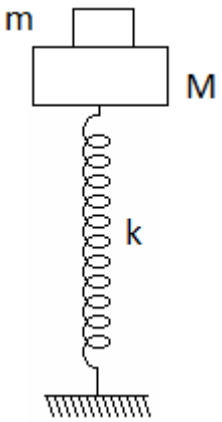
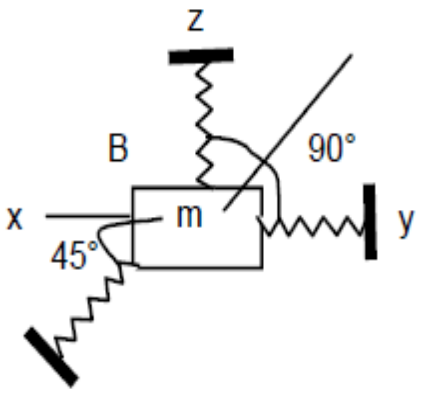
1. The equation of a particle executing S.H.M. is x= (5m) sin[(πs^{-1})t + π/3]. Write down the amplitude, time period and maximum speed. Also find the velocity at t = 1s.
2. A particle executes a S.H.M. of time period T. Find the time taken by the particle to go directly from its mean position to half the amplitude.
3. A particle suspended from a vertical spring oscillates 10 times per second. At the height point of oscillation the spring becomes unstressed. Then find maximum speed and speed at stretching of 0.20cm. Take g = π^2 m sec^{-2}.
4. The moment of inertia of the disc used in a torsion pendulum about the suspension wire is 0.2 Kg m^{-2}. It oscillates with a period of 2s. Another disc is placed over the first one and the time period of the system becomes 2.5s. Find the moment of inertia of the second disc about the wire
5. A particle starts oscillating simple harmonically from its equilibrium position with a time period T. Find the ratio of KE to PE of the particle at time t= T/12
6. A particle at the end of a spring executes S.H.M. with a period t_1, while the corresponding period for another spring is t_2. If the period of oscillation with the two springs is T then find the relation between T , t_1 and t_2
7. Two simple harmonic motions are represented by the equations y_1 = 0.1 sin (100 πt + π / 3) and y_2 = 0.1 cos πt. Find the phase difference of the velocity of particle 1 with respect to the velocity of particle 2
8. Length of a simple pendulum executing simple harmonic motion is increased by 21 %. Find the percentage increase in the time-period of the pendulum of increased length
9. A small block of mass m is kept on a bigger block of mass M which attached to a vertical spring of constant k as sown in fig. The system oscillates vertically. (a) Find the resultant force on the smaller block when it is displaced through a distance x above its equilibrium position. (b) Find the normal force on the smaller block at this position. When is this force smallest in magnitude? (c) What can be the maximum amplitude with which the two block may oscillates together

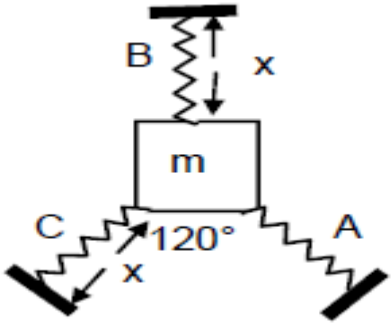


Fig(9)



Fig(10)

10. A particle of mass m is attached to their springs A, B and C of equal forces constant k as shown in fig (10). If the particle is pushed slightly against the spring C and released, find the time period of oscillation.
11. Repeat the previous exercise if the angle between each pair of spring is 120^0 initially.



12. A system of springs with their spring constants is as shown in Fig (12). What is the frequency of oscillation of the mass m