

**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: MONDAY**

**TIME: 9.00 – 11.00 A.M.**

**DATE: 30/11/2009**

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**INSTRUCTIONS:**

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

**PLEASE TURN OVER**

## **QUESTION ONE (30 MARKS)**

(a) Proof that;

(i)  $(A \cap U) \cap (\emptyset \cup A') = \emptyset$  **(2 marks)**

(ii)  $(A \cup \emptyset) \cup (U \cap A')$  **(2 marks)**

(b) Proof that;

(i)  $P \vee \neg P$  is a tautology

(ii)  $P \vee \neg P$  is a contradiction **(4 marks)**

(c) Use Venn diagram to show that the following argument is valid

S<sub>1</sub>: My saucepans are the only things I have that are made of tin

S<sub>2</sub>: I find all your presents very useful

S<sub>3</sub>: None of my saucepans is of the slightest use

S<sub>4</sub>: Your presents to me are not made of tin **(4 marks)**

(d) Eliminate  $\theta$  from the following equations

(i)  $X = a \cot \theta, y = b \sin \theta$

(ii)  $X = \sin \theta + \cos \theta, y = \sin \theta - \cos \theta$  **(6 marks)**

(e) The second, fourth and eighth terms of an A.P are in geometrical progression, and the same of the third and fifth terms is 20. Find the first term and the common difference of the progression. **(4 marks)**

(f) Find the number of ways the word RANDOM must be arranged if

(i) The two N'S must be together **(2 marks)**

(ii) The two N'S must be separated **(3 marks)**

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

## **QUESTION TWO (20 MARKS)**

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

- (i)  $f \circ g(x)$  **(1 mark)**
- (ii)  $g \circ f(x)$  **(1 mark)**
- (iii)  $f \circ g \circ h(x)$  **(2 marks)**
- (iv)  $f^{-1} \circ g^{-1}(x)$  **(3 marks)**
- (v)  $h^{-1} \circ f^{-1}(x)$  **(3 marks)**
- (vi)  $h^{-1} \circ f^{-1} \circ g^{-1}(x)$  **(3 marks)**
- (vii)  $(g \circ f)^{-1}(x)$  **(2 marks)**

(b) A committee of ten is to be chosen from nine men and six women. In how many ways can it be formed if at least three women are to be in the committee?

**(5 marks)**

## **QUESTION THREE (20 MARKS)**

(a) Use Venn diagram to show that

(i)  $(A \cup B \cup C)^1 = (A \cup C)^1 \cap (A \cup B)^1$  **(6 marks)**

(ii)  $(A \cup B)^1 = A^1 \cap B^1$  **(4 marks)**

(iii)  $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$  **(6 marks)**

(b) Use a Venn diagram to show that the following argument is valid.

$S_1$ : Babies are illogical

$S_2$ : Nobody is despised who can manage a crocodile

$S_3$ : Illogical people are despised

$S$ : Babies cannot manage crocodiles. **(4 marks)**

## QUESTION FOUR (20 MARKS)

(a) Construct the following truth tables.

(i)  $\neg(\neg p \vee \neg q)$  **(4 marks)**

(ii)  $\neg(\neg p \wedge \neg q)$  **(4 marks)**

(b) Use a truth table to show that;  $\neg(p \wedge q) \equiv \neg p \vee \neg q$  **(4 marks)**

(c) If  $y = b \cot \theta$ , simplify;

(i)  $\frac{y}{b^2 + y^2}$  **(3 marks)**

(ii)  $y\sqrt{b^2 + y^2}$  **(2 marks)**

(d) Prove that  $\frac{\tan \theta + \cot \theta}{\sec \theta + \operatorname{cosec} \theta} = \frac{1}{\sin \theta + \cos \theta}$  **(3 marks)**

## QUESTION FIVE

(a) (i) prove that the sum( $S_n$ ) of the first n terms of an A.P whose first term is a given

by:  $S_n = \frac{n}{2}\{2a + (n - 1)d\}$  where d is the common difference. **(6 marks)**

(ii) 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. **(4 marks)**

(b) (i) In the first term of a G.P is a and the common ratio is r, prove that the sum  $S_n$  of the first n terms is given by:

$$S_n = a \left( \frac{r^n - 1}{r - 1} \right) \quad \textbf{(6 marks)}$$

(ii) In a geometrical progression, the sum of the second and third terms is  $-12$ .

Find the first term and the common ratio. **(4 marks)**