

B.Sc. - I (Information Technology) (CBCS Pattern) Semester-II
UBITT204 - Paper-IV : Discrete Mathematics

P. Pages : 2

Time : Three Hours



GUG/S/25/10923

Max. Marks : 80

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

Either:

1. a) Explain the following. 8
- i) Equality of sets
 - ii) Null set or Empty set
 - iii) Power set
 - iv) Subset
- b) Prove that $A \cap (B - C) = (A \cap B) - (A \cap C)$. 8

OR

- c) Construct the truth table for following 8
- i) $\sim(p \vee q) \wedge r$
 - ii) $(p \rightarrow q) \leftrightarrow (\sim q \rightarrow \sim p)$

- d) Let 8
- $$A = \begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 1 \\ 1 & 1 & 0 \\ 0 & 0 & 0 \end{bmatrix} \quad B = \begin{bmatrix} 1 & 1 & 0 \\ 1 & 0 & 1 \\ 0 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix}$$
- i) Compute $A \vee B$
 - ii) Compute $A \wedge B$

Either:

2. a) Determine the value of the following. 8
- i) $P(15, 3)$
 - ii) ${}_{20}P_3$
 - iii) ${}_{52}P_4$
 - iv) ${}_{9}P_2$

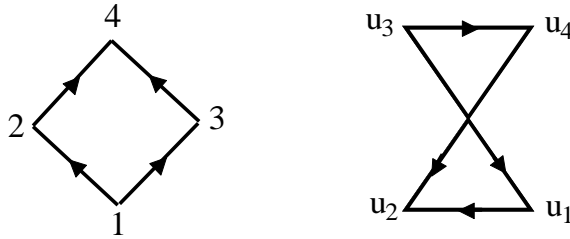
- b) Consider a finite set $A = \{5, 6, 7\}$ 8
- Let $P_1 = \begin{pmatrix} 5 & 5 & 7 \\ 5 & 7 & 6 \end{pmatrix}$ and $P_2 = \begin{pmatrix} 5 & 6 & 7 \\ 6 & 5 & 7 \end{pmatrix}$ be two permutations of A. Determine $P_1 \cdot P_2$ and $P_2 \cdot P_1$

OR

- c) Define the following. 8
- i) Many One function.
 - ii) Many one into function.
 - iii) Equal function.
 - iv) Identity function.
- d) Prove that the number of combinations of 'n' things taken all at a time is one or $C(n, n) = 1$. 8

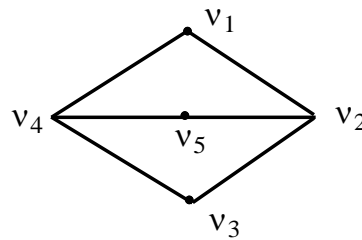
Either:

3. a) Explain the following 8
 i) Graph ii) Undirected Graph
 iii) Mutli Graph iv) Weighted Graph
- b) Show that the following graphs are isomorphic. 8



OR

- c) Show that the graph of figure does not contain a Hamiltonian cycle. 8



- d) Define the following 8
 i) Path length of a Vertex ii) Forest

Either:

4. a) Explain the following: 8
 i) Semigroup ii) Group
 iii) Sub semigroup iv) Isomorphism
- b) Let $(\{x, y\}, \cdot)$ be a semigroup, where $x \cdot x = y$ show that 8
 i) $x \cdot y = y \cdot x$ ii) $y \cdot y = y$

OR

- c) Define Monoid. Explain using suitable example. 8
 d) Show that $(ab)^{-1} = b^{-1}a^{-1}$ for all $a, b \in G$ 8

5. Solve all the questions.

- a) Prove that : $\overline{(A \cap B)} = \bar{A} \cup \bar{B}$ 4
 b) Determine the number of permutations that can be made out of the letters of the word PROGRAMMING. 4
 c) Construct the tree 4

$$(3 - (2 - (11 - (9 - 4)))) \div (2 + (3 + (4 + 7)))$$

 d) Consider the set $A = \{-1, 0, 1\}$ Determine whether A is closed under 4
 i) Addition ii) Multiplication
