THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of Jkuat)

Faculty of Applied & Health Sciences

DEPARTMENT OF MATHEMATICS & PHYSICS

UPGRADING MATHEMATICS

AMA 1101: ALGEBRA

FINAL EXAMINATION

SERIES: AUGUST/SEPTEMBER 2011

TIME: 2 HOURS

Instructions to Candidates:

You should have the following for this examination

- Answer booklet

This paper consists of **FIVE** questions

Answer question **ONE (COMPULSORY**) and any other two questions

This paper consist of **FOUR** printed pages

Quest1ion One (30 marks)

a) Simplify the expression

i) $$\frac{(3x+y)^2-(y-3x)^2}{(x+y)^2-(y-x)^2}$$ (2 marks)

ii) $$\frac{\log 25-\log 125+\log\sqrt{625}}{\log 5^3}$$ (3 marks)

iii) $$\frac{(16a^2)^{1/2}\times(36a^4)^{-1/2}}{2a^{1/2}\times 5a^{1/2}\times 8a^{9/4}}$$ (4 marks)

b) Make A the subject of the formula

$$T=\frac{2m}{n}\sqrt{\frac{L-A}{3K}}$$ (3 marks)

c) Solve by completing squares (5 marks)

$$ax^2+bx+c=0$$

d) Obtain the first five terms of the expansion $(1+8x)^6$ in ascending powers of x. Hence find the value of $(1.08)^6$ correct to 4 decimal places (5 marks)

e) Express $\frac{\sqrt{3}-2\sqrt{2}}{\sqrt{3}+\sqrt{2}}$ in the form $a+b\sqrt{c}$ where a, b and c are real numbers (3 marks)

f) In how many ways can eleven books be arranged on a shelf (2 marks)

g) A car registration number in a country of Burma consists of 3 letters followed by 3 digits. The first letter is always A and the other two letters should NOT include A, I or O. The first digit must not be zero, otherwise, any digits from 0 to 9 may be used in any of the three places. How many different registrations are there? (3 marks)

Question Two (20 marks)

a) Show that the sum of the first n terms of the AP with first term *a* and common difference *d* is $\frac{n}{2}(2a+(n-1)d)$ $l = a + (n-1)d$ take last term as: (5 marks)

b) 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 ratio and the sum of the first 6 terms of the first 6 terms of the series (6marks)

c) Solve the following equation given that:

$$\log 2(x+2) + \log 2(x-2) = 5$$

(5 marks)

d) A gear wheel having 80 teeth is in mesh with 25 tooth gear. What is the gear ratio? (2 marks)

e) Simplify $\frac{(9\times 3^2)^3}{(3\times 27)^2}$ (2 marks)

Question Three (20 marks)

a) Evaluate $\left(\frac{1\frac{1}{2}+3\frac{1}{6}}{4\frac{1}{3}-3\frac{2}{5}}\right)\div 1\frac{2}{3}$ (4 marks)

b) Factorize and simplify as far as possible

$$\left(\frac{15x^2+11x-12}{12x^2+x-20}\right)$$

(5 marks)

c) Convert the recurring decimal 0.65° into the original fraction (5 marks)

d) Solve without using logarithms

(i) $4^x + 2^{2x} - 1 = 15$ (5 marks)

(ii) $\left(\frac{1}{49}\right)^m \times \left(\frac{1}{343}\right)^{-1} = 2401$ (3 marks)

Question Four (20 marks)

a) Jane can walk at 6km/h and run at 10km/h. Walking from home to school takes her 16 minutes longer than it takes her to cover the same distance running. Find the distance from home to school. (6 marks)

b) By using substitution $y = 3^x$ or otherwise, solve $9^{x+1} - 3^x = 3^{x+3} - 3$ (7 marks)

c) Sketch the graph of $y = x^2 - 5x + 6$ and use the graph to solve the inequality $x^2 - 5x + 6 < 0$ (7 marks)

Question Five (20 marks)

a) P varies directly as square of Q and inversely as R.

(i) If Q increases by 5% and R decreases by 10%, find the percentage change in P (4 marks)

(ii) Given that P=2 when R=5 and Q=4, find the positive value of Q when P=4.5 and R=5 (4 marks)

b) Three types of coffee A, B and C are mixed in the ratio 2:3:5 by mass. Type A coffee costs shs. 210 per kg, type B shs. 160 per kg and type C is shs. 120 per kg. The blend is then sold at a profit of 30%. Determine the selling price of the blend per kg. (5 marks)

c) A man dines at the same hotel for 3 consecutive days where the menu is always constant for one of any 4 types of goat dish, or any 2 types of chicken dish, or 1 type of a vegetarian dish. In how many ways can a man arrange his lunches over the 3 days. If he does not have a goat dish 2 days running nor repeat any dish? (7 marks)