

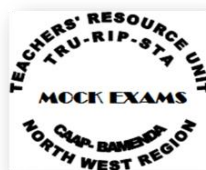


REPUBLIQUE DU CAMEROUN
Paix-Travail-Patrie

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MINISTRY OF SECONDARY EDUCATION

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MARCH 2019

The Teachers' Resource Unit and the Regional Inspectorate of Pedagogy in collaboration with MTA	SUBJECT CODE NUMBER 0765	PAPER NUMBER 2
GENERAL CERTIFICATE OF EDUCATION REGIONAL MOCK EXAMINATION	SUBJECT TITLE PURE MATHEMATICS WITH MECHANICS	
ADVANCED LEVEL	DATE Tuesday 26th March 2019 MORNING	

Time Allowed: THREE hours
INSTRUCTIONS TO CANDIDATES

Mobile phones are **NOT ALLOWED** in the examination room.

Full marks may be obtained for answers to **ALL** questions.

In calculations, you are advised to show all the steps in your working, giving your answer at each stage.

Nonprogrammable electronic calculators, Mathematical formulae booklets and tables are allowed.

You are reminded of the necessity for good English and orderly presentation in your answers.



1. i). Given that α and β are the roots of the quadratic equation $ax^2 + bx + c = 0$. Show that

$$\lambda\mu b^2 = ac(\lambda + \mu)^2 \text{ where } \frac{\alpha}{\beta} = \frac{\lambda}{\mu}.$$

ii) A mapping $g: \mathbb{R} \rightarrow \mathbb{R}$ where g is defined by $g(x) = \frac{2x-1}{x+1}$, $x \neq -1$.

a) Show that $g(x)$ is a bijective function

b) Find $gg(x)$, the composite function for $g(x)$

(12marks)

2(i). Using truth tables, show that $\sim(p \Rightarrow q) \equiv p \wedge \sim q$.

ii) Find all real values of x for which $3^{1+2x} - 26(3^x) - 9 = 0$

iii) Find the set of values which satisfy the inequality $\frac{2}{x-1} \leq \frac{1}{x}$.

(11 marks)

3(i). Solve the equation $\sin x - \sin 5x + \cos 3x = 0$, giving all your answers between 0° and 180° .

ii) Prove that a) $\cos^4 \theta - \sin^4 \theta = \cos 2\theta$

$$\text{b) } \sin\left(\frac{\pi}{4} + A\right) + \sin\left(\frac{\pi}{4} - A\right) \equiv \sqrt{2} \cos 2A$$

(10 marks)

4(i). Prove that the sequence $U_n = \frac{2n-7}{3n+2}$ is monotonically increasing.

ii) Find the range of values of x for which the sequence $\sum_{r=0}^{\infty} [-(1-x)^r]$ converges.

iii) A football club has 15 players. Find the possible number of teams with 11 players which can be formed if

a) every player can play all the wings

b) the team has 2 goal-keepers who cannot play another wing.

(10 marks)

5(i). Use the matrix method to solve the following system of equations:

$$x + 2y + 3z = 4$$

$$2x + 4y + 5z = 0$$

$$3x + 5y + 6z = 1$$

ii) Using the transformation matrix $T = \begin{pmatrix} 2 & 1 & 2 \\ 3 & 1 & 2 \\ 2 & 2 & 1 \end{pmatrix}$, find the image of the line with equation

$$\vec{r} = 3\vec{i} + \vec{j} + 2\vec{k} + \lambda(2\vec{i} + \vec{j} - \vec{k})$$

(9

marks)

6. A plane π passes through the points $A(1, 2, 6)$, $B(-2, 3, 2)$ and $C(0, 1, 4)$. Find

a) the Cartesian equation of the plane π .

b) the distance of the plane π from the origin.

c) the vector equation of a line l which passes through the point $D(0, 2, 1)$ and is perpendicular to the plane π .

d) the coordinates of the point R where the line intersects with the plane π .

(10 marks)



7. i). Express $(x + \frac{4}{x}) \frac{dy}{dx} - y = 1$ in the form $y = f(x)$ where the curve passes through the origin.

ii) Given that $x = \frac{2+t}{1+2t}$ and $y = \frac{3+2t}{t}$, show that $\frac{dy}{dx} = \left(\frac{1+2t}{t}\right)^2$.



(8

marks)

8. The variables x and y are connected by the relation $y = \log(a + bx)$ where a and b are constants.

The table below shows values of x and y .

x	1	2	3	4	5	6
y	0.857	0.924	0.982	1.033	1.079	1.121

a) Use the trapezium rule to estimate to 2 decimal places the value of $\int_1^6 y dx$.

b) By drawing a suitable straight line, estimate the values of a and b to 2 significant figures.

(11

marks)

9. i). Express $f(x) = \frac{x^2}{x^2 + 4}$ into partial fractions and hence show that $\int_0^2 f(x) dx = 2 - \frac{\pi}{2}$.

ii). Show that the equation $x^3 - 2x^2 - 1 = 0$ has roots between 2 and 3.

Using the Newton-Raphson method with 2 as its first approximation, determine by means of the iterations two other approximations for the root. Give your answers to 3 decimal places.

(10

marks)

10. Solve for z the equation $z^3 i^7 - 2i - 2 = 0$ and express your solution in the form $r(\cos \alpha + i \sin \alpha)$ where α is an angle in radians.

(9 marks)

STOP. GO BACK AND CHECK YOUR WORK.