

# Unit 9 - Week 8

**Course outline**

How does an NPTEL online course work?

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## Assignment 8

The due date for submitting this assignment has passed. **Due on 2020-03-25, 23:59 IST.**  
 As per our records you have not submitted this assignment.

1) A force  $\mathbf{F} = 4y\hat{i} + 4x\hat{j}$  N is applied on a particle initially at (2,4). If final position to the particle is (2,2), then what is the work done by force  $\mathbf{F}$  on the particle (in J)?

No, the answer is incorrect.  
 Score: 0  
 Accepted Answers: (Type: Numeric) -16

1 point

2) The figure shows two spring mass systems: system (a) with two springs in parallel and system (b) with two springs in series. If  $k_a$  and  $k_b$  are the effective spring constants for system (a) and (b) respectively,select the correct option(s) from the following.(One or more than one may be correct)

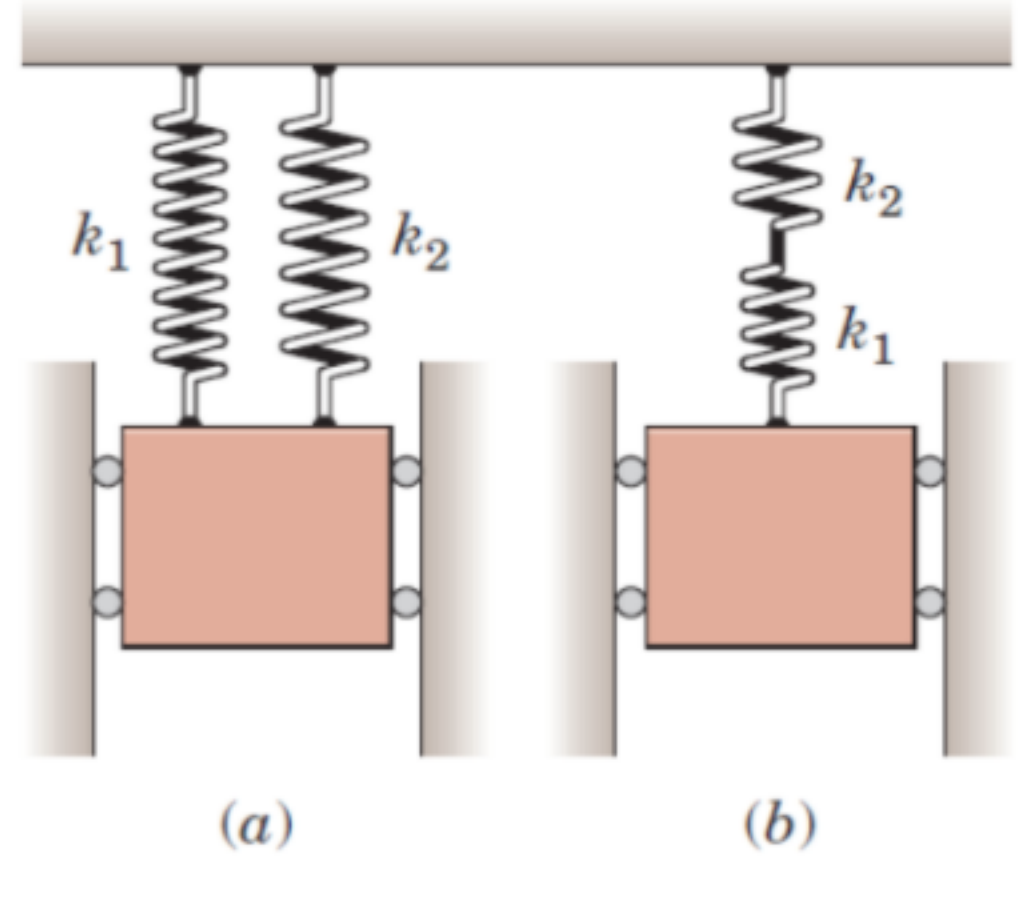


Figure 1: Figure for question No.2

- $k_a = k_1 + k_2$
- $k_b = k_1 + k_2$
- $1/k_a = 1/k_1 + 1/k_2$
- $1/k_b = 1/k_1 + 1/k_2$

No, the answer is incorrect.  
 Score: 0  
 Accepted Answers:  $k_a = k_1 + k_2$   
 $1/k_b = 1/k_1 + 1/k_2$

1 point

3) A sphere of mass 'M' and radius 'R' is rolling on a horizontal surface(with sufficient friction to avoid slipping) with a speed of 'v'. The sphere comes in contact with a spring of spring constant 'k' and starts deforming it. What will be the maximum deformation of the spring?

