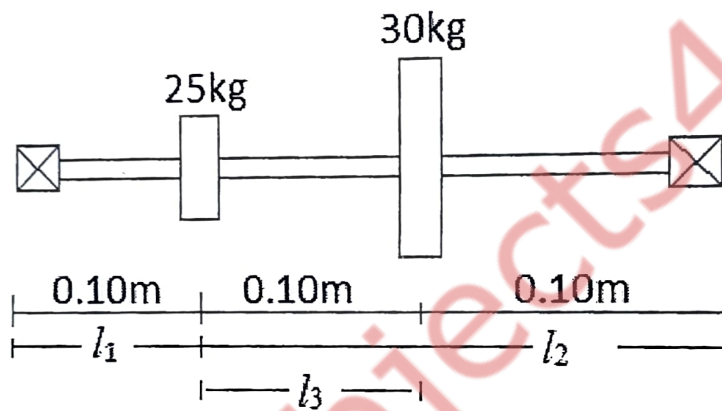




## SECTION-B

2. A mass,  $m = 1000 \text{ kg}$  is supported on a suspension of stiffness,  $k = 100 \text{ kN/m}$  and damping coefficient,  $c = 4 \text{ kN/m/s}$ . If the mass is given an initial displacement,  $X_0 = 0.1m$ , determine the residual amplitude of free damped oscillations after two cycles ( $X_2$ ).
3. Determine the mass  $M$  to be placed at the end of the reeds of a Frahm's tachometer so as to get a frequency of  $30 \text{ Hz}$  ( $188 \text{ rad/s}$ ); given : Length of reed,  $L = 50 \text{ mm}$ ; width,  $w = 5 \text{ mm}$ ; thickness,  $t = 0.5 \text{ mm}$ , Take  $E = 19.6 \times 10^{10} \text{ N/m}^2$ .
4. Explain the working principle of centrifugal pendulum absorber with the help of a neat sketch.
5. Determine the influence coefficient of the system shown in the following figure



6. Write a short note on 'whirling of uniform shaft'.

## SECTION-C

7. The vibrations of a cantilever are given  $y = y_1 \left( 1 - \cos \frac{\pi x}{2l} \right)$ . Calculate the frequency with following data for this cantilever using Rayleigh's method :
  - a) Modulus of elasticity of the material is  $2 \times 10^{11} \text{ N/m}^2$ .
  - b) Second moment of area about bending axis is  $0.02 \text{ m}^4$ .
  - c) Take Mass =  $6 \times 10^4 \text{ kg}$ , Length =  $30 \text{ m}$ .

8. A trailer has 100 kg mass when fully loaded and 250 when empty. The spring of the suspension is 350 kN/m. the damping factor is 0.5 when the trailer is fully loaded. The speed is 100 km/hr. the road varies sinusoidally with a wave length of 5m. Determine the amplitude ratio of the trailer when fully loaded and empty.
9. a) Write a note on vibration isolators and dampers.
- b) Determine the error in an accelerometer reading if the natural frequency of the accelerometer is 5 times the frequency of the observed motion.