same way hope

UNIVERSITY OF BAMENDA

ECOLE NORMALE SUPERIEUR ANNEXE DE BAMBILI

COMMON ENTRANCE EXAMINATION JULY 2012
SECOND CYCLE TECHNICAL EDUCATION 3HOURS

EXERCISE 1

Determine whether the following sums converge or not. Justify your answers

1. $\sum_{n=1}^{\infty} \frac{1}{2^n+1}$
2. $\sum_{n=1}^{\infty} \frac{2n+1}{n^3+1}$
3. $\sum_{n=2}^{\infty} \frac{1}{\ln(n)}$
4. $\sum_{n=1}^{\infty} \frac{99^n}{n!}$
5. $\sum_{n=1}^{\infty} \frac{n}{2^n}$

EXERCISE 2

Suppose that f is a differentiable function on the real line. In terms of the derivative f' of f, express the derivative of the following.

1. $f(3x)$
2. $f(x^2)$
3. $f(\pi f(x))$

$[f(3-2f(x))]^4$

EXERCISE 3

1. Verify that the differential equation:

   $(2x+\sin y - ye^{-x})dx + (x\cos y + \cos y + e^{-x})dy = 0$ Is exact and find its solution curve

2. Solve the following: $\frac{dy}{dx} + xy = x^2$

EXERCISE 4

Evaluate $\iint_x xydA$ over the triangle T with vertices (0, 0); (1, 0); and (1, 1)

EXERCISE 5

1. Find $\int_0^3 f(x)dx$ where $f(x) = \begin{cases} \sqrt{1-x^2}.if\ 0 \le x \le 1 \\ 2.if\ 1 \le x \le 2 \\ x-2.if\ 2 \le x \le 3 \end{cases}$

2. Find the total area A lying between the curve $y = \sin x$ and $y = \cos x$ from $x = 0$ to $x = 2\pi$

`UNIVERSITY OF BAMBILI H.T.T.T.C

CAMPUS: BAMBILI

ENTRANCE EXAMINATION,

JULLY 2012

CYCLE: SECOND CYCLE **TECHNICAL TEACHING**

SERIES: DATA PROCESSING **DURATION: 3H**

COEFFICIENT: 4

TOPIC: APPLIED MATHEMATICS

Exercise I (12 marks)

A company manufactures parts which it conditions per hundreds. Day labourer manufacture varies between 100 parts and 600 pieces. It is supposed that the

benefit, expressed in thousands of francs, corresponding to the quantity Q of parts manufactured, is given by:

$f(q) = -2q^2 + 20q - 18 - 16Lnq$, With q expressed in hundreds: $1 \le q \le 6,5$.

Part A. Economic study (2=1+0.5+0.5)

1. To calculate, in francs, the benefit carried out for a day labourer production of 100 coins then of 500coins.
2. Calculate, in francs, the benefit corresponding to the manufacturing of the 201^e parts.
3. One manufacturing 400 parts. Calculation, in francs, the average benefit carried out by part manufactured.

Part B. Theoretical study

Let f the function defined for all $x \in [1,6,5]$ by:

$f(x) = -2x^2 + 20x - 18 - 16\ln x.$

1. General study .(2,5=0,5+1+0,5+0,5 marks)

Calculation the derivative f' of f.

Show that the equation $f'(x)=0$ has a solutions x_1 and x_2 which one will determine (with $x_1 \prec x_2$).

Show that $f'(x)$ has the same signs that $-4(x-1)(x-4)$.

Draw the table of variation of f on $[1;6;5]$.

2. Particular study (2=1+ marks)

2.1. Show that the equation $f(x)=0$ has a solution α, distinct from 1 and only one, in the interval $[1;6;5]$.

2.2. Prove that $6,19 \leq \alpha \leq 6,20$.

3. Graphic study. (2=1+1 marks)

Recopy and supplement the following table. The values of $f(x)$ will be round with 10^{-1} near.

x	1	2	3	4	5	6	6,5
$f(x)$							

Draw in the orthogonal frame, the curve of the function f on $[1;6;5]$ Graphic units 2cm on the X-axis. 1cm on the y-axis

4. The function g and G are respectively defined on $]0,+\infty[$ by

$g(x)=\ln(x)$ And $G(x)=x\ln(x)-x$

Check that G is a primitive of g on $]0,+\infty[$ (0, 5 mark)

Deduce a primitive F of f on $[1;6;5]$. (0, 5 mark)

Part C. Return to the economic survey. (2,5=0,5+0,5+0,5+1)

1. Determine the units, maximum quantity parts to be manufactured so that it has benefit.

2. Determine, in unites, the quantity of parts to manufacture in order to obtain the maximum benefit. To calculate in francs the benefit.
3. Reveal on the graph the preceding results.
4. The average benefit B_m carried out per hundreds of parts is expressed, in thousands of francs; by $B_m = \frac{1}{5,5}\int_1^{6.5} f(x)dx$ calculate B_m with a margin of 100 francs.

EXERCISE II (8 marks)

A company manufactures margarine breads industrially. Their packing carries in particular the following indication: ``weight net: 500 grams``

1) Theory of probability

It is estimated that the weight, in grams, of produced bread, is a random variable X which follows the normal law of average 520 and standard deviation 20

It is supposed that the weights of different the bread are independent from to each other

With packing, a bread is refused if its weight is lower or equal to 490 grams.

a) a bread arrives at packing. Show that the decimal approximation round with 10^{-4} close to the probability that it is refused is equal to 0.0668
b) Two breads arrive at packing. Calculate the probability of each of the two following events.

A: "the two breads are refused"

B: "one at least of the two breads is refused"

(One will give the round decimal approximations to 10^{-3} close to these probabilities while using for calculations, the approximate result obtained with the preceding question.)

2) Determination of binominal distribution and approximation by a normal law the company produced, before packing, 10.000 breads per week. One notes Y the

3) random variable measuring the number of refused breads, in the one week production.

a) To explain why Y follows the binomial distribution. Give the parameters of this law calculate the average and the standard deviation of Y (one will round the last two results with the whole numbers closest)

b) One replaces the law Y by the normal which constitutes a satisfactory approximation of it.

Justify and give the parameters of those?

Calculate, by using this approximation, probability of the event

"$650 \leq Y \leq 700$ "(One will round with the result with 10^{-2})