

Section-D

8. Write short notes on the following with the help of suitable examples :
- Homeomorphic and isomorphic graphs.
 - Cut points and bridge
 - Multi-graph
 - Path and circuit.
9. (a) Explain Eulerian path and Hamiltonian path with suitable examples.
- (b) What do you mean by Spanning Tree and Minimum Spanning tree ? Explain Kruskal's Algorithm to find minimum spanning tree.

B.Tech. 3rd Semester (IT) F-Scheme Examination,
December-2016

DISCRETE STRUCTURES

Paper-CSE-203-F

Time allowed : 3 hours]

[Maximum marks : 100

Note : Question No. 1 is compulsory. Attempt five questions with selecting one question from each section (A-D). All questions carry equal marks.

- Prove that $A \cup B = B \cup A$ and $A \cap B = B \cap A$.
 - Define one-to-one and onto functions.
 - How many 6-digit numbers can be formed from the digits 0, 1, 2, 3, 4, 5, 6, 7, if no digit is repeated.
 - Define order of the recurrence relation with suitable examples.
 - Define Semigroup and Monoid.
 - Let us consider a group $(G, *)$, where G is a set having elements $\{0, 1\}$ and $*$ is a binary operation. Also, let $H = \{1\}$ is a subgroup of G . Determine all the left cosets of H in G .
 - Draw a 3-regular graph of five vertices.
 - Define Tree and path length of a vertex in a rooted tree.

Section-A

2. (a) Prove that
- $(A \cup B)^c = A^c \cap B^c$
 - $(A \cap B)^c = A^c \cup B^c$
- (b) What do you mean by Cartesian product of two sets ? Find Cartesian product of the following sets :
- $P = \{1, 2, 3\}, Q = \{k, l, m, n\}$
 - $R = \{a, b, c, d\}, S = \{4, 5, 6\}$
3. (a) Generate the truth table for the following
- $A \oplus B \oplus C$
 - $A \uparrow B \uparrow C$
- (b) Consider the following propositions $\sim p \vee \sim q$ and $\sim (p \wedge Q)$. Are they equivalent ? Also show that the statement $p \wedge \sim p$ is a contradiction.

Section-B

4. (a) How many permutations can be made out of the letters of the word "DISCRETE" ? How many of these
- begin with D
 - D and T occupy the end places.

- (b) Find the sum of the following series :
- $$0.5 + 0.55 + 0.555 + 0.5555 + \dots$$
5. (a) Solve the recurrence relation
- $$a_{r+2} - 2a_{r+1} + a_r = 2^r \text{ with the initial conditions } a_0 = 2 \text{ and } a_1 = 1.$$
- (b) Solve the difference equation
- $$y_k - y_{k-1} - 6y_{k-2} = -30. \text{ Given that } y_0 = 20, y_1 = -5.$$

Section-C

6. (a) Explain isomorphism, homomorphism and automorphism with the help of suitable examples.
- (b) Consider an algebraic system $(Q, *)$, where Q is the set of rational numbers and $*$ is a binary operation defined by $a * b = a + b - ab \forall a, b \in Q$. Determine whether $(Q, +)$ is a group.
7. (a) Explain Rings, Normal Subgroups and Cyclic groups with the help of suitable examples.
- (b) Show that the order of each sub-group of a finite group is a divisor of the order of the group.