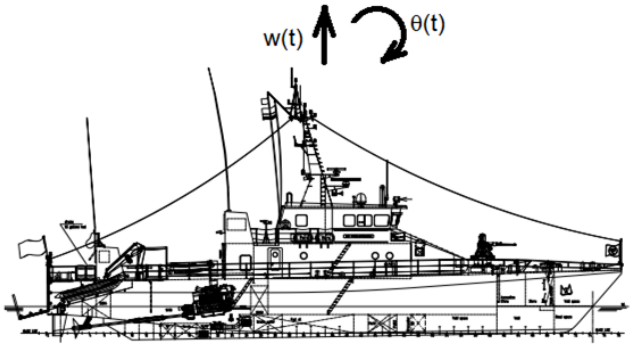
College of Maritime Engineering, and Biological, Oceanical and Natural Resource Sciences

First Evaluation – Ship Vibrations **June 26th, 2017**

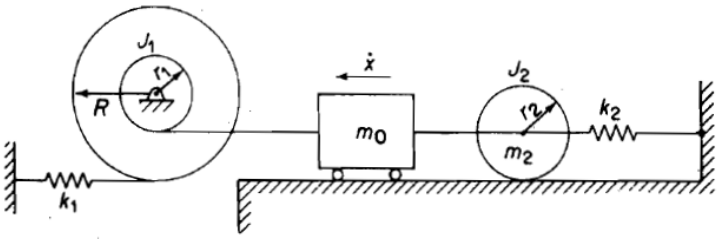
Student: .....

1.- The response of a ship in the vertical plane is summarized with the heave and pitch motions, assuming she is a rigid body:

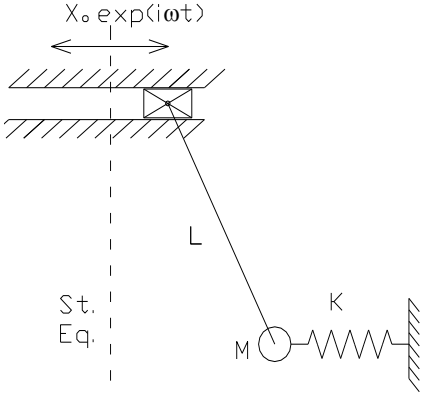


A naval craft (*L*: 40 m, *B*: 7.40 m, *D*: 3.70 m, *T*: 1.86 , *Δ*: 241 tons, *v*: 20 knots) responds to a train of regular waves in the following way: $w(t) = 0.985\cos(\omega t + 133^o)$, *m*, and $\theta(t) = 4.03^o \cos(\omega t + 20.8^o)$, degrees, where *w* is the vertical motion of midship section and θ is the angle of rotation in the direction perpendicular to the plane. Determine the time for the bow to reach its first maximum, when the frecuency is 2.09 rad/sec. (20)

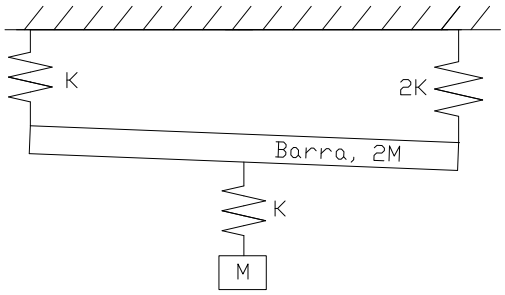
2.- Applying the energy method, deduce the equation of motion of the following system; the disk does not slip on the floor. Then deduce an expression for the natural frequency of the system. (25)



3.- Deduce the equation of motion of the pendulum with its support point undergoing an specified harmonic motion $X_0 e^{i\omega t}$ in the horizontal direction. A spring with stiffness *K=Mg/L*, is acting on its lower end, in the horizontal direction, as shown in the figure. What would be the amplitud of response for $\omega = \sqrt{g/L}$? (30)



4.- A system composed by a rigid bar with mass *2M* and length *L*, is suspended through two springs from its ends; at its center, it has another mass *M* connected through a third spring, with stiffness *K*, as shown in the figure. Deduce the equation of motions for the system, as it oscillates in the plane of the figure. (25)



jrml/2017

I certify that during this exam I have complied with Code of Ethics of our university.

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