

Mt Kenya



University

UNIVERSITY EXAMINATION 2010/2011

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF INFORMATION TECHNOLOGY

EXAMINATION FOR BACHELOR OF BUSINESS INFORMATION TECHNOLOGY

UNIT CODE: BBIT 1201

TITLE: DISCRETE MATHEMATICS

DATE: NOVEMBER, 2010

TIME: 2 HOURS

INSTRUCTIONS: Answer Question **ONE** and any other **TWO** questions.

QUESTION ONE

- a) Write the converse, inverse and the contra positive of the following sentence. "If the Sun shines brightly today , then it will set early"
(4mks)
- b) Define the terms: Tautology, Logical equivalence and a propositional function.
(3mks)
- c) State three methods of proving theorems
(3Mks)
- d) Explain the meaning of the term lattice
(2mks)
- e) How many ways are there to select 5 players from a 10-member tennis team to make a trip to a match at another school?
(3mks)
- f) Differentiate between the cardinality of a set and the Cartesian product of sets(4mks)
- g) What is a partially ordered set
(2mks)
- h) Simplify the following Boolean expressions
(5mks)
 - a. $\overline{(1 + 0)} + \overline{(1.0)}$
 - b. $\overline{(\overline{1 + 1})} + \overline{(0)} + 1.1$
- i) Draw the venn diagram showing the intersection between two sets A and B. (2 mks)

QUESTION TWO

Use a relevant method of proving theorems to:

- a) Prove that the following formula for the sum of a finite number of terms of a geometric progression is given by,

$$\sum_{j=0}^n ar^j = a + ar + ar^2 + \dots \dots \dots ar^n = \frac{ar^{n+1} - a}{r-1}$$

(7mks)

- b) Prove that $\sqrt{2}$ is irrational.

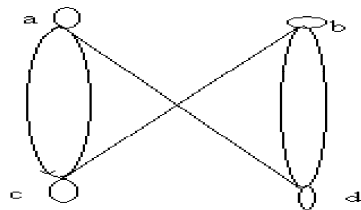
(7mks)

- c) Prove the theorem "the integer n is odd if and only if n^2 is odd" (6mks)

QUESTION THREE

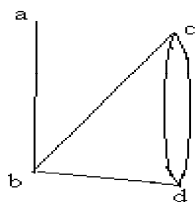
- a) Represent each of the following graphs using an adjacency matrix

i)



(4mks)

ii)



(4mks)

- b) Draw the graphs with the following adjacency matrices

i)
$$\begin{bmatrix} 1 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 1 & 0 & 1 \\ 0 & 0 & 0 & 0 & 1 & 1 \\ 1 & 0 & 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 1 & 1 & 0 \end{bmatrix}$$

(6mks)

ii)
$$\begin{bmatrix} 1 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 1 & 1 & 0 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 0 & 1 & 1 & 0 & 0 \end{bmatrix}$$
 (6mks)

QUESTION FOUR

- a) What is the Cartesian product $A \times B \times C$ where $A = \{0,1\}$, $B = \{1,2\}$ and $C = \{a, b, c\}$ (6mks)
- b) Find the power set of the set $\{0,1,2\}$
(4mks)
- c) Let A, B and C are sets. Show that $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$ using identities
(4mks)
- d) Suppose that f is defined recursively by;
- $f(0)=3$
- $f(n+1)=2f(n)+3$.
- Find $f(1)$, $f(2)$, $f(3)$ and $f(4)$
(4mks)
- e) What is a Venn diagram?
(2mks)

QUESTION FIVE

- a) Show that the propositions $\neg p \vee q$ and $p \rightarrow q$ are logically equivalent
(6mks)
- b) Let $R(x,y,z)$ denote the statement $z = x^2 + y^2$. Find the truth values of $R(0,0,1)$, $R(1,1,2)$ and $R(2,3,13)$.
(6mks)
- c) Draw the truth tables for negation and the implication of a proposition p and q
(4mks)
- d) Explain the meaning of the following terms.
- i) Open sentence
 - ii) Logical Reasoning
(4mks)