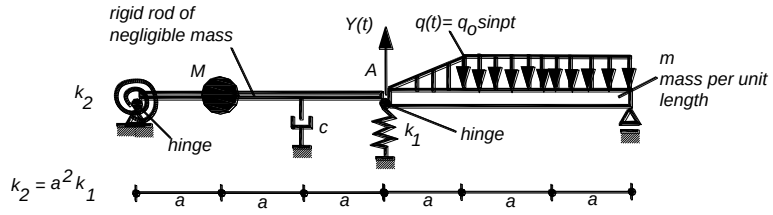
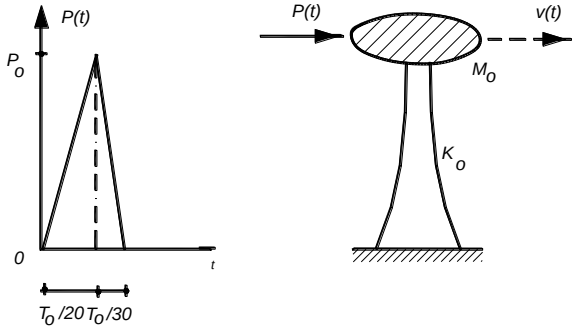
ADVANCED DYNAMICS OF STRUCTURES / QUIZ / October 31, 2007

1. For the rigid--body assemblage shown,
   a. Set up the equation of motion for the generalized displacement $Y(t)$ of the point *A* by using the principle of the virtual work.
   b. If the period of the system is $T = 7.163\sqrt{ma/k_1}$ determine the ratio of $M/(ma)$.



2. The single-degree-of-freedom system shown is subjected to an external force $P(t)$ having a time variation given.
   a. Obtain the variation of up the displacement $v(t)$ in terms of parameters P_o , K_o and T_o (the period of the system) by assuming that the external load con be considered as a short-duration impulse and that the initial conditions to be $v(t=0)=0$ and $\dot{v}(t=0)=0$. Evaluate the maximum displacement, velocity of the mass and the maximum of the base shear.
   b. Assuming $M_o\ g = 100kN$, $K_o = 10MN/m$ and $P_o = 30kN$, determine the period of the system, the maximum displacement, velocity and the base shear. Draw the variation of the displacement $v(t)$ for $0 \le t \le 2\,T_o$.



$$m\ddot{v} + c\dot{v} + k\,v = -\,p(t) \qquad \omega^2 = k/m \qquad \omega = 2\pi/T \qquad I = \int_0^{t_1} p(t)\,dt \qquad v(t) = \frac{I}{m\,\omega}\sin\omega t$$

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

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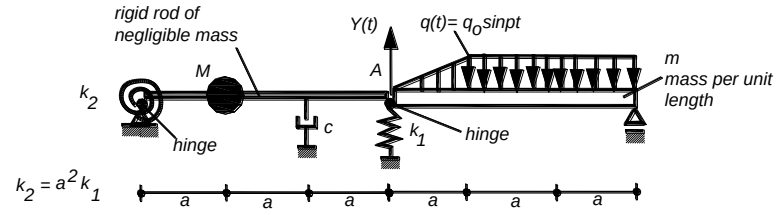

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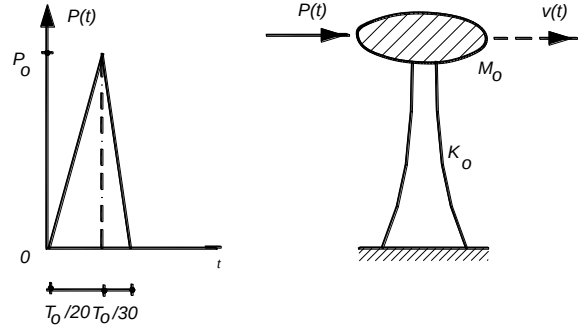

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