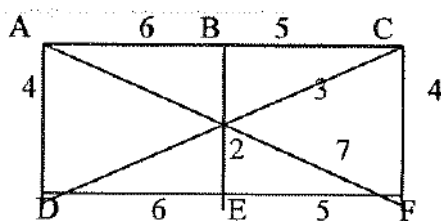
- c) To Prove: 4

i) $P(n, n) = 2 \times p(n, n-2)$ ii) $P(n, n) = p(n, n-1)$

- d) Prove that the number of combinations of 'n' things taken all at a time is one or $C(n, n) = 1$ 4

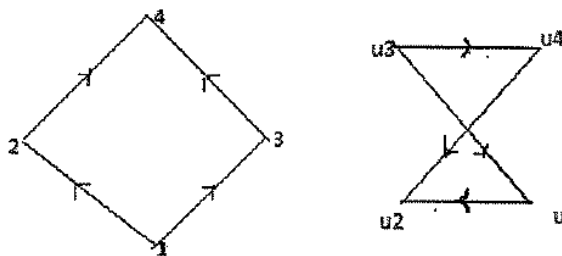
Either:

3. a) Explain Euler path and circuit with examples? 4
- b) Determine the minimum spanning tree of the weighted graph shown in fig. below- 4



OR

- c) Show that the following graphs are Isomorphic. 4



- d) Construct the tree 4
- i) $((3 * (1 - x)) \div ((4 + (7 - (y + 2))) * (7 + (x \div y)))$
- ii) $(7 + (6 - 2)) - (x - (y - 4))$

Either:

4. a) Consider an algebraic system $(N, +)$, where the set $N = \{0, 1, 2, 3, \dots\}$ the set of natural numbers and $+$ is an addition operation. Determine whether $(N, +)$ is a monoid. 4
- b) What is Group? Explain with example. 4

OR

- c) Prove the left Cancellation law i.e. $ea = ac \implies b = c \forall a, b, c \in G$ (Left Cancellation). 4
- d) What are Binary Operations on set and Explain following Properties with examples. 4
- i) Closure ii) Associative
- iii) Commutative iv) Identity

5. Attempt all the questions.

- a) Prove that : $\overline{(A \cap B)} = \bar{A} \cup \bar{B}$ 2
- b) Determine the number of permutations that can be made out of the letters of the word PROGRAMMING. 2
- c) Define: 2
- i) Graph ii) Tree
- d) Show that $(a^{-1})^{-1} = a$ for all $a \in G$, where G is a group and a^{-1} is an inverse of a . 2
