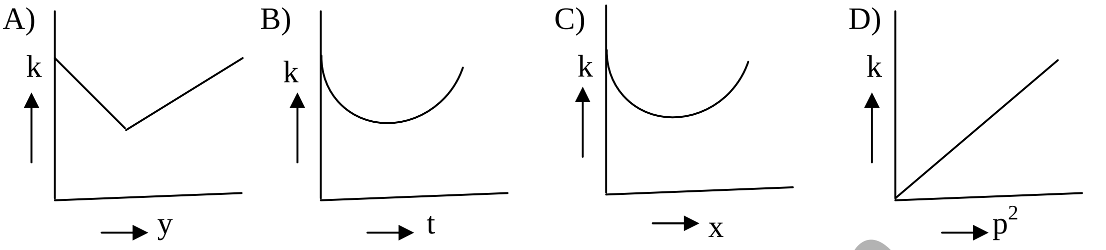
DYNAMICS

PREVIOUS EAMCET BITS
(Engineering paper)

1. A particle is projected of from a point at an angle θ with the horizontal direction. At any time ‘t’, if p is the linear momentum, y is the vertical displacement, ‘x’ is horizontal displacement, the graph among the following which does not represent the variation of kinetic energy ‘k’ of the particle is **[EAMCET 2009 E]**



1) Graph (A) 2) Graph (B) 3) Graph (C) 4) Graph(D)

Ans: 1

Sol. All the graphs represent correctly except A.

2. A motor of power P_0 is used to deliver water at a, certain rate through a given horizontal pipe. To increase the rate of flow of water through the same pipe n times, the power of the motor is increased to p_1. The ratio of p_1 to p_0 is **[EAMCET 2009 E]**

1) n : 1 2) $n^2 : 1$ 3) $n^3 : 1$ 4) $n^4 : 1$

Ans: 3

Sol: $$\frac{\text{mass of water flowing}}{\text{second}} = \frac{\text{volume} \times \text{density}}{\text{time}}$$

$$= \frac{\text{Area} \times \text{length} \times \text{density}}{\text{time}}$$

$$= \text{Area} \times \text{velocity} \times \text{density}$$

$$= AV\rho$$

$$\therefore \text{ Rate of increase of K.E} = \frac{\frac{1}{2}mv^2}{\text{time}} = \frac{\left(\frac{VA\rho}{}\right)V^2}{2} = \frac{1}{2}A\rho V^3$$

Mass m, flowing out per second, can be increased to m_1 by increasing to V to V_1, then power increases from P to P_1.

$$\therefore \frac{P_1}{P} = \frac{\frac{1}{2}A\rho V_1^3}{\frac{1}{2}A\rho V^3} \Rightarrow \frac{P_1}{P} = \left(\frac{V_1}{V}\right)^3$$

$$\therefore \frac{m_1}{m} = \frac{A\rho V_1}{A\rho V} = \frac{V_1}{V}$$

But given $m_1 = nm$, $v_1 = nv$

$$\therefore \frac{p_1}{p} = n^3 \Rightarrow p_1 = n^3 p$$

3. A river of salty water is flowing with a velocity of $2ms^{-1}$. If the density of the water is 1.2 gm/sc. Then the kinetic energy of each cubic metre of water is **[EAMCET 2008 E]**

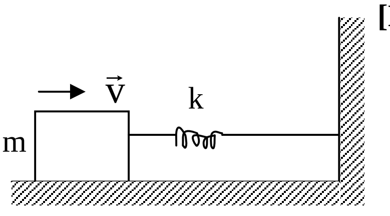
1) 2.4 J 2) 24 J 3) 2.4 KJ 4) 4.8 KJ

Ans: 3

Sol. $K.E = \frac{1}{2}mv^2 = \frac{1}{2}[\text{volume} \times \text{density}] \times v^2$

$= \frac{1}{2} \times 1 \times 1.2 \times \frac{10^{-3}}{10^{-6}} \times (2)^2 = 2.4$ KJ

4. A block of mass m = 25 kg sliding on a smooth horizontal surface with a velocity v = $3ms^{-1}$ meets the spring of spring constant k = 100 N/m fixed at one end as shown in figure. The maximum compression of the spring and velocity of block as it returns to the original position respectively **[EAMCET 2007 E]**



1) $1.5m, -3ms^{-1}$ 2) $1.5m, 0.01ms^{-1}$

3) $1.0\,m, 3\,ms^{-1}$ 4) $0.5\,m, 2\,ms^{-1}$

Ans: 1

Sol: According to the law of conservation of energy when block strikes the spring the kinetic energy of block converts into potential energy of spring

$\therefore \frac{1}{2}mv^2 = \frac{1}{2}kx^2$

Where x is compression in spring

$\Rightarrow x = \sqrt{\frac{mv^2}{k}} = \sqrt{\frac{25 \times (3)^2}{100}} = 1.5m$

As the block returns to the original position, again potential energy converts into kinetic energy of the block, so velocity of the block is same as before but its sign changes as it goes to mean position

$\therefore v = -3ms^{-1}$

5. A man slides down on a telegraphic pole with an acceleration equal to one-fourth of acceleration due to gravity the fractional force between man and pole is equal to in terms of mass weight w **[EAMCET 2007 E]**

1) $\frac{w}{4}$ 2) $\frac{w}{2}$ 3) $\frac{3w}{4}$ 4) w

Ans:3

Sol. As man is sliding down weight acting down is greater than upward force.

