الامتحان الوطني الموحد للبكالوريا
المسالك الدولية – خيار أنجليزية
الدورة الاستدراكية 2019
- الموضوع -

RS22E

المملكة المغربية
وزارة التربية الوطنية والتكوين المهني والتعليم العالي والبحث العلمي

المركز الوطني للتقويم والامتحانات والتوجيه

المادة	الرياضيات	مدة الانجاز	3
الشعبة أو المسلك	مسلك علوم الحياة والأرض ومسلك العلوم الفيزيائية – خيار أنجليزية	المعامل	7

GENERAL INSTRUCTIONS

- ✓ The use of non- programmable calculator is allowed ;
- ✓ The exercises can be treated in the preferred order by the candidate ;
- ✓ The use of red color when writing solutions is to be avoided.

COMPONENTS OF THE EXAM

✓ The exam consists of three exercises and a problem , independent of each other according to the fields as follows :

Exercise 1	Geometry in space	3 points
Exercise 2	Complex numbers	3 points
Exercise 3	Calculating probabilities	3 points
Problem	Study of numerical function, calculating integrals and numerical sequences	11 points

Exercise 1 : (3 points)

In the space referred to an orthonormal direct coordinate system $(O,\vec{i},\vec{j},\vec{k})$,

we consider the points $A(1,2,2)$, $B(3,-1,6)$ and $C(1,1,3)$

0.75 1)a) Verify that $\overrightarrow{AB}\wedge\overrightarrow{AC}=\vec{i}-2\vec{j}-2\vec{k}$

0.5 b) Deduce that $x-2y-2z+7=0$ is a cartesian equation of the plane (ABC)

0.75 2) Let the points $E(5,1,4)$ and $F(-1,1,12)$, and (S) the set of the points M such that $\overrightarrow{ME}\cdot\overrightarrow{MF}=0$. Show that the set (S) is the sphere of center $\Omega(2,1,8)$ and radius $R=5$

0.5 3)a) Calculate $d(\Omega,(ABC))$ the distance of the point Ω to the plane (ABC)

0.5 b) Deduce that the plane (ABC) intersects the sphere (S) along a circle (Γ) of radius $r=4$

Exercise 2 : (3 points)

0.75 1) a) Solve in the set of complex numbers $\mathbb{C}$ the equation : $z^2-3z+3=0$

0.5 b) Let $a=\frac{3}{2}+\frac{\sqrt{3}}{2}i$, Write the number a in the trigonometric form.

0.5 2) We consider the complex number $b=\frac{\sqrt{2}}{2}(1+i)$, verify that $b^2=i$

0.5 3) Let $h=\cos\frac{\pi}{12}+i\sin\frac{\pi}{12}$, show that $h^4+1=a$

4) In the complex plane referred to an orthonormal direct coordinate system $(O,\vec{u},\vec{v})$,

we consider the point B of affix b and the rotation R with center O and angle $\frac{\pi}{2}$

0.5 a) Let c the affix of the point C image of the point B by the rotation R . Show that $c=ib$

0.25 c) Deduce the nature of the triangle OBC

Exercise 3 : (3 points)

An urn contains one red, two white and three black balls , indistinguishable by touch.

We drow randomly successively and with replacement three balls from the urn

We consider the following events: A : "The three balls drawn are of the same color"

B : " None of the three balls drawn are white"

C : " There are exactly two white balls among the balls drawn"

2 1) Show that $p(A)=\frac{1}{6}$ and $p(B)=\frac{8}{27}$

1 2)Calculate $p(C)$

Problem : (11 points)

First part :

We consider the numerical function f defined on IR^* by : $f(x)=2+8\left(\frac{x-2}{x}\right)^2 e^{x-4}$

and (C) the curve of f in an orthonormal coordinate system $\left(O,\vec{i},\vec{j}\right)$ (unit: $1cm$)

0.5 1) a) Verify that $\lim\limits_{x\to-\infty} f(x)=2$ and then interpret geometrically the obtained result

0.5 b) Verify that $\lim\limits_{x\to 0} f(x)=+\infty$ and then interpret geometrically the obtained result

0.5 2) a) Calculate $\lim\limits_{x\to+\infty} f(x)$

0.5 b) Show that the curve (C) admits a parabolic branch in the direction of y axis at $+\infty$

0.75 3)a) Show that $f'(x)=\frac{8(x-2)(x^2-2x+4)e^{x-4}}{x^3}$ for every x on IR^*

0.25 b) Verify that $x^2-2x+4>0$ for every x on IR

0.75 c) Show that the function f is strictly decreasing on $]0,2]$ and strictly increasing on each of the intervals $]-\infty,0[$ and $[2,+\infty[$

0.5 d) Set up the table of variations of the function f on IR^*

1 4) Sketch the curve (C) in the system coordinate $\left(O,\vec{i},\vec{j}\right)$

0.5 5)a) Verify that the function $H: x\mapsto \frac{1}{x}e^{x-4}$ is a primitive of the function $h: x\mapsto \frac{x-1}{x^2}e^{x-4}$ on $[2,4]$

0.25 b) Verify that $f(x)=2+8e^{x-4}-32\frac{(x-1)}{x^2}e^{x-4}$ for every x on IR^*

0.5 c) Calculate the integral $\int_2^4 e^{x-4}dx$

0.75 d) Calculate, in cm^2, the area enclosed between the curve (C), the abscissa axis , and the lines of equations $x=2$ and $x=4$

Second part :

1) We consider the numerical function g defined on $[2,4]$ by $g(x)=8(x-2)e^{x-4}-x^2$

0,25 a) Calculate $g(4)$

0,5 b) Verify that for every x on the interval $[2,4]$, $g(x)=-(x-4)^2e^{x-4}+x^2(e^{x-4}-1)$

0,5 c) Verify that for every x on the interval $[2,4]$ $e^{x-4}-1\leq 0$,
and then deduce that for every x on the interval $[2,4]$ $g(x)\leq 0$

0,5 2)a) Verify that for every x on the interval $[2,4]$, $f(x)-x=\left(\frac{x-2}{x^2}\right)g(x)$

0,25 b) Deduce that for every x on the interval $[2,4]$, $f(x)\leq x$

3) Let (u_n) the numerical sequence defined by $u_0=3$ and $u_{n+1}=f(u_n)$ for every natural number n

0,5 a) Show by induction that $2\leq u_n\leq 4$ for every natural number n

0,5 b) Determine the monotony of the numerical sequence (u_n), and then deduce that (u_n) is convergent

0,75 c) Calculate the limit of the numerical sequence (u_n).