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 I

DAY: MONDAY

TIME: 9.00 – 11.00 A.M.

DATE: 29/11/2010

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

QUESTIONS

a) Use mathematical induction to prove the following formular

$S_n = 1^2 + 2^2 + 32 + 4^2 + \ldots + n^2 = \frac{n(n+1)(2n+1}{6}$ (6 marks)

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

i) $(P \wedge \neg q) \vee (\neg p \vee q)$ (4 marks)

ii) $[p \rightarrow (q \rightarrow p)] \Leftrightarrow (p \wedge \neg p)$ (4 marks)

c) Solve the following equation $2\sin^2 x + 3\cos x - 3 = 0$ (4 marks)

d) In an AP the fouth term is 13 and the seventh term is 22. Determine

i) The first term and the common difference (4 marks)

ii) The value of n if the nth term is 100 (3 marks)

iii) The value of m if the sum to m terms of the series is 175 (5 marks)

QUESTION TWO (20 MARKS)

a) Two planes leave an airport L at 12.00 noon. The first plane flies due West at a speed of 600km/h and the second flies on a bearing N30^{o}E at a speed of 1000km/h. Calculate how far a part the planes will be at 1.00PM and the bearing of the second plane from the first at that time (4 marks)

b) How many ways can you choose chairman, Vice- chairman, Secretary, Vice-secretary, Organizing secretary and Tresearer from a group of 10 Christians? (3 marks)

c) Solve triangle ABC , given that C = 42.9^O a = 14.6cm and r = 11.4cm (4 marks)

d) Prove that the conditional operation distributes over conjuction; that is

$p \rightarrow (q \wedge r) \equiv (p \rightarrow q) \wedge (p \rightarrow r)$ (4 marks)

e) The third term of a G.P is $1\frac{1}{4}$ and the sixth term is $\frac{5}{32}$. Determine the first term, the common ration and the sum of the first six terms of the series. (5 marks)

QUESTION THREE (20 MARKS)

a) An auditorium has 20 rows of seats. There are 20 seats in the first row, 21 seats in the second row, and 22 seats in the third row and so on. How many seats are there in all 20 rows? (4 marks)

b) Prove the distribution law $p \vee (q \wedge r) \equiv (p \vee q) \wedge (p \vee r)$ (6 marks)

c) Given $f(x) = x + 2$ and $g(x) = 4 - x^2$, find the following

i) $(f \circ g)(x)$ (2 marks)

ii) $(g \circ f)(x)$ (2 marks)

d) Expand $(1+2y)^{20}$ upto the term y^5 and hence evaluate $(0.96)^{20}$ and $(1.04)^{20}$ (6 marks)

QUESTION FOUR (20 MARKS)

a) Let A = (1,2,3,4,5) and let R be the relation on A defined as follows

R = (1,3), (1,4) , (2,1), (2,2), (2,4), (3,5) , (5,2), (5,5)

i) Write down the matrix representation of R (2 marks)

ii) Draw the graphical representation of R (2 marks)

b) Find the inverse of $f(x) = 4x$. Then verify that both $f(f^{-1}(x))$ and $f^{-1}(f(x))$ are equal to the identity function (6 marks)

c) Prove that p (n): $1 + 4 + 7 + . . . + (3n - 2) = \frac{n(3n-1}{2}$ (6 marks)

d) Find the power set of T = (4,7,8) (4 marks)

QUESTION FIVE (20 MARKS)

a) A market researcher investigating consumers' preference for three brands of beverages namely: coffee, tea and cocoa, in Ongata town gathered the following information:

From a sample of 800 consumers, 230 took coffee, 245 took tea and 325 took cocoa, 30 took all the three beverages, 70 took coffee and cocoa, 110 took coffee only, 185 took cocoa only.

Required:

i) Present the above information in a Venn diagram. (2 marks)

ii) The number of customers who took tea only. (2 marks)

iii) The number of customers who took coffee and tea only (2 marks)

iv) The number of customers who took tea and cocoa only. (2 marks)

v) The number of customers who took none of the beverages. (2 marks)

b) Which of the following equations represents y as a function of x

i) $x^2 + y = 1$ (2 marks)

ii) $-x + y^2 = 1$ (2 marks)

iii) Find $(f + g)(x)$ for the functions

c) $f(x) = 2x + 1$ and $g(x) = x^2 + 2x - 1$

Then evaluate the sum when $x = 2$ (6 marks)