- $\sqrt{Mv^2/k}$
- $\sqrt{3Mv^2/2k}$
- $\sqrt{7Mv^2/5k}$
- None of the above

No, the answer is incorrect.  
 Score: 0  
 Accepted Answers:  $\sqrt{7Mv^2/5k}$

1 point

4) A circular hoop of mass 'm' and radius 'R' attached to a spring of spring constant 'k' at the centre of the hoop using a massless bar attached to the hoop,rolls without slipping on a horizontal surface. If the hoop is performing a periodic motion with a cyclic frequency  $\omega$ , the value of  $\omega$  is

- $\sqrt{k/m}$
- $\sqrt{k/2m}$
- $\sqrt{k/3m}$
- $\sqrt{2k/3m}$

No, the answer is incorrect.  
 Score: 0  
 Accepted Answers:  $\sqrt{k/2m}$

1 point

5) A ball of mass  $m = 3kg$  is released from a height  $h = 4m$  with a speed  $v = 20m/s$  along vertically downward direction. It collides with the ground and rebounds vertically with a speed half its speed when it collides with the ground. What will be the maximum height reached by the ball(in m)?(Take  $g = 10m/s^2$ )

No, the answer is incorrect.  
 Score: 0  
 Accepted Answers: (Type: Numeric) 6

1 point

6) A cylinder of mass m, radius r rolls without slipping,down a surface with some arbitrary geometry as shown in the figure, reaching a flat surface at the end. What will be the velocity of the cylinder when it reaches the flat surface?

