



THE OPEN UNIVERSITY OF SRI LANKA
BACHELOR OF TECHNOLOGY – LEVEL 06

FINAL EXAMINATION – 2005

MPZ 6231 – DISCRETE MATHEMATICS (ESSAY TYPE PAPER)

DURATION : THREE (03) HOURS

Date : 11th May, 2006

Time: 9.30 a.m. - 4.30 p.m.

The Questions are grouped in the following manner.

Section A : Q : 1 – 4
 B : Q : 5 – 7
 C : Q : 8 – 9

Please ensure that the answers for questions in different sections are given on separate books. Mark your index number on each book.

Please answer a total of six questions choosing at least one from each single section.

SECTION – A

01. Consider the following propositions
P : Mathematicians are generous
Q : Spiders hate Algebra

Write the compound propositions symbolized by:

i. $P \vee \bar{q}$

ii. $(\bar{q} \wedge p)$

iii. $\bar{p} \rightarrow q$

iv. $\bar{p} \leftrightarrow \bar{q}$

02. Prove by induction that $f(n) = n(n^2 + 5)$ is divisible by 6 for all positive integers n .
03. Let $A = B = \mathbb{R}$ the set of all real numbers.
 Let $f: A \longrightarrow B$ be given by the formula $f(x) = 2x^3 - 1$ and
 Let $g: B \longrightarrow A$ be given by the formula $g(y) = \sqrt[3]{\frac{1}{2}y + \frac{1}{2}}$
 Show that f is a bijection between A and B and g is a bijection between B and A .
04. If $f(n)$ and $g(n)$ are two functions from \mathbb{Z}^+ to \mathbb{R} . Explain mathematically what is meaning by the statement $f \in o(g)$
- If $f_1 \in O(g)$ and $f_2 \in O(g)$ show that $f_1 + f_2 \in O(g)$
 - If $f \in O(g)$ and $g \in O(h)$ show that $f \in O(h)$

SECTION - B

05. Define an equivalence relation:
 Let X be a set and suppose
 $A_1, A_2, A_3, \dots, A_n$ are mutually disjoint subsets of X such that

$$X = \bigcup_{i=1}^n A_i$$

Define a relation R on X by
 $xRy \iff \{x \text{ and } y \text{ belong to the same subset } A_i\}$
 Show that R is an equivalence relation in X .

06. a. Show that $(p \vee q) \vee (\overline{p \wedge q})$ is a tautology and
 b. $(P \wedge \overline{q}) \wedge (\overline{P} \vee q)$ is a contradiction.
07. a. The set theoretic definition of graph
 $G = G(V, E)$ is given by
 $V(G) = \{V_1, V_2, V_3, V_4, V_5\}$
 $E(G) = \{\{V_1, V_2\}, \{V_1, V_3\}, \{V_2, V_4\}, \{V_3, V_5\}\}$
 Diagram G in three way representation.
- b. Establish five different but equivalent definitions of a tree.

SECTION – C

08. a) How are fractals related to the field of chaos.
b) Give an examples for 0, 1, 2, 3 dimensionals.
09. Explain the following concepts.
- a. Simple feed back system
 - b. Sensitive dependence on initial conditions
 - c. Attractor of period one.

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