KABARAK UNIVERSITY

EXAMINATIONS

2008/2009 ACADEMIC YEAR

FOR THE DEGREE OF BACHELOR OF EDUCATION SCIENCE

COURSE CODE: **MATH 110**

COURSE TITLE: **BASIC MATHEMATICS**

STREAM: **SESSION I**

DAY: **THURSDAY**

TIME: **9.00- 11.00 A.M.**

DATE: **13/08/2009**

INSTRUCTIONS:

Answer Question **ONE** and any other **TWO** Questions.

PLEASE TURN OVER

QUESTION ONE (30 MARKS)

(a) Write the general term(s) of the following sequences

(i) $\left\{1, \frac{1}{2}, \frac{1}{3}, \frac{1}{4} - - -\right\}$

(ii) $\left\{0, \frac{1}{2}, \frac{2}{3}, \frac{3}{4}, - - -\right\}$

(iii) $\left\{1, \frac{1}{3}, \frac{1}{5}, \frac{1}{7} - - -\right\}$ **(6 marks)**

(b) Show that $\sqrt{2}$ is an irrational number. **(7 marks)**

(c) Given two propositional forms $p \cap (q \cup r)$ and $(P \cap q) \cup (p \cap r)$, show the relationship of the two, by use of a truth table **(4 marks)**

(d) Prove that $\mathrm{A} - B = (A \cap B)^1$ **(5 marks)**

(e) Write short notes on the following;

(i) Universal set **(2 marks)**

(ii) Disjointed sets **(2 marks)**

(iii) Empty set **(2 marks)**

QUESTION TWO (20 MARKS)

(a) By use of mathematical induction prove that **(5 marks)**

$$\sum_{j=1}^{n} j^3 = \frac{n^2(n+1)^2}{4}$$

(b) State and prove the De'morgans laws by

(i) Use of reasoning technique **(5 marks)**

(ii) Boolean logic **(5 marks)**

(c) Show that that $\frac{p}{q} + \sqrt{2}\ \frac{r}{5}$ is irrational. **(5 marks)**

QUESTION THREE (20 MARKS)

(a) There are 3 boys and 4 girls at a party. In how many ways can a team of 5 pupils be formed so as to include at least one boy. **(4 marks)**

(b) Prove the following;

(i) $\frac{\cos\theta \sin^2\theta + \cos^3\theta}{\sin\theta} = \frac{1}{\tan\theta}$ **(2 marks)**

(ii) $\sin 3A = 3\ \sin A\ - 4\sin^3 A$ **(8 marks)**

(iii) $\cos^2 x + \sin^2 x = 1$ **(6 marks)**

QUESTION FOUR (20 MARKS)

(a) Using the Boolean logics show that the digital circuit $a \cdot (b + c) = a \cdot b + a \cdot c$ works. **(6 marks)**

(b) Write short notes on the following;

(i) Closure by addition **(2 marks)**

(ii) Closure by multiplication **(2 marks)**

(c) By using concept of G.P series

(i) Derive a formula of sum to infinity **(4 marks)**

(ii) Express $0.\ddot{4}\ddot{5}$ and $0.0\dot{7}$ in lowest form. **(6 marks)**

QUESTION FIVE (20 MARKS)

(a) Derive;

(i) Sum of the G.P **(5 marks)**

(ii) Sum of the A.P **(5 marks)**

(b) Given $f(x) = 2x^2 - 6x + 8$. Find $f^{-1}(x)$ **(5 marks)**

(c) Prove that $\sqrt{8}$ is irrational. **(5 marks)**