(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 1064 **Roll No.** | | | | | | | | | | |

B.Tech.

(SEM. III) ODD SEMESTER THEORY EXAMINATION 2012-13

DISCRETE STRUCTURES

Time : 3 Hours *Total Marks : 100*

Note :– (i) Attempt **all** questions.
(ii) All questions are of equal marks.
(iii) Notations used have usual meaning.
(iv) Assume any relevant data, if missing.

1. Attempt any **four** parts of the following : **(5×4=20)**

(a) Define set. Explain various ways of representation of sets by using suitable example.

(b) In a group of 52 persons who drink tea or coffee or both, 16 drink tea but not coffee and 33 drink tea. Find the following :

(i) How many drink tea and coffee both ?

(ii) How many drink coffee but not tea ?

(c) A relation **R** on the set **A={1,2,3,4}** given by **R=[(1,1),(1,2),(2,2),(3,1),(3,2),(3,3),(4,2),(4,4)]** represent it by indegrees and outdegrees of each vertex.

(d) If ***N*** is the set of natural numbers and ***R*** is a relation in **N × N** defined as (a,b) ***R*** (c,d) if and only if ad=bc, then prove that **R** is an equivalence relation.

(e) The function *f* maps a calendar month onto the number of days in that month. What is the range of function *f* when the domain is :

(i) {months in 1979}

(ii) {months in 1980}

(f) If the relation ***R*** in the set of all natural numbers is defined by "a***R***b if and only if $a^2-4ab+3b^2=0$". Prove that ***R*** is reflexive and it is neither symmetric nor transitive.

2. Attempt any **two** parts of the following : **(10×2=20)**

(a) Let $A_n = \{x : x \text{ is divisible by } n\}$ where $n \in N$. Find $A_3 \cap A_5$ and $A_3 \cup A_5$.

(b) Prove that conditional operation distributes over conjuction, i.e. $p \Rightarrow (q \vee v) \equiv (p \Rightarrow q) \vee (p \Rightarrow v)$.

(c) What is ring ? Explain various types of rings and give any example theorem for each one.

3. Attempt any **two** parts of the following **:** **(10×2=20)**

(a) What do you mean by Complemented Lattice ? Give at least two examples. Show that a complemented distributive lattice is Boolean algebra.

(b) Explain Boolean algebra ? Explain all five laws of Boolean algebra ? For any Boolean algebra (B, +, •, /)

(i) Identify for the operation + is unique.

(ii) Identify for the operation • is unique.

(c) What is binary tree ? Explain all the traversal of a binary tree with suitable example for each one.

4. Attempt any **two** parts of the following : **(10×2=20)**

(a) Explain proposition. Consider the following sentences and check whether the given sentences are proposition or not. Give reasons also :

(i) The President of India is a women.

(ii) An elephant weighs more than a human being.

(iii) If a stone is thrown in the air, it will fall to the ground.

(iv) Watch the movie.

(v) How wonderful !

(vi) What is your name ?

(b) Show that :

(i) $\{\rightarrow, \Rightarrow\}$ is functionally complete.

(ii) $p \Leftrightarrow q$ implies $p \Rightarrow q$.

(c) What are Quantifiers ? List all the types of quantifiers and symbols used for them. Give example proof for each one.

5. Attempt any **two** parts of the following : **(10×2=20)**

(a) What is a Digraph ? Explain incidence, parallel edges, and degree of vertex in digraph in detail with example.

(b) Prove the theorem "the number of vertices of odd degree in a graph is always even". Make suitable assumptions for it.

(c) What do you mean by isomorphism and homomorphism of graphs ? Give their properties and observations.