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B.Tech. IN COMPUTER SCIENCE AND ENGINEERING (BTCSVI)

Term-End Examination

June, 2011

BICS-008 : DISCRETE MATHS STRUCTURE

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt **any seven** questions. All questions carry **equal** marks. **All** the questions are to be answered in english language only.*

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1. Prove that the relation R on the set $N \times N$ defined by $(a, b)R(c, d) \Leftrightarrow a+d=b+c$ for all $(a, b), (c, d) \in N \times N$ is an equivalence relation. **10**

2. Let $N = \{0, 1, 2, 3, \ldots\ldots\ldots\}$. Define functions f, g, and h from set N to N by **10**

$f(n) = n+1$

$g(n) = 2n$

$$h(n) = \begin{cases} 0 \text{ if } n \text{ is even} \\ 1 \text{ if } n \text{ is odd} \end{cases}$$

Compute go(fog)oh

Is the function h inversible ?

Is the function f onto ?

3. If Q^+ be the set of all positive rational numbers and $*$ be a binary composition in Q^+ defined by **10**

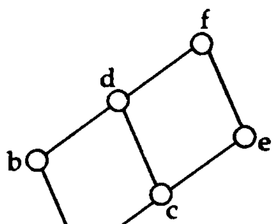
$a * b = \dfrac{ab}{3}$, $a, b \in Q^+$, show that $(Q^+, *)$ is a group. Find the identity of the group.

4. (a) Prove that the set $\{1, -i, i, 1\}$ is an abelian multiplicative finite group of order 4. **5**

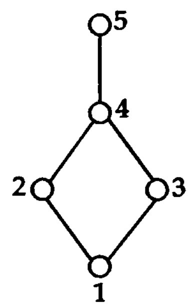
(b) Prove that the set of cube roots of unity is an abelian finite group with respect to multiplication. **5**

5. Define Isomorphic lattice. Show that the lattice L and L' given below are not isomorphic : **10**

L :



L' :



6. Simplify $F(A, B, C, D) = \Sigma(0, 1, 4, 5, 6, 8, 9, 12, 13, 14)$ using Karnaugh Map. **10**

7. Show that the given formula is a Tautology. **10**

$$\big((P \vee Q) \wedge 7(7P \wedge (7Q \vee 7R))\big) \vee (7P \wedge 7Q) \vee (7P \wedge 7R)$$

8. (a) What do you understand by fields ? Explain with axioms. **5**

(b) Define Rings with the axioms. **5**

9. Solve the recurrence relation **10**

$a_r - 7a_{r-1} + 10\ a_{r-2} = 0$

by the method of generating functions with the initial conditions, $a_0 = 3$ and $a_1 = 3$.

10. Write short notes on ***any two*** of the following : **10**

(a) Bipartite graphs and Planar graphs with examples.

(b) Euler and Hamiltonian paths with examples.

(c) Explain pre and post order Binary tree traversal with examples.