



SOUTH EASTERN KENYA UNIVERSITY

UNIVERSITY EXAMINATIONS 2014/2015

FIRST YEAR FIRST SEMESTER EXAMINATION

FOR THE DEGREE OF BACHELOR OF SCIENCE FISHERY AND AQUICULTURE, BACHELOR OF SCIENCE FORESTRY

PAS 108: GENERAL MATHEMATICS

DATE: 24TH APRIL 2015

TIME: 2 HOURS

INSTRUCTION TO CANDIDATES

ANSWER QUESTIONS ONE AND ANY OTHER TWO.

Question one (COMPULSORY) (30 MARKS)

- a. Express $\frac{x}{(x-1)(x+2)}$ in partial fractions (6marks)
- b. Obtain y in terms of x when $\ln(y-1) = 3\ln x + 2$ (3marks)
- c. Find the inverse of each of the following functions:
- i) $y = e^x$ (3marks)
- ii) $y = \frac{1}{x+2}$ (2marks)
- d. Express the following in the form $a + ib$ and state the real and imaginary parts in each case
- i) $z_1 = (2+i) - (3+3i)$ (2marks)
- ii) $z_2 = i(i+2)$ (2marks)

iii) $z_3(1-i)(1+2i)$ (2mark)

e. Find the inverse of the matrix $A = \begin{bmatrix} 1 & 3 \\ -1 & 4 \end{bmatrix}$ (2marks)

f. Find the first three terms in the expansion of $\frac{1}{(1+x)^2}$ (2marks)

g. Find $\frac{dy}{dx}$ for $y = x^2 + 2$ from the first principles. (3marks)

h. Given that $f(x) = 2x - 1$ and $g(x) = \frac{4}{x-2}$. Find $f \circ g^{-1}(x)$. (3marks)

QUESTION TWO (20 MARKS)

a. Evaluate $\int \frac{x^2 - 1}{(x^3 - 3x)^{\frac{1}{2}}} dx$ (5marks)

b. Find the equation of the circle whose center is (2,3) and radius $r = 5$ (5marks)

c. Find the numbers A, B and C such that the fraction $\frac{2x}{(1-x)(1+x^2)}$ is equal to $\frac{A}{1-x} + \frac{B+Cx}{1+x^2}$.

Hence obtain the expansion of the fraction $\frac{B+Cx}{1+x^2}$ in ascending powers of x as far as x^5 .

(10 marks)

QUESTION THREE (20 MARKS)

a. Find the distance between the points $A(7,9)$ and $B(-4,5)$ (3marks)

b. Given the matrices $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & -1 & 1 \\ 3 & 1 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 1 & 1 \\ 1 & -1 & 3 \\ 1 & 3 & 0 \end{bmatrix}$, compute

i) $2A + 3B$ (3marks)

ii) AB (3marks)

c. Find the derivatives of the following functions

i) $x^2 - 2xy + y^2 - 2x = 0$ (5marks)

ii) $y = \frac{4+5x}{4-5x}$ (6marks)

QUESTION FOUR (20MARKS)

a. Find 'a' so that the slope m of the line through the two points $A(2a,4)$ and $B(-7,9a)$ is 3. (3marks)

- b. Find the derivative of $y = \frac{x+3}{2x^3+1}$ $y = (x+3)(2x^3+1)$ (3marks)
- c. Find the value
- i) 9P_3 (2marks)
- ii) 9C_3 (2marks)
- iii) ${}^9P_3 \div {}^9C_3$ (1mark)
- d. Given the two vectors $\mathbf{p} = 2\mathbf{i} + 3\mathbf{j} + 4\mathbf{k}$ and $\mathbf{q} = 4\mathbf{i} - 3\mathbf{j} + 2\mathbf{k}$,
Find:
- i) The magnitude of $\mathbf{p} + \mathbf{q}$ (2marks)
- ii) The angle between the two vectors. (2marks)
- iii) The dot product of \mathbf{p} and \mathbf{q} (2marks)
- iv) $\mathbf{q} \times \mathbf{p}$ (3marks)

QUESTION FIVE (20MARKS)

- a. If $f(x) = x^2 - x$ prove that $f(h+1) = f(-h)$. (2marks)
- b. Determine the domain of the following functions
- i) $y = \frac{2x}{(x-2)(x+1)}$ (2marks)
- ii) $y = \sqrt{4-x^2}$ (2marks)
- c. Find the general and particular solutions for the differential equation $\frac{dy}{dx} = 6x - 2$ given that
 $x = 3$ when $y = 0$ (4marks)
- d. Find the remainder when $x^5 - 4x^3 + 2x + 3$ is divided by $x - 1$ (4marks)
- e. Solve the quadratic equations below using the specified method
- i) $x^2 - x + 1 = 0$ (quadratic formula) (3marks)
- ii) $z^2 - 4z + 13 = 0$ (completing the square) (3marks)