KABARAK UNIVERSITY

UNIVERSITY EXAMINATIONS

2008/2009 ACADEMIC YEAR

FOR THE DEGREE OF BACHELOR OF COMPUTER SCIENCE

COURSE CODE: MATH 110

COURSE TITLE: BASIC MATHEMATICS

STREAM: **Y1S1**

DAY: **MONDAY**

TIME: **11.00 – 1.00 P.M.**

DATE: **08/12/2008**

INSTRUCTIONS TO CANDIDATES:

1. Answer Question **ONE** and any other **TWO** Questions.
2. Show all your workings in the booklet provided and be neat.

PLEASE TURN OVER

QUESTION ONE (30 MARKS)

(a) Given that $\varepsilon = N$; $A = \{1,3,12,35\}$

$B = \{3,7,12,20\}$ and $C = \{x : x \ \ is \ \ aprime \ \ number\}$

Find

(i) $B \ \mathsf{f} \ C$

(ii) $A \ \mathsf{r} \ (B - C)$

(iii) $(A \ \mathsf{r} \ B) \ \mathsf{f} \ C$

(iv) $A - (B - C)$ **(5 mks)**

(b)(i) Complete the following table:

$[q \ v \ (\sim \ p \ \Lambda \ q)] \ v \ (\sim \ p \ \Lambda \sim q)$

(ii) Is the complex proposition above logically true, logically false or logically indeterminate? **(6 mks)**

(c) Given two complex numbers; $z_1 = -2 - 4i$ and $z_2 = +5 - 3i$ from the set C.

(i) Find $z_1 - z_2$ and $\frac{z_2}{z_1}$

(ii) Show that C is closed under multiplication

(iii) Find $\bar{z}_1$ and hence $z_2 \ \bar{z}_1$ **(5 mks)**

(d) A function f is defined by $f : x \to x - 4$. Another function g is such that

$$gf : x \to x^2 - 8x + 12$$

Find the function $g(x)$. Hence find $fg(2)$. **(6 mks)**

(e) How many different 4 –figure numbers can be formed from the digits 1, 2, 4, 5, 6, 7, 9 if

(i) repetitions are allowed **(1 mk)**

(ii) repetitions are not allowed **(1 mk)**

(iii) Find the number of permutations of the telephone 0733370700 **(6 mks)**

(f) Find five numbers in an arithmetic progression whose sum is 255 and whose last term is 55. **(4 mks)**

QUESTION TWO (20 MARKS)

(a) Show that;

(i) $\dfrac{\cos 2\theta + \sin 2\theta - 1}{\cos 2\theta - \sin 2\theta + 1} = \tan\theta$

(ii) $\dfrac{\cos^2\theta}{1+\sin\theta} + \dfrac{\cos^2\theta}{1-\sin\theta} = 2$ **(6 mks)**

(b) Solve the equation for x given that

$\sin 3x + \sin x = 0$

for $-180^0 \le x \le 180^0$ **(5 mks)**

(c) If $\sin = \dfrac{3}{5}$ and $\cos B = \dfrac{12}{13}$ where both A and B are acute angles, find without using calculators or tables, the values of:

(i) cos (A – B)

(ii) sin (A + B)

(iii) tan (A – B) **(4 mks)**

(d) Prove that

$$\tan 3\theta = \frac{3\tan\theta - \tan^3\theta}{1 - \tan^2\theta - 2\tan^3\theta}$$ **(5 mks)**

QUESTION THREE (20 MKS)

(a) Find the least number of terms of the G.P

2 + 6 + 18 + 54 + that the must be taken in order that the sum exceeds 125,000.

(5 mks)

(b) The seventh term of an A.P is 11 and its common difference is $\frac{5}{2}$. Determine the 27^{th} term and the sum to 10 terms of this A.P. **(4 mks)**

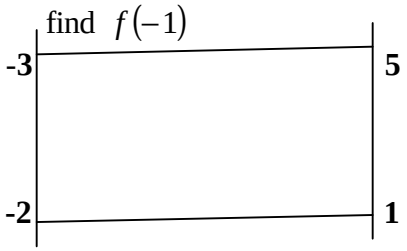
(c) An A.P consists of 25 terms of which the fourth term is 4 and the 22^{nd} term is 5. Find the sum of the A.P. **(4 mks)**

(d) Prove by mathematical induction that

$$1^3 + 2^3 + \text{------} + n^3 = \sum_{i=1}^{n} i = \frac{1}{4}n^2(n+1)^2$$ **(7 mks)**

QUESTION FOUR (20 MKS)

(a) The figure shows a mapping of some linear function $f(x)$. Find this function and hence find $f(-1)$



(5 mks)

(b) If $f(x) = \frac{1}{2}x - 3$ and $g(x) = \frac{x+3}{x-5}$, find

(i) $fg(x)$ and $gf(x)$. What do you notice?

(ii) $(gf)^{-1}(x)$ **(5 mks)**

(c) In some KABU class, all members study one, two or three subjects. 12 study Business Management, Accounting and Human Resource 7 study Business management and accounting only, 6 study business management only. In all 27 study business management, 28 study Accounting and 22 study human resource. How many study Accounting only, and human resource? How many students are there in the class?

(6 mks)

(d) Show that $\sim (p \ v \ q) \ \Lambda \ p = 0$ **(4 mks)**

QUESTION FIVE (20 MARKS)

(a) Find the number of permutations of:

(i) The word SIMPLE if repetitions are allowed and when repetitions are not allowed.

(ii) The number 0720732232 **(6 mks)**

(b) Find n if $(n + 3)\ C_4 = 6 \times (n + 2)\ C_3$ **(3 mks)**

(c) Expand $(2 - ½x)^6$ and hence find 1.97^6 to 3 d .p **(4 mks)**

(d) Find the constant term in the expansion of $\left(2x + \frac{1}{2x}\right)^8$ **(3 mks)**

(e) What is the exact value of $\left(\sqrt{3}+1\right)^4 \ \left(\sqrt{3}-1\right)^4$? **(4 mks)**