REPUBLIQUE DU CAMEROUN
Paix-Travail-Patrie

MINISTERE DES ENSEIGNEMENTS SECONDAIRES

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REPUBLIC OF CAMEROON
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MINISTRY OF SECONDARY EDUCATION

TEACHERS' RESOURCE UNIT
REGIONAL BRANCH FOR THE NORTH WEST

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MARCH 2020

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 **MATHEMATICS with MECHANICS**	
ADVANCED LEVEL	DATE **Saturday 21st March 2020 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.

Mathematical formulae Booklets published by the Cameroon GCE Board are allowed.

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

Calculators are allowed.

Start each question on a new page.

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

1. (i) Given the polynomial $P(x)=3x^3+2x^2-7x+2$

(a) Find the remainder when $P(x)$ is divided by x^2+x-2 (2marks)

(b) Factorise completely $P(x)$ (2marks)

(ii) Express the complex number $4\sqrt{3}-4i$ in the form $r(\cos\alpha+i\sin\alpha)$.

Hence, use De Moivre's theorem to find the values of z in the form $r(\cos\alpha+i\sin\alpha)$ for which

$z^3-4\sqrt{3}+4i=0$ (6marks)

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2. (i) One root of the quadratic equation $2x^2+bx+c=0$ is twice the other.

Show that $b^2-9c=0$ (3marks)

(ii) $\frac{1}{2}+\frac{7}{4}x+rx^2+\ldots$ is the binomial expansion of $\frac{2+kx}{(2-5x)^2}$ in ascending powers of x.

(a) Find the values of r and k. (6marks)

(b) State the range of values of x for which the expansion is valid. (2marks)

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3. (a) Find all solutions of the equation $\cos 4\theta=0$ in the interval $0\le\theta\le\pi$. (3marks)

(b) Show that $\cos 4\theta\equiv 8\cos^4\theta-8\cos^2\theta+1$ (3marks)

Hence

(c) find, to four significant figures, the solutions of the equation $8x^4-8x^2+1=0$ (3marks)

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4. (i) In each week the growth of a plant is two-thirds of the growth in the previous week. The plant grows 12cm in the first week.

(a) Calculate the growth of the plant in the eighth week. (3marks)

(b) Find the limiting height of the plant. (3marks)

(ii) A circle with centre at $(2,-3)$ touches the line $3x-4y-5=0$. Find the equation of the circle. (4marks)

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5. (i) A committee of five is to be formed from 4 boys and 3 girls. Find the number of ways the committee can be formed if the eldest boy and the eldest girl must be included. (4marks)

(ii) Prove by Mathematical induction that for all positive integer n, $\sum_{r=1}^{n}(r^2+1)r!=n(n+1)!$ (5marks)

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6. (i) The relation R is defined on the set $\mathbb{Z}$ of integers by aRb if $b=a^n$, $n\in\mathbb{Z}$. Show that R is a partial order. (6marks)

(ii) A continuous function f is defined by

$$f(x)=\begin{cases}2x-6c, & \text{for } 0<x\le 2\\ 5cx, & \text{for } 2<x\le 5\end{cases}$$

Find the value of the constant c. (3marks)

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7. (i) Show that for all real values of x, the expression x^2-3x+3 is positive.

Hence, find the set of real values of x for which $\frac{1}{x-2}>\frac{x}{x-3}$ (5marks)

(ii) (a) Show that the equation $2x^3-x-4=0$ has a root α in the interval $]1,\ 2[$ (2marks)

(b) Starting with $x=1.385$, find to three decimal places, a second approximation to α, using the Newton-Raphson method. (3marks)

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8. (i) Given that $xy-\cos x=0$ show that $x\frac{d^2y}{dx^2}+2\frac{dy}{dx}+xy=0$ (4marks)

(ii) Use the substitution $u=\sin x$ to evaluate $\int_0^{\frac{\pi}{2}}\frac{\cos x}{3+\cos^2 x}dx$ (7marks)

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9. (i) $A(1, 1, 2)$, $B(2, 2, 2)$, $C(1, -1, 6)$ are three points in a plane and (l) is a line which passes through the points A and B.

Find (a) a vector equation of the line (l), (2marks)

(b) the area of triangle ABC. (3marks)

(ii) Find the image of the plane $3x+5y-2z=4$ under the transformation defined by

$$\begin{pmatrix}2 & 1 & 4\\ 3 & 5 & 1\\ 1 & 2 & 0\end{pmatrix}$$ (6marks)

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10. The numerical function g of the real variable x is defined by $g(x)=\frac{x-1}{x^2}$.

(a) State the domain of definition (D_g) of g. (2mark)

(b) Evaluate the limits at the bounds of (D_g). (2marks)

(c) Find $g'(x)$ and determine the intervals within which g is increasing or decreasing. (4marks)

(d) Sketch the curve (C_g) of g. (4marks)

END