1. (c) From given equation⇒ *sec*

Time taken from mean position to the maximum displacement *sec*.

1. (c)  

Phase difference of velocity of first particle with respect to the velocity of 2nd particle at *t* = 0 is



1. (c) At centre 
2. (c) ⇒and  On solving *ω* = 2 ⇒  ⇒ *sec*
3. (a)  
4. (b)  ⇒  Now 
5. (b) The particles will meet at the mean position when *P* completes one oscillation and *Q* completes half an oscillation

So 

1. (a) From given equation  and 

∴⇒

1. (d)  [ *a* =1]
2. (a)  and  
3. (c) Velocity  and acceleration 

Now given, ⇒  ⇒  ∴ 

1. ((b) , 

and  

1. (b) Ball execute S.H.M. inside the tunnel with time period 

Hence time to reach the ball from one end to the other end of the tunnel 

1. (b) 
2. (a) At mean position, the kinetic energy is maximum.

Hence  On putting the values we get 

1. (a) 
2. (c) If suppose bob rises up to a height *h* as shown then after releasing potential energy at extreme position becomes kinetic energy of mean position

*l*

*h*

*θ*

*h=l* (1 – cos *θ*)

*l*



Also, from figure 

 So, 

1. (d) Let bob velocity be *v* at point *B* where it makes an angle of 60o with the vertical, then using conservation of mechanical energy

*A*

*v=*3*m/sec*

*B*

*l=*0*.*5*m*

60*°*

*l* cos*θ*

*l* (1-cos*θ*)

 ⇒ 



1. (a) If initial length  then 

By using 

Hence,  % increase = 

1. (d) Suppose at , pendulums begins to swing simultaneously.

Hence, they will again swing simultaneously

if   

1. (c) For stationary lift 

For ascending lift with acceleration *a*,   

1. (c) The effective acceleration in a lift descending with acceleration  is 

∴ 

1. (c) According to the principle of conservation of energy,  or  
2. (d) Given spring system has parallel combination, so  and time period 
3. (b) With respect to the block the springs are connected in parallel combination.

 Combined stiffness *k* = *k*1+ *k*2 and 

1. (a)  ⇒  ⇒  
2. (a) ⇒⇒ 
3. (b) As *mg* produces extension *x*, hence  ∴ 
4. (d)  ⇒ ⇒ 
5. (d) and 

Equivalent spring constant for shown combination is *K1* + *K*2. So time period *t* is given by 

By solving these equations we get 

1. (c) =