

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

P. Pages : 3

Time : Three Hours



GUG/W/23/11761

Max. Marks : 40

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

Either:

1. a) What is set? Explain different operations on set. 4

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) If A and B are matrices, then 4

i) $(A^T)^T = A$

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

d) Show that, 4

i) $p \vee (q \wedge r) \equiv (p \vee q) \wedge (p \vee r)$

ii) $\sim (p \wedge q) \equiv \sim p \vee \sim q$

Either:

2. a) Define the 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) Determine the value of n if 4

i) ${}^nC_4 = {}^nC_3$

ii) ${}^{20}C_{n+2} = {}^{20}C_{2n-1}$

OR

c) Determine the number of permutations that can be made out of the letters of the word. 4

i) PROGRAMMING

ii) BANANA

d) To prove: 4

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

ii) $p(n, n) = p(n, n-1)$

Either:

3. a) Define the following terms. 4

i) Graph

ii) Adjacent Node

iii) Parallel Edges

iv) Loop

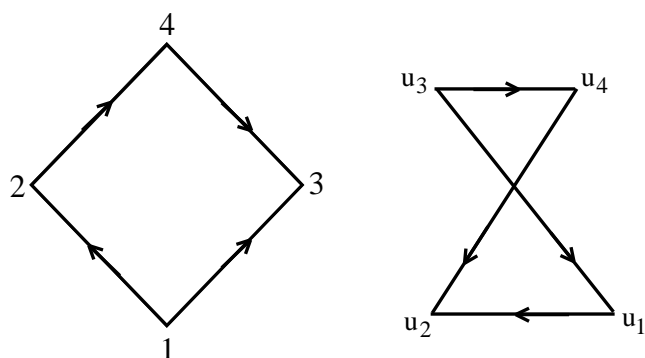
b) Construct tree, 4

i) $((3 * (1 - x)) \div ((4 + (7 - (y + 2)))) * (7 + (x \div y)))$

ii) $(7 + (6 - 2)) - (x - (y - 4))$

OR

c) Show that the following graphs are isomorphic. 4



d) Explain Kruskal's Algorithm to find the minimum spanning tree. 4

Either:

4. a) What is Group? Explain with example. 4

b) Prove the left Cancellation law, i.e. $ab = ac, b = c \forall a, b, c \in G$ (left cancellation). 4

OR

- c) Explain Finite – State Machines. 4
- d) Let $(A, *)$ be semigroup. Show that for a, b, c in A , if $a * c = c * a$ and $b * c = c * b$ then $(a * b) * c = c * (a * b)$. 4

5. Solve all the questions.

- a) Construct the truth table for $(P \wedge Q) \vee (\neg P \wedge Q) \vee (P \wedge \neg Q) \vee (\neg P \wedge \neg Q)$ 2
- b) Let $X = \{1, 2, 3, 4\}$ and $R = \{(x, y) / x < y\}$. Draw diagram of R and its matrix. 2
- c) Define: 2
- i) Indegree of nodes
- ii) Outdegree of nodes
- 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
