COMPETITIVE ENTRANCE EXAMINATION INTO HTTTC BAMBILI	
CYCLE:1stCYCLE **LEVEL: 1st** **OPTION: INDUSTRIAL** **PAPER: PHYSICS**	**Session: 2009**
DURATION: 3hrs	

Exercise I (5pts)

With a spool (B) one achieves two experiences

Experience 1: one established to the boundary marks of the spool a tension continues $U_1 = 12V$ and the intensity of current that cross it is $I_1 = 0.24A$.

Experience II:

one established to the boundary marks of the spool a tension alternative sinusoidal of frequency $f = 50Hz$ and value efficient $U_2 = 12V$; the intensity of current crossing the spool has for value of efficient $I_2 = 0.2A$.

1. Of these two experiences, deduct the resistance R and the inductance L of the spool. (1pt)
2. One brings up in series with the spool a capacitor C. Capacity to the boundary-marks of the portion so constituted, one applies a tension alternative sinusoidal of value efficient $U = 15{,}57mA$. While using the construction of Fresnel, calculate C.
3. In the construction to take $C = 4\mu F$.

3.1 Express the power middle P consumed by the circuit according to $U, R \text{ and } Z$ the I I impedance of the circuit.

3.2 Show that P is maximal to the resonance, to calculate f_0, I_0, P_0 values of $f, I \text{ and } P$ in resonce.

3.3 For what values of $f_1 and f_2$ $(f_2 > f_1)$ the frequencies do the inattentive power P IS equal to half of P_0? $(1pt)$.

Exercise II (7mks)

In a place where $= 9.8ms^{-2}$, a tray of mass $m = 100g$ rests horizontally on a vertical spring. The superior extremity is fixed on a horizontal support. Some grooves don't allow the tray a vertical movement. The mass of the spring and rubbings are disregarded.

2.1. While putting on the tray a mass, $M = 100g$, one notes that the tray goes down from $2.5mm$. Knowing that the shortening of the spring is every time proportional to the weight it supports, calculate stiffness,$K$of the spring. A diagram must indicate the shortening of the two weights of tray and the due to the useful mass. $(1pt)$.

2.2. One replaces the mass of $100g$ by any mass M of weight P. One separates the tray at a distance vertically downwards and abandons it without initial speed. While choosing (ox) vertically downwards and while applying the second law of Newton to the tray of mass and the mass M.

To express the period, , of the oscillations according to P, K, g, p the new weight of the tray. Write the hourly equation of the movement.

2.3. One is interested solely in the mass M.

2.3.1. To express the reaction of the tray on the mass M according to $M, g \text{ and } v$, acceleration of the mass M movement$(1pt)$.

2.3.2. One can give to the system of the big amplitude oscillations without the load take off the tray. From what value of a_0 of the amplitude does it have for it to occur? One will express a_0 as function of the reaction to be equal to zero.

2.3.3. Calculate a_0, for $p = P = 0.98N$.

2.4 The tray being in balance and structural a mass of $100g$, one pulls vertically on the lower face of the tray with a strength in order to lower the tray of $a = 20mm$, then one suppresses f suddenly.

2.4.1.While supporting that the tray and the mass M are always governed by the hourly equation of question 2.2, express the speed of V_0 take off the mass M of the tray knowing that this take off take place to the elongation $x(t) = -a_0$.

2.4.2. To what height is the mass M going to rise?

Exercise III

A strong, (s) of mass, $= 0.76kg$, slips on a horizontal aerotable with negligible rubbings. The strong is bound to the aerotable through the intermediary of two take out again constant of $k = 5.2Nm^{-1}$ stiffness. The mass of the two springs is negligible. One designated by 0 the position of the centre of inertia G of in balance, one note that the two springs lay down of a length $b = 29cm$ (to seeface).

Remotes of its position of balance of a X$m = 25cm$ length, the strong is released. During the oscillations either M any position of, G, one puts $OM = x$.

1 what is the nature of the movement of (S)?

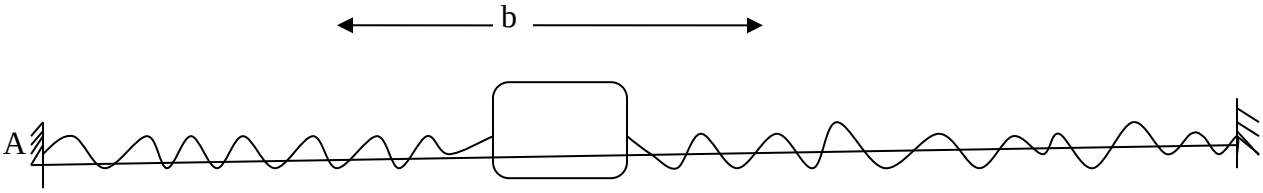
2-For the studied system, to give the expression according to the variable, x.

2-1- the potential energy $E_p(x)$. (1mk)

2-2-of the total mechanical energy $E(x)$ while choosing like origin of the potential energy of the weight of the horizontal passing by G. (1mk).

2-3 Of the kinetic energy $E_c(x)$ (0.5mk).

3-to calculate the speed of the strong (S) for the abscissa $x = 12cm$ $(0.5mk)$.



A small ball of mass $m = 100g$ joined by two sons of negligible mass to two points $A\ anb\ B$ of a vertical axis in rotation of constant angular speed ω. Are the sons $AC\ and\ BC$ stretched for a speed ω are sufficient?

$G = 9.8ms^{-2}, r = 0.5m, AC = AB = 1m$

1- the theorem of inertial centre. (0.5mk)

2-calculate the angle α.

3-Express tension $T_A\ and\ T_B$ of the sons in function of $m, g, r, \omega\ and\ \alpha$. $(2pts)$.

4-Determine the value ω_0 of ω from which the sons are stretched. (1pt).