KABARAK   **UNIVERSITY**

UNIVERSITY EXAMINATIONS
2009/2010 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: **FRIDAY**

TIME: **2.00 – 4.00 P.M.**

DATE: **06/08/2010**

INSTRUCTIONS:

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

PLEASE TURN OVER

QUESTION ONE (30 MARKS)

(a) Find the sum of n terms of the series 2 x 3 + 3 x 4 + 4 x 5 + --------

The mth term of the series is (m + 1) (m + 2) or $m^2 + 3m + 2$ **(5 marks)**

(b) Write in the $\sum$ notation.

    (i)   2 X 7 + 3 X 8 + 4 X 9 + 5 X 10 + 6 X 11 **(2 marks)**

    (ii) $1 + \dfrac{2}{3} + \dfrac{3}{9} + \dfrac{4}{27} + \dfrac{5}{81}$ **(2 marks)**

(c) Show that $\sqrt{8}$ is irrational number. **(8 marks)**

(d) Consider the following logical equivalence summarized below and draw the truth
table to extract the logical conclusion. $(p \rightarrow q) \wedge (q \rightarrow p) = p \Leftrightarrow q$ **(5 marks)**

(e) Use binomial theorem to expand $\dfrac{1}{1-x}$ in ascending powers of x, as far as the term in x^3.
(4 marks)

(f) Using reasoning technique show that $A - B = A \cap B^1$ **(4 marks)**

QUESTION TWO (20 MARKS)

(a) Find the sum of n terms of the series 2 x 3 + 3 x 4 + 4 x 5 + ------ The mth term of the series
is $(m + 1)(m + 2)$ or $m^2 + 3m + 2$ **(6 marks)**

(b) Derive the sum of G.P and hence evaluate the smallest number of terms of the series
8 + 24 + 72 + ------, that will give a total greater than 6,000,000. **(10 marks)**

(c) Derive the sum to infinity hence express as fraction in their lowest terms; $0\overset{..}{4}\overset{.}{5}$ **(4 marks)**

QUESTION THREE (20 MARKS)

(a) Prove the identify $\cos^2 A - \cos^2 B = \sin(A + B)\sin(B - A)$ **(5 marks)**

(b) Solve the equation $\cos 6x + \cos 4x + \cos 2x = 0$ for values of x from $0°$ to $180°$
inclusive. **(5 marks)**

(c) If A, B, C are the angles of a triangle prove that

$$\cos A + \cos B + \cos C - 1 = 4 \sin\frac{A}{2} \ \sin\frac{B}{2} \ \sin\frac{C}{2}$$ **(10 marks)**

QUESTION FOUR (20 MARKS)

(a) Use mathematical induction to prove $1^2 + 2^2 + \ - - - \ + n^2 = \frac{1}{6}n\,(n+1)(2n+1)$

(6 marks)

(b) In how many ways can a committee of 5 be formed from 6 boys and 7 girls if the committee

must have at least 1 girl?   **(5 marks)**

(c) By use of truth table show that $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$ **(6 marks)**

(d) Find the coefficient of x^{10} in the expansion of $(2x - 3)^{20}$ **(3 marks)**

QUESTION FIVE (20 MARKS)

(a) Let $f(x) = x + 2 \qquad g(x) = (x + 3)$
     Find
   (i) fog **(2 marks)**

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

   (iii) $\{fog\}^{-1}$ **(2 marks)**

(b) Using Booleen logic prove that the digital circuit $a \cdot (b + c) = a \cdot b + a \cdot c$ works.

(4 marks)

(c) State and prove De'morgans theorems. (Use truth tables)   **(10 marks)**