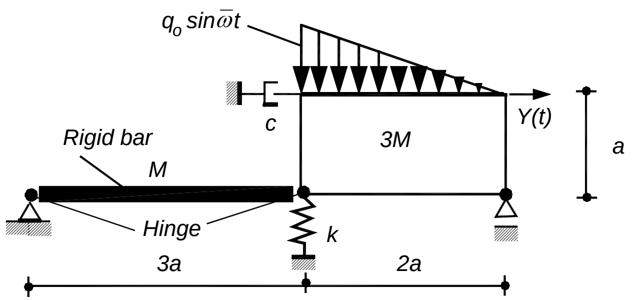
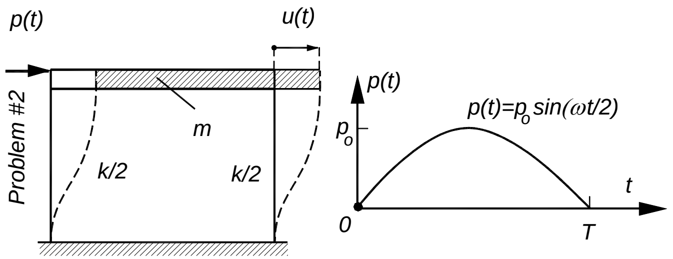
ADVANCED DYNAMICS OF STRUCTURES **QUIZ** **October 22, 2014**

Problem # 1:

Write down the equation of motion of the rigid-body assemblage in terms of $Y(t)$ the horizontal displacement by using the principle of the virtual work. Obtain the free undamped vibration period $T = \alpha\sqrt{M/k}$ of the assemblage and determine α. Find the resonance condition ($\omega = \bar{\omega}$) in terms of the parameters of the undamped system.





Problem # 2:

A single degree of freedom undamped system of the mass m, the stiffness k is subjected to the external load $p(t)$, where $p(0 \le t \le T) = p_o \sin(\pi t / T)$ and $p(t \ge T) = 0$. The variation of the external load is given as shown. Assuming the system starts from the rest position, i.e., $u(t=0)=0$ and $\dot{u}(t=0)=0$ .Find the displacement response $u(0 \le t \le T)$ and $u(t \ge T)$, where T is the free vibration period of the system.

$m\ddot{u} + c\dot{u} + ku = p(t)$ $\omega^2 = k/m$ $\omega = 2\pi/T$

$u(t) = \dfrac{1}{m\omega}\int_0^t p(\tau)\sin\omega(t-\tau)\,d\tau$ $I_\theta = \dfrac{M}{12}(a^2+b^2)$

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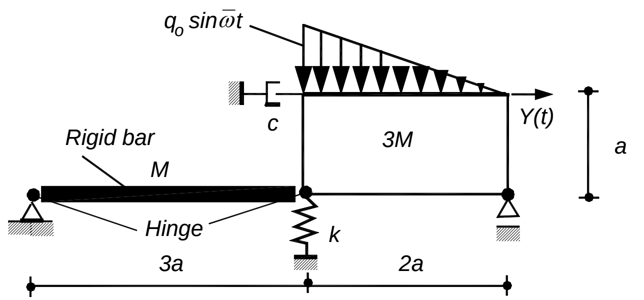

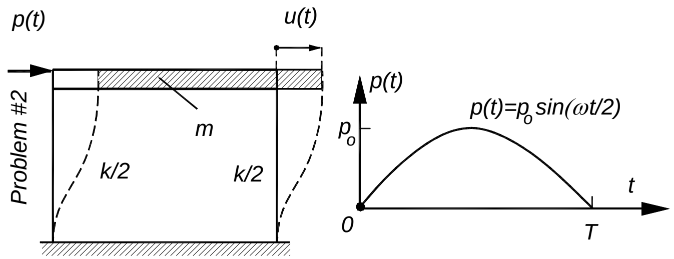

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