KABARAK UNIVERSITY

UNIVERSITY EXAMINATIONS

2010/2011 ACADEMIC YEAR

FOR THE DEGREE OF BACHELOR OF SCIENCE IN ECONOMICS AND MATHEMATICS AND BACHELOR OF COMPUTER SCIENCE

COURSE CODE: MATH 110

COURSE TITLE: BASIC MATHEMATICS

STREAM: Y1S1

DAY: THURSDAY

TIME: 9.00 – 11.00 A.M.

DATE: 09/12/2010

INSTRUCTIONS:

Attempt question **ONE** and any other **TWO** questions.

PLEASE TURN OVER

QUESTION ONE (30 MARKS)

(a) Twenty-four dogs are in kennel. Twelve of the dogs are black, six of the dogs have short tails, and fifteen of the dogs have long hair. There is only one dog that is black with a short tail and long hair. Two of the dogs are black with short tails and do not have long hair. Two of the dogs have short tails and long hair but are not black, if all of the dogs in the kennel have at least one of the mentioned characteristics, how many dogs are black with long hair but don not have short tails? **(6 marks)**

(b) Approximate the value of $\sqrt{10}$ using binomial theory. **(6 marks)**

(c) Derive the formula of sum of Arithmetic progression (A.P) given that 1st term is "a" and

(d) nth term is $L = a + (n-1)d$. Hence find the sum of all the terms in a sequence.

$1, -{}^{3}/_{2}, -4,$ ----------, -49 **(6 marks)**

(e) Prove that $\sqrt{8}$ is irrational number. **(4 marks)**

(f) Using Vern's diagram show $(A \cap B)^1 = A^1 \cup B^1$ **(4 marks)**

(g) Derive the identity $\sin^2 x + \cos^2 x = 1$ from a quarter circle **(4 marks)**

QUESTION TWO (20 MARKS)

Consider the following digital operators then fill the tables below and deduce schematic symbols (digital device) for each table. **(20 marks)**

AND (all high = high, else low)		
Input 1	**Input 2**	**output**

OR (any high = high, else low)		
Input 1	**Input 2**	**output**

NAND (all high = low, else high)		
Input 1	**Input 2**	**output**

NOR (any high = low, else high)		
Input 1	**Input 2**	**output**

XOR (different = high, same = low)		
Input 1	**Input 2**	**output**

QUESTION THREE (20 MARKS)

(a) Differentiate between permutation and combination. **(3 marks)**

(b) In how many ways can r objects be chosen from n unlike objects? **(5 marks)**

(c) In how many different ways can the word Mississippi be written without repetition? **(4 marks)**

(d) In how many ways can committee of 4 be chosen from 4 girls and 5 boys if the committee must have at most 2 girls. **(5 marks)**

(e) A mixed hockey team containing 5 men and 6 women is to be chosen from 7 men and 9 women. In how many ways can this be done? **(3 marks)**

QUESTION FOUR (20 MARKS)

(a) Let $f(x) = x + 5$ and $g(x) = x + 2$
Find;

(i) fog **(2 marks)**

(ii) gof **(2 marks)**

(iii) $\{f(x)g(x)\}^{-1}$ **(4 marks)**

(b) Derive the sum of the G.Ps given 1st term is a and common ratio is r. Hence find the smallest number of terms of the G.P $8 + 24 + 72 + ----$, that will give a total greater than 6,000,000? **(7 marks)**

(c) If $\sin(x + \alpha) = \cos(x - \beta)$ find $\tan x$ in terms of $\propto$ and β. **(5 marks)**

QUESTION FIVE (20 MARKS)

(a) Using truth table show that $A \cup (B \cap \complement) = (A \cup B) \cap (A \cup \complement)$ **(7 marks)**

(b) Prove that $\sin 3A = 3\sin A - 4\sin^3 A$. **(7 marks)**

(c) Use mathematical induction to prove that
$1^2 + 2^2 + ----- + n^2 = \frac{1}{6}n(n+1)(2n+1)$ **(6 marks)**