

Mount Kenya



University

UNIVERSITY EXAMINATION 2014/2015

SCHOOL OF PURE AND APPLIED SCIENCES
DEPARTMENT OF MATHEMATICS, STATISTICS AND ACTUARIAL SCIENCES

BACHELOR OF EDUCATION
SCHOOL BASED

UNIT CODE: BMA1106

UNIT TITLE: FOUNDATION MATHEMATICS

DATE: APRIL/MAY 2015

MAIN EXAM

TIME: 2 HOURS

INSTRUCTIONS: Answer question one and any other two

1. a) Simplify $\sqrt{50} + \sqrt{2} - 2\sqrt{18} + \sqrt{8}$ (3 Marks)
- b) Given that A is the set of natural numbers less than or equal to 20, list the members of the following.
- i) A , the multiples of 3 (1 Mark)
- ii) B , the multiples of 4 (1 Mark)
- iii) $(A \cup B)'$ (2 Marks)
- c) Solve the following equation for x $x^{2/3} - x^{1/3} - 2 = 0$ (3 Marks)
- d) Solve the pair of simultaneous equations $\log(y-x) = 0$ and $\log y = \log(21+x)$ (4 Marks)
- e) Solve the inequality $3x+7 \geq 5x-3$ (3 Marks)
- f) Solve the equation $\frac{4}{x-1} + \frac{3}{x} = 3$ (4 Marks)
- g) Expand $(1+4x)^{14}$ in ascending powers of x up to and including the 4th term. Hence evaluate $(1.0004)^{14}$, correct to four decimal places. (5 Marks)

$$(2+4x)^2 (2+2y) (2+2y)$$
$$2(2+4x)(2+2y)^2$$
$$2(2^2 + 2 \cdot 2y + 2 \cdot 2y + 2y^2)$$
$$2(4 + 4y + 4y + 2y^2)$$
$$2(4 + 8y + 2y^2)$$
$$8 + 16y + 4y^2$$

h) Find $\frac{dy}{dx}$ for $y = \sqrt{6x+1}$ (4 Marks)

2. a) Find $\frac{dy}{dx}$ for each of the functions

i) $y = \frac{x}{2x-1}$ (4 Marks)

ii) $y = (5x+3)^3(x-2)^2$ (4 Marks)

b) Evaluate $\int_{-2}^2 (x^2 + 4x) dx$ (4 Marks)

c) Use the substitution of $u = 1-x^2$ to find $\int \frac{x}{\sqrt{1-x^2}} dx$ (5 Marks)

d) Find $\int_1^2 \frac{dx}{(3-5x)^2}$ (3 Marks)

3. a) Given that set A and B are defined as follows.

$$A = \{x^3 : x \in N\}$$

$$B = \{3n^2 : n \in N\}$$

List the first 5 members of each set. (6 Marks)

b) Rationalize the denominators of $\frac{2\sqrt{2}-\sqrt{3}}{\sqrt{2}+\sqrt{3}}$ (4 Marks)

c) Solve the matrix equation $\begin{pmatrix} 5 & 3 \\ 8 & 5 \end{pmatrix} \begin{pmatrix} u & x \\ v & y \end{pmatrix} = \begin{pmatrix} 2 & 3 \\ 3 & 4 \end{pmatrix}$ (6 Marks)

d) A committee of six is to be formed from nine women and three men. In how many ways can the members be chosen so as to include at least one man? (4 Marks)

4. a) The function f and g are defined by $f(x) = 3x - 5, x \in R$ and $g(x) = 3 - 2x, x \in R$.

- i) Express the function $fg(x)$ hence evaluate $fg(3)$ (5 Marks)
- ii) The composite function h is defined by $h = gf$. Find $h(x)$ (3 Marks)
- iii) Find the inverse function h^{-1} (3 Marks)

b) The functions f and g are defined by $f: x \rightarrow 4 - x, x \in IR$ and $g: x \rightarrow 3x^2, x \in R$

- i) Find the range of g . (4 Marks)
- ii) Solve $gf(x) = 48$ (5 Marks)

5. Solve $y^2 - 7y + 10 = 0$ hence find the solution to

$$(x^2 + 1)^2 - 7(x^2 + 1) + 10 = 0 \quad (7 \text{ Marks})$$

b) Solve the simultaneous equations $2x^2 - xy + y^2 = 3^2$ and $y = \frac{-5}{x}$ (5 Marks)

c) Show that the elimination of x from the simultaneous equations.

$$x - 2y = 1$$

$$3xy - y^2 = 8$$

Produces the equation $5y^2 + 3y - 8 = 0$

Solve the quadratic equation by completing the square method. (8 Marks)