

## Work Energy and Power

### Assignment 1

#### Question 1

A peculiar spring has a force law

$$F = -Dx^3$$

which of the following is true

- (a) potential energy at point x when  $U = 0$  at  $x = 0$  is  $\frac{Dx^4}{4}$
- (b) if a mass m is attached to the spring. Mass is displaced slightly, it will follow simple harmonic motion
- (c)  $\frac{Dx^4}{4}$  work has to be done on the spring in stretching it from 0 to x
- (d) none of the above

#### Question 2

An object of mass M slides downward along a plane inclined at angle  $\theta$ .

The coefficient of friction is k

Find  $d(U + KE)/dt$

- (a)  $km g^2 \cos\theta (\sin\theta - k\cos\theta)$
- (b)  $km g^2 \sin\theta (\sin\theta - k\cos\theta)$
- (c)  $km g^2 (\sin\theta - k\cos\theta)$
- (d) none of the above

#### Question 3

What is true for gravitational force

- (a) work done between the two points does not depend on the path travelled
- (b) work done in a closed loop is zero
- (c)  $W = -\Delta U$
- (d) it is a conservative force

#### Question 4

An object moves on a inclined plane in upward direction at uniform velocity. Neglect frictional force. Which of the following is true

- (a) gravitational force does negative work
- (b) engine does positive work
- (c) normal reaction force does not do any work
- (d) none of the above

#### Question 5

If F is the conservative force, U is potential energy associated with this force and dr... is displacement. Which of the following is true

- (a)  $\oint F \cdot dr = 0$

(b)  $dU = \mathbf{F} \cdot d\mathbf{r}$

(c)  $\mathbf{F} = \frac{-\partial U}{\partial x} \mathbf{i} + \frac{-\partial U}{\partial y} \mathbf{j} + \frac{-\partial U}{\partial z} \mathbf{k}$

(d) none of the above

**Question 6**

A body(m) is moving along positive x axis at  $t = 0$ ,  $v = v_0$  and  $x = 0$

It is subjected to retarded force

$$F = -2x$$

Find the x coordinate, where  $\frac{dx}{dt}$  is 0

(a)  $x = v_0 \sqrt{(m/2)}$

(b)  $x = v_0 \sqrt{(m)}$

(c)  $x = v_0 \sqrt{(2m)}$

(d) none of the above

**Question 7**

A particle moves from rest at point  $P_1$  on the surface of the smooth circular cylinder of radius R

Find the angle it will leave the cylinder

(a)  $\theta = \sin^{-1} 2/3$

(b)  $\theta = \cos^{-1} 1/3$

(c)  $\theta = \cos^{-1} 2/3$

(d) none of the above

**Question 8**

The kinetic energy of a particle moving along a circle of radius R depend on the distance covered S as

$$T = aS^2$$

where a is constant

find the force acting on the particle as a function of S

(a)  $2aS^2/R$

(b)  $2aS \sqrt{[1 + (S/R)^2]}$

(c)  $2aS \sqrt{[1 - (S/R)^2]}$

(d) none of the above

**Question 9**

A body is thrown vertically upward with a velocity v. It rise to some height and come back. find the mean power over all cycle

(a)  $mgv$

(b) 0

(c)  $mgv^2$

(d) none of the above

**Answers**

1. (a), (c)
2. (a)
3. all
4. (a), (b), (c)
5. (a), (c)
6. (a)
7. (c)
8. (b)
9. (b)