ME756A: Principles of Vibration Control

Thought-Provoking Questions Set 1

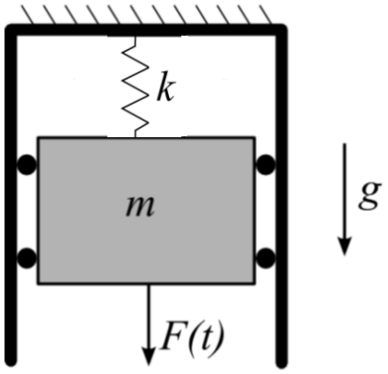
Q1. There are two systems shown below:

(a) Spring-mass system, $\omega_n = \sqrt{\frac{k}{m}}$

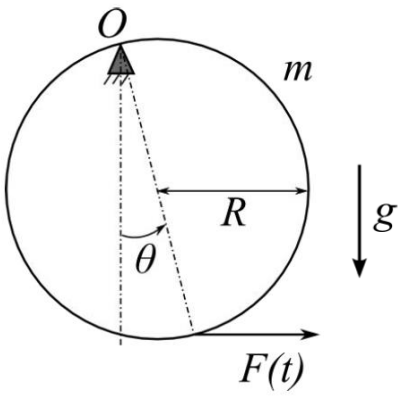
(b) Thin hoop of mass **m** and radius **R** hanging from a knife edge, $\omega_n = \sqrt{\frac{g}{2R}}$.

Why in the expression for natural frequency, one system has no acceleration due to gravity (g) term while other one has?

Try to come up with a general rule that will predict when the acceleration of gravity will appear in the expression for the natural frequency.



(a)



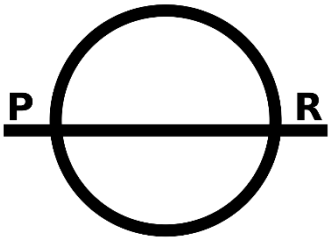
(b)

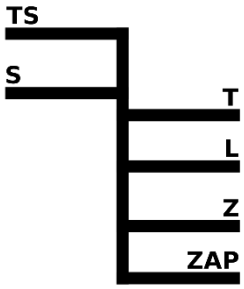
Q2. A Pendulum is first swung in air and then in water. It has been observed that it's natural frequency reduced by about 30%. Can you guess what could be the major reason for the change?
***Hint*:** Damping offered by water is not the major culprit.

Q3. Under what conditions the formal solution of a differential equation can be assumed to be of an exponential form?

Q4. Why do oil tankers have more than one compartment instead of carrying all the quantity in a single one?

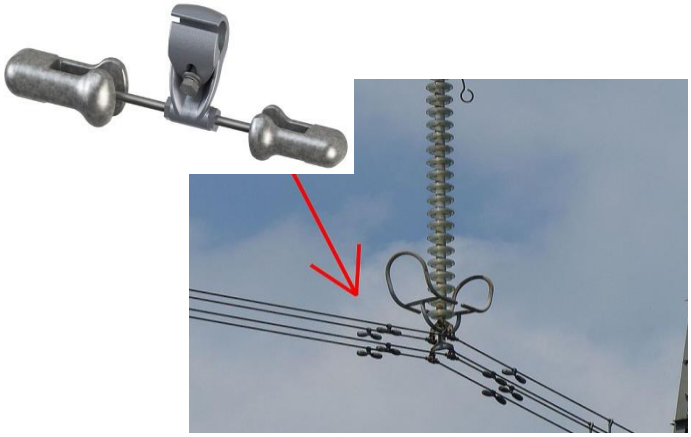
Q5. What is Plimsoll line and the consequences of violating it?





Q6. Have a look at this picture and try to guess the significance of the ring?

Q7. What are these structures installed over high voltage Power transmission lines and their utility?



Q8. What design changes did engineers make to reconstruct Tacoma Narrows Bridge (1950) after the previous collapse in 1940?