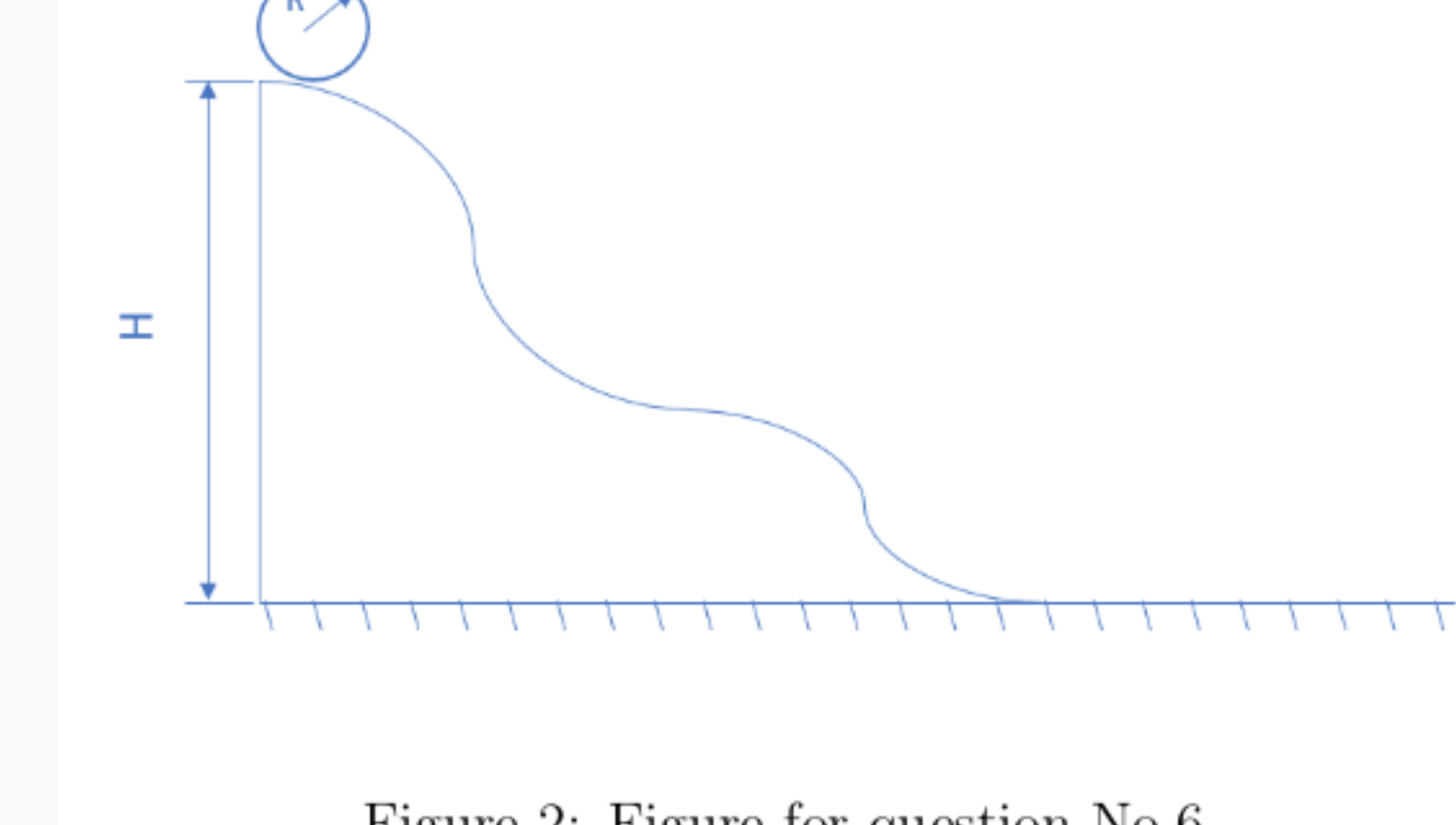


Figure 2: Figure for question No.6

- $\sqrt{2gH}$
- $\sqrt{4gH/3}$
- $\sqrt{gH}$
- The velocity of the cylinder will depend on the geometry of the surface which it rolls down

No, the answer is incorrect.  
 Score: 0  
 Accepted Answers:  $\sqrt{4gH/3}$

1 point

7) A uniform rod of mass m and length L hinged at its end is given an angular velocity  $\omega_0$  when it is making an angle of  $0^\circ$  with vertical. Find the expression for maximum angle  $\theta$  the rod can make with vertical if this given initial value of angular velocity is not sufficient for it to make cross  $\theta = \pi$  position

