UNIVERSITY OF BAMENDA

ECOLE NORMALE SUPERIEUR ANNEXE DE BAMBILI

COMMON ENTRANCE EXAMINATION JULY 2011
SECOND CYCLE TECHNICAL EDUCATION   3HOURS

__PAPER__: APPLIED MATHEMATICS (MINOR) FOR ALL ENGINEERING

__EXERCISE 1__: 8Pts

In $E = IR^3$, ONE considers the endomorphism f of which the matrix in the basis canonical B is

$$A = \begin{pmatrix} 2 & 1 & 1 \\ 1 & 2 & 1 \\ 0 & 0 & 2 \end{pmatrix}$$

1) Determine the kerf of this endomorphism then conclude

2) Determine the characteristic polynomial $p(\lambda)$ and deduce the det(A)

3) Determine the eigenvalues (one will designate them by in the ascending order)

4) Determine the eigenvectors under-spaces as well as the vectors that generate them

5) Show that these vectors form a basis B' of $E = IR^3$

6) Determine the matrix of passage P of the basis B' and its inverse

7) Determine the matrix of A in the basis B' then conclude

8) One considers the system differential:

$$\begin{cases} x'(t) = 2x + y + z \\ y'(t) = x + 2y + z \\ z'(t) = 2z \end{cases}$$

Where x, y, and z are unknown functions of the variables t B'

a) Write this system under matrix shape

b) Find the general solution of this system while using the previous question

Exercise 2: 5pts

Let us consider the function f(x) of real x of period 2π defined in the interval $-\pi \leq x \leq \pi$ by $x^2 - \pi^2$

3. Compute the sum of the Fourier series. Study the convergent (justify your answer)

4. Deduce the sum of convergent series

$$\sum_{1}^{\infty} \frac{1}{n^2} ; \qquad \sum_{1}^{\infty} \frac{(-1)^n}{n^2}$$

Exercise 3: 7pts

For the numerical value, one will give and will use the decimal values approximate to 10^{-3} near. A sample of 200 people is extracted, at random and with discount, of the population constituted by the employees of a big enterprise. The following picture describe the distribution of the raw yearly wageses of these 200 employees in 1989 (one supposes that the wageses are distributed uniformly in every class).

Salaire in thousand	[50;100[	[100;150[	[150;200[	[200;250[	[250;300[

Effectifs	90	50	30	20	10

1)   One considers a chosen at random employee, in this sampling what is the probability so that it's gross income, 1989 either strictly lower at 250 thousand

2)   One now consider 40 people, chosen as Radom with discount, in the sample. One note X the value uncertain corresponding to the number of people amount the 40 of which the gross income, in 1989 is greater or equal to 250 thousand.

a)   What is the law follow by X justify and calculate $E(X)$

b)   Calculate the probability of the event "X=3"

c)   Calculate the probability of the event "X=3" all over again, while using this time the approximation of the law of X by the law of poisson in the same way hope