Bengal Engineering and Science University

Final Semester Examination of BE (IT) 3rd Semester, 2011

DISCRETE MATHEMATICS (IT 303)

Full Marks: 35 **Time: 2 hours**

(Answer any five questions)

1. a) What is Proposition? 1+3+3=7

b) Construct the truth tables for the following statements:

i) $(p \to p) \vee (p \to \bar{p})$

ii) $(p \vee \bar{q}) \to \bar{p}$

2. a) Evaluate the sum using generating function: 4+3=7

$1^2 + 2^2 + 3^2 + \cdots + r^2$

b) Determine the discrete numeric function corresponding to the following generating function:

$A(z) = \frac{1}{1-4z^2}$

3. a) Solve the following recurrence relation: 5+2=7

$a_r - 7a_{r-1} + 10a_{r-2} = 3^r$, given that $a_0 = 0$ and $a_1 = 3$.

b) What is equivalence relation?

4. a) Let ρ be an equivalence relation on a set S and $a, b \in S$. Then prove that $cl(a) = cl(b)$ if and only if $a \rho b$. 2+5=7.

b) Let S be the set of all positive divisors of 30. Verify whether the binary relation $\leq$ on S is Poset, where $a \leq b$ means "a is a divisor of b", for a, b in S. Draw the covering diagram of the given relation if the relation is Poset.

5. a) Let (G, o) be a group. Prove that a non-empty subset H of G forms a subgroups of (G, o) if and only if $a \in H, b \in H \Rightarrow a \, o \, b^{-1} \in H$. 4+3=7.

b) If (G, o) be a group in which $(a \, o \, b)^2 = a^2 \, o \, b^2$ for all $a, b \in G$, prove that the group is abelian.

6. a) Show that the following mapping f is injective but not surjective

$f : \mathbb{Z} \to \mathbb{Q}$ defined by $f(x) = 2^x, x \in \mathbb{Z}$. 3+4=7.

b) Show that the following mapping f is a bijection. Determine f^{-1}.

$f : \mathbb{R} \to \mathbb{R}$ defined by $f(x) = 2x + 3, x \in \mathbb{R}$.