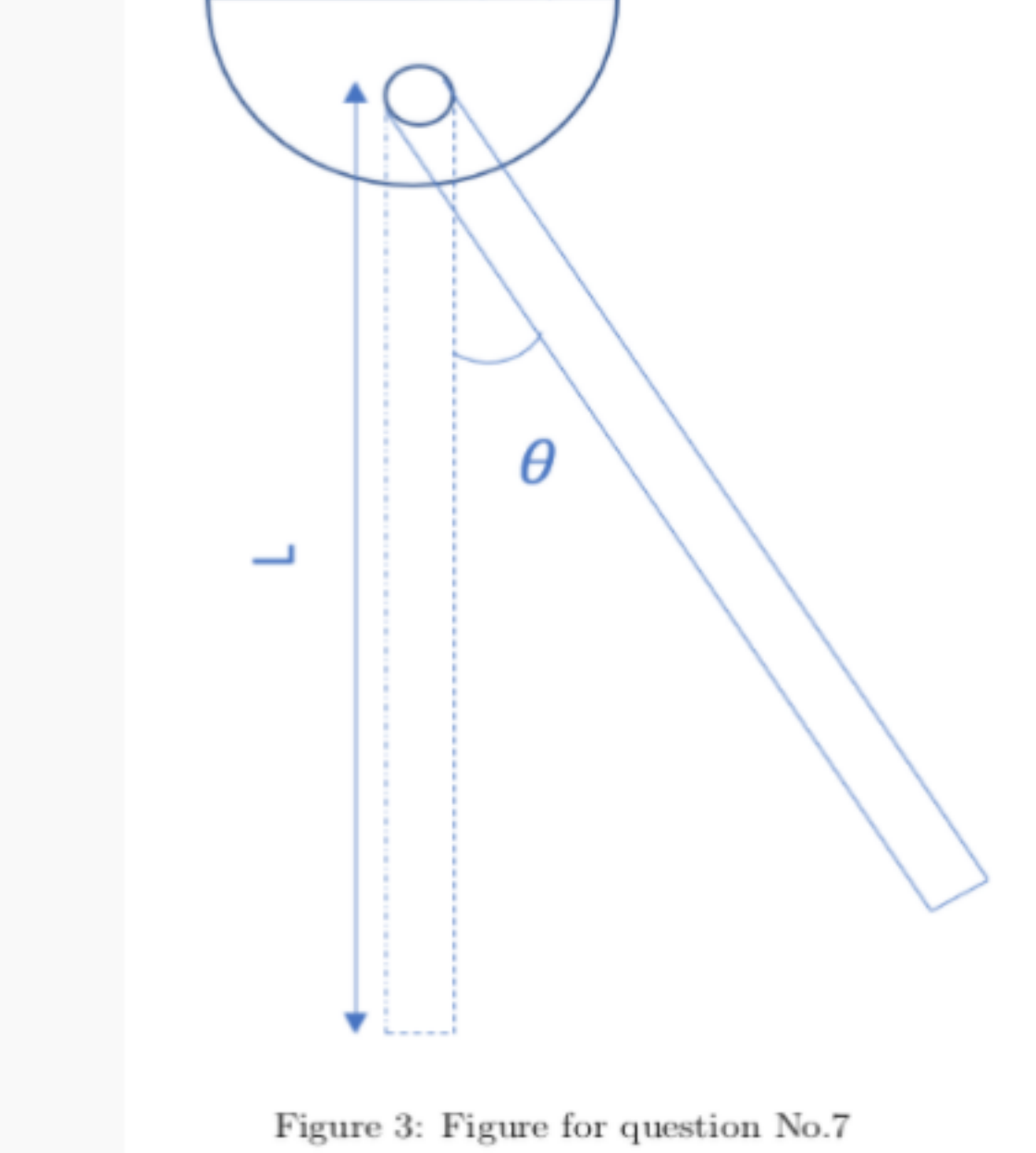


Figure 3: Figure for question No.7

- $\cos^{-1}(1 - \omega_0^2 L/3g)$
- $\cos^{-1}(1 - \omega_0^2 L/4g)$
- $\cos^{-1}(1 - \omega_0^2 L/12g)$
- $\cos^{-1}(1 - \omega_0^2 L/12g)$
- None of the above

No, the answer is incorrect.  
 Score: 0  
 Accepted Answers:  $\cos^{-1}(1 - \omega_0^2 L/3g)$

1 point

8) For the same system as in question 7, what will be the component of reaction at pin along the length of the rod, when the rod has attained the maximum displacement?

- $mg(1 - \omega_0^2 L/3g)$
- $mg(1 - \omega_0^2 L/4g)$
- $mg(1 - \omega_0^2 L/12g)$
- None of the above

No, the answer is incorrect.  
 Score: 0  
 Accepted Answers:  $mg(1 - \omega_0^2 L/3g)$

1 point

9) A ball is thrown up making some angle  $\theta$  with horizontal. The maximum height reached by the ball is h and the speed of the ball at that instant is u. Find the angle  $\theta$  with horizontal with which the ball was thrown up

- $\tan^{-1}(\sqrt{gh}/u)$
- $\tan^{-1}(u/\sqrt{gh})$
- $\tan^{-1}(\sqrt{2gh}/u)$
- $\tan^{-1}(u/\sqrt{2gh})$

No, the answer is incorrect.  
 Score: 0  
 Accepted Answers:  $\tan^{-1}(\sqrt{2gh}/u)$

1 point

10) Consider a point mass m connected to a massless and inextensible string of length l. What is the minimum value of linear velocity that needs to given the point mass when it is at its lowest position so that it can complete revolutions without string getting slacked?

- $\sqrt{gl}$
- $\sqrt{2gl}$
- $\sqrt{4gl}$
- $\sqrt{5gl}$

No, the answer is incorrect.  
 Score: 0  
 Accepted Answers:  $\sqrt{5gl}$

1 point