KABARAK UNIVERSITY

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: **2.00 – 4.00 P.M.**

DATE: **27/11/2008**

INSTRUCTIONS TO CANDIDATES:

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

PLEASE TURN OVER

QUESTION ONE (30 MARKS)

(a) Given that $U = |N| = \{1, 2, 3, 4 - - -\}$ is the universal set, let A = $\{1, 2, 3, 4\}$ and

B = $\{3, 4, 5, 6, 7\}$. Find

(i) B^c

(ii) B\A

(iii) A\B **(3 mks)**

(b) Show that A = $\{2, 3, 4, 5\}$ is not a subset of B = $\{x : x \in |N|, x \, is \, even\}$ **(3 mks)**

(c) Prove $(A \cap B) \cup (A \cap B^c) = A$ **(5 mks)**

(d) Prove that $P \rightarrow q \equiv \neg p \vee q$ **(5 mks)**

(e) Use the standard set systems N, Z, Q, ϕ, u and $\Re$ to find:

(i) $N \cup Z$ **(1 mk)**

(ii) $N \cap Z$ **(1 mk)**

(iii) $N \setminus \Re$ **(2 mks)**

(f) Show that $\cos^2 \theta (\tan^2 + 1) = 1$

(g) Find the number of ways in which the letter ISOSECLES can be arranged if the two E'S are separated. **(4 mks)**

(h) A ferry which can only hold ten people is to carry a party or thirteen men and seven women across a river. Find the number of ways in which the party may be taken across if all the women go on the first trip.

(3 mks)

QUESTION TWO (20 MARKS)

(a) If the first term of an A.P is a, and then n^{th} term is L, and the sum of n terms is S_n, show that;

$$S_n = \frac{n(a+l)}{2}$$ **(5 mks)**

(b) If the first term of a G.P is a and the common ratio is r and the sum of n terms is S_n, show that;

$$S_n = a\left(\frac{1-r^n}{1-r}\right)$$ **(5 mks)**

(c) In a geometric progression, the sum of the second and third terms is 9, and the seventh term is eight times the fourth term. Find the first term, the common ratio and the fifth term. **(5 mks)**

(d)The second term of an arithmetical progression is three times the seventh, and the ninth term is one. Find the first term and the common difference. **(5 mks)**

QUESTION THREE (20 MKS)

(a) Given that $\cot\theta = -\frac{1}{3}$, θ in quadrant IV find $\sin\theta$ **(4 mks)**

(b) Show that

(i) $\frac{\tan\theta - \cot\theta}{\sin\theta\cos\theta} = \sec^2\theta - \operatorname{cosec}^2\theta$ **(4 mks)**

(ii) $\frac{\operatorname{cosec}\theta + \cot\theta}{\tan\theta + \sin\theta} = \cot\theta\ \operatorname{cosec}\theta$ **(4 mks)**

(c) Given that $\cos^2 x + \sin^2 x = 1$ and $\cos^2 x = \cos^2 x - \sin^2 x$

show that

$$Tan\left(\frac{A}{2}\right) = \pm\sqrt{\frac{1-\cos A}{1+\cos A}}$$

where A = 2x **(8 mks)**

QUESTION FOUR (20 MKS)

(a) Show that the following argument is valid.

S_1: Babies are illogical

S_2: Nobody is despised who can manage crocodile

S_3: Illogical people are despised

S: Babies cannot manage Crocodiles. **(4 mks)**

(b) Verify that the proposition $PV \neg(p \Lambda q)$ is tautology. **(4 mks)**

(c) Verify that the position $(p \Lambda p) \Lambda \neg(pVq) \equiv \neg p$ is a contradiction. **(7 mks)**

(d) Show that $\neg(p \vee q) \vee (\neg p \wedge q) \equiv \neg p$

QUESTION FIVE (20 MARKS)

(a) If $f(x) = 3x, g(x) = \frac{1}{x}$ and $h(x) = x^2 - 2,$

Find;

(i) fog(x) **(1 mk)**

(ii) gofoh(x) **(2 mks)**

(iii) g^{-1}o f^{-1}(x) **(3 mks)**

(iv) $(gof)^{-1}$(x) **(3 mks)**

(v) f^2(x) **(1 mk)**

(b) Illustrate the distribution law $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$ with Venn diagrams. **(10 mks)**