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

PAPER ID : 1064 Roll No.

B. Tech.

(SEM. III) EXAMINATION, 2007-08

DISCRETE STRUCTURE

Time : 3 Hours] *[Total Marks : 100*

Note : *(1) Answer **all** questions.*

*(2) All questions carry **equal** marks.*

(3) In case of numerical problems assume data wherever not provided.

(4) Be precise in your answer.

1 Attempt any **four** of the following questions : **5×4=20**

(a) Let $N = \{1, 2, 3, \ldots\}$ and a Relation is defined in $N \times N$ as follows (a, b) is related to (c, d) if and only if $ad = bc$ then show whether R is a equivalence relation or not.

(b) (i) Find the no. of partitions on $A = \{a, b, c, d\}$

(ii) Define symmetric difference and disjoint set.

(c) Draw the Hasse diagram of the relation s defined as |, "divides" on set B where $B = \{2, 3, 4, 6, 12, 36, 48\}$

(d) Let $A = \{1, 2, 3, 4, 5, 6\}$, construct pictorial discription of relation R on A for the following :

(i) $R = \{(J,K) \mid J \text{ is multiple of } K\}$

(ii) $R = \{(J, K) \mid (J-K)^2 \in A\}$

(iii) $R = \{(J, K) \mid (\sqrt{\ } \text{ divides } K)\}$

(iv) $R = \{(J, K) \mid J \times K \text{ is prime}\}$

(e) If $f : A \to B$ be both one to one and onto then $f^{-1}A \to B$ is both one to one and onto; prove the theorem.

(f) Prove that $(\sqrt{5})$ is not a rational number (prove by contradiction).

2 Attempt any **four** of the following questions : **5×4=20**

(a) Simplify $F(A, B, C, D) = \sum(0,1, 4, 5, 6, 8, 9, 12, 13, 14)$ using Karnaugh map.

(b) (i) Determine the generating function of a numeric function a_r where

$$a_r = \begin{cases} 2^r & \text{if } r \text{ is even} \\ -2^r & \text{if } r \text{ is odd} \end{cases}$$

(ii) Using generating function solve the recurrence relation

$$F(K) = F(K-2) + F(K-1) \quad F(0) = F(1) = 1$$

(c) What is Recursion and Recurrence Relation ? Solve the following recurrence relation using initial condition as

$$s(0) = s(1) = 1$$

$$s(k) - 9s(k-1) + 8s(k-2) = 9k + 1$$
