

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

P. Pages : 2

Time : Three Hours



GUG/S/23/10923

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 questions only.

Either:

1. a) If A and B are finite set, find **8**
 $|A \cup B| = |A| + |B| - |A \cap B|$
- b) What is sets? Explain different operations on sets. **8**
- OR**
- c) Make a truth table for following statements. **8**
- i) $\sim q \rightarrow (p \rightarrow q)$
- ii) $((p \rightarrow q) \wedge (q \rightarrow r)) \rightarrow (q \rightarrow r)$
- d) Prove the statement is true by using mathematical induction. **8**
 $1^2 + 2^2 + 3^2 + \dots + n^2 = \frac{n(n+1)(2n+1)}{6}$

Either:

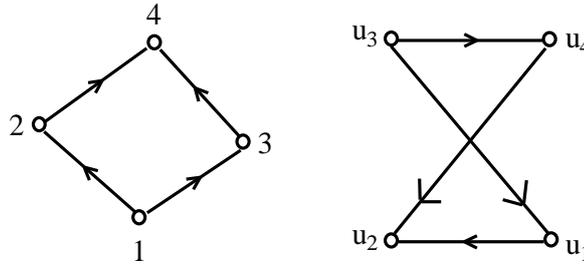
2. a) Determine the value of the following **8**
- i) 4P_2 ii) ${}^{52}P_4$
- iii) ${}^{20}P_3$ iv) $P(15,3)$
- b) Determine the value of n if **8**
- i) $6 \times {}^nP_3 = 3 \times {}^{n+1}P_3$
- ii) $3 \times {}^nP_4 = 7 \times {}^{n-1}P_4$

OR

- c) Define function. Explain the types of function in detail. **8**
- d) Prove that, composition (product) of two cycles may not be a cycle. **8**

Either:

3. a) Show that, following graphs are isomorphic. 8



- b) Construct the Tree for following. 8

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

ii) $3 - (x + (6 * (4 \div (2 - 3))))$

OR

- c) Define the following terms: 8

i) Graph

ii) Diagraph

iii) Adjacent node

iv) Mixed graph

- d) Show that, sum of indegrees of all the nodes of a simple digraph is equal to be sum of outdegree of all it's nodes and that sum is equal to the number of edges of the graph. 8

Either:

4. a) Consider the binary operation $*$ on θ the set of rational number defined by 8

$$a * b = \frac{ab}{2} \quad \forall a, b \in \theta, \text{ Determine whether } *, \text{ is (i) associative (ii) commutative}$$

- b) Fill in the following table, so that the binary operation $*$, is commutative 8

$*$	a	b	c
a	b		
b	c	b	a
c	a		c

OR

- c) T be the set of all even integer. Show that the semigroups $(Z, +)$ and $(T, +)$ are isomorphic. 8

- d) Show that, $(a^{-1})^{-1} = a$ for all $a \in G$, where G is group and a^{-1} is an inverse of a . 8

5. Attempt **all** the questions.

- a) Construct the truth table for $((P \rightarrow (Q \rightarrow R)) \rightarrow ((P \rightarrow Q) \rightarrow (P \rightarrow R)))$ 4

- b) Prove that $p(n, n) = 2 \times p(n, n - 2)$ 4

- c) Define Isomorphic Graph with an example. 4

- d) Explain: 4

i) State transition table

ii) Derivation Trees
