KABARAK   **UNIVERSITY**

UNIVERSITY EXAMINATIONS
2010/2011 ACADEMIC YEAR
FOR THE DEGREE OF BACHELOR OF EDUCATION
SCIENCE

COURSE CODE: **MATH 110**

COURSE TITLE: **BASIC MATHEMATICS**

STREAM: **SESSION II**

DAY: **TUESDAY**

TIME: **2.00 – 4.00 P.M.**

DATE: **12/04/2011**

INSTRUCTIONS:

1. Answer question **ONE** and any other **TWO** questions
2. Begin each question on a separate page
3. Show your workings clearly

PLEASE TURN OVER

QUESTION ONE (30 MARKS)

a) Find thr three angles of the triangle whose sides have lengths a = 8 cm , b = 19 cm and c = 14 cm   (6 marks)

b) In a survey of 120 people, it was found that 50 read daily nation, 52 read Kenya times and 52 read the standard. Also 18 read Nation and standard, 22 read Nation and Kenya times, 16 read both Kenya times and standard and 16 read no newspaper at all.
   i) Find the number of people who read all three magazines   (3 marks)
   ii) Fill in the correct number of people in each of the eight regions of the Venn diagram   (3 marks)
   iii) Determine the number of people who read exactly 1 Newspaper and 2 News papers   (4 marks)

c) Prove that $p \wedge (q \vee r) \equiv (p \wedge q) \vee (p \wedge r)$ (6 marks)

d) Three numbers are in G.P. Their product is 64 and sum is 124/5. Find them   (6 marks)

e) How many ways can you choose chairman, Vice- chairman, Secretary, Vice-secretary, Organizing secretary and Tresearer from a group of 12 Christians?

QUESTION TWO (20 MARKS)

a) Given $f(x) = 3x - 2$ $find$ $f^{-1}(x)$ and $show\,that\,(fof^{-1}(x)) = x\,and\,(f^{-1}of)(x) = x$ (12 marks)

b) For each of these relations on the set {1,2,3,4}, decide whether it is reflexive, symmetric, anti-symmetric or transitive
   i)   {(2,2),(2,3),(2,4),(3,2),(3,3),(3,4)}
   ii)   {(1,1),(1,2),(2,1),(2,2),(3,3),(4,4)}
   iii)   {(2,4),(4,2)}
   iv)   {(1,2),(2,3),(3,4)}   (8 marks)
   v)   {(1,1),(2,2),(3,3),(4,4)}
   vi)   {(1,3),(1,4),(2,3),(2,4),(3,1),(3,4)}

QUESTION THREE (20 MARKS)

f) $Pr\,ove\,that$ $\dfrac{\tan\theta - \cot\theta}{\tan\theta + \cot\theta} = (\sin\theta - \cos\theta)(\sin\theta + \cos\theta)$ (7 marks)

g) Prove the following proposition:

$$p(n): \frac{1}{1(3)} + \frac{1}{3(5)} + \frac{1}{5(7)} + \ldots\ldots + \frac{1}{(2n-1)(2n+1)} = \frac{n}{2n+1}$$ (7 marks)

h) Mr Kigen arranges to pay off a debt of Kshs 9,600 in 48 annual instalments which form an arithmetic series. When 40 of these instalments are paid, Mr Kigen becomes insolvent and his creditors find that Kshs 2400 still remains unpaid. Find the values of each of the three instalments of Mr Kigen. Ignore interest   (6marks)

QUESTION FOUR (20 MARKS)

a) Expand the following upto y^4 and hence evaluate $(0.92)^{20}$ and $(1.08)^{20}$

$(1+3y)^{20}$ (7 marks)

b) Given $f(x) = 2x + 3$ and $g(x) = \frac{1}{2}(x - 3)$ find the following

    i) $(fog)(x)$ (4 marks)

    ii) $(gof)(x)$ (3 marks)

c) Find the general solution for the equation $24\sec^2\theta - 26\tan\theta - 18$ (6 marks)

QUESTION FIVE (20 MARKS)

a) The number of bacteria in a refrigerated food is given by

$N(T) = 20T2 - 80T + 500, \ 2 \leq T \leq 14$

Where T is the celcius temperature of food. When the food is removed from refrigeration, the temperature is given by

         $T(t) = 4t + 2, \quad 0 \leq t \leq 3$

      Where t is the time in hours. Find the following.

    i)   The composite $N(T(t))$. What does this represent   (3 marks)

    ii)   The number of bacteria in the food when t = 2hours   (2 marks)

    iii)   The time when the bacteria count reaches 2000   (3 marks)

b) Use laws of logic to classify the following expressions as tautologies or contradictions

i) $(P \ \wedge \neg q) \vee (\neg p \vee q)$ (5 marks)

ii) $[p \rightarrow (q \rightarrow p)] \Leftrightarrow (p \wedge \neg p)$ (5 marks)