

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

FINAL EXAMINATION – 2005

MPU 4301 – DISCRETE MATHEMATICS (ESSAY TYPE PAPER)

DURATION : FOUR (04) HOURS



1142

Date : 11th May, 2006

Time: 9.30 a.m.- 5.30 p.m.

The Questions are grouped in the following manner.

Section A : Q : 1 – 4
 B : Q : 5 – 8
 C : Q : 9 – 10

Please ensure that the answers for questions in different sections are given 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. In how many of the permutations of 10 things taken 4 of a time will
- One thing always occur
 - Never occur.
04. If $f(n)$ and $g(n)$ are two functions from Z^+ to R . Explain mathematically what is meant 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
 $xRy \Leftrightarrow \{x \text{ and } y \text{ belong to the same subset } A_i\}$
 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. $(P \wedge \bar{q}) \wedge (\bar{P} \vee q)$ is a contradiction.
07. a. Define the Boolean Algebra $(B, +, \cdot, 1)$
 b. Show that $b = c \Leftrightarrow a + b = a + c$
 Also show that
 $a \cdot b = a \cdot c$ for some a
 c. For any $a \in B$ show that $a + a = 2a$ and $a \cdot a = a$

08. Let $f: A \rightarrow B$ be a function
- then f^{-1} is a function from B to A iff f is 1-1.
 - If f^{-1} is a function then the function f^{-1} is also 1-1
 - f^{-1} is every where defined iff f is onto.
 - f^{-1} is onto iff f is every where defined.

SECTION - C

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

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