$Mg - F = \frac{Mg}{4}$

$\Rightarrow F = \frac{3Mg}{4} = \frac{3w}{4}$

6. A rifle of 20 kg mass can fire 4 bullet per second the mass of each bullet is 35×10^{-3} kg and its final velocity is 400 ms^{-1}. Then what force must be applied on the rifle so that it does not move backwards while firing the bullets? **[EAMCET 2007 E]**

1) 80 N 2) 28N 3) – 112 N 4) – 56 N

Ans: 4

Sol. From law of conservation of momentum

$M_R V_R + M_B V_B = 0$

Where M_R and M_b are the masses of rifle and bullet

V_R and V_b are the velocity of rifle and bullet

$$V_R = -\frac{M_b V_b}{M_R} = -2.8\,ms^{-1}$$

Force applied on the rifle = $\frac{M_b V_b}{t} = -56N$

7. A motor is used to deliver water at a certain rate through a given horizontal pipe. To deliver n-times the water through the same pipe in the same time the power of the motor must be increased as follows: **[EAMCET 2006 E]**

1) n - times 2) n^2 - times 3) n^3 - times 4) n^4 - times

Ans: 3

Sol: $\frac{\text{mass of water flowing}}{\text{second}} = \frac{\text{volume} \times \text{density}}{\text{time}}$

$$= \frac{\text{Area} \times \text{length} \times \text{density}}{\text{time}}$$

= Area × velocity × density

$= AV\rho$

$$\therefore \text{Rate of increase of K.E} = \frac{\frac{1}{2}mv^2}{\text{time}} = \frac{\left(\frac{VA\rho}{}\right)V^2}{2} = \frac{1}{2}A\rho V^3$$

Mass m, flowing out per second, can be increased to m_1 by increasing to V to V_1, then power increases from P to P_1.

$$\therefore \frac{P_1}{P} = \frac{\frac{1}{2}A\rho V_1^3}{\frac{1}{2}A\rho V^3} \Rightarrow \frac{P_1}{P} = \left(\frac{V_1}{V}\right)^3$$

$$\therefore \frac{m_1}{m} = \frac{A\rho V_1}{A\rho V} = \frac{V_1}{V}$$

But given $m_1 = nm$, $v_1 = nv$

$$\therefore \frac{p_1}{p} = n^3 \Rightarrow p_1 = n^3 p$$

8. A bullet of mass 10 g is fired horizontally with a velocity $100\,ms^{-1}$ from a rifle situated at a height 50 m above the ground. If the bullet reaches the ground with a velocity $500\,ms^{-1}$, the work done against air resistance in the trajectory of the bullet is ($g = 10\ ms^{-2}$) **[EAMCET 2006 E]**

1) 5005 J 2) 3755 J 3) 3750 J 4) 17.5 J

Ans: 3

Sol: From equation of motion $v^2 = u^2 - 2as$

$$(500)^2 = (1000)^2 - 2 \times a \times s$$

$$s = \frac{(1000)^2 - (500)^2}{2a} = \frac{37500}{a}$$

$\therefore$ Work done against air resistance = Fs $\Rightarrow ma \times s$

$$= \frac{10}{1000} a \times \frac{375000}{a} = 3750\ J$$

9. The machine gun fires 240 bullets per minute. If the mass of each bullet is 10 g and the velocity of the bullets is 600 ms^{-1}, the power (in kW) of the gun is **[EAMCET 2005 E]**
1) 43200 2) 432 3) 72 4) 7.2
Ans: 4

Sol: $\text{Power} = \frac{\text{Work}}{\text{Time}} = \frac{\frac{1}{2}nmv^2}{t}$

$= \frac{\frac{1}{2}\times 240\times 10\times 10^{-3}\times 36\times 10^4}{60}$

= 7.2 kw

10. A block of mass 2 kg is initially at rest on a horizontal frictionless surface. A horizontal force $\vec{F} = \left(9 - x^2\right)\hat{i}$ newtons acts on it, when the block is at x = 0. The maximum kinetic energy of the block between x = 0 and x = 3m in joule is **[EAMCET 2004 E]**
1) 24 2) 20 3) 18 4) 15
Ans: 3

Sol: As work done = K.E

$\therefore \text{ K.E} = \int F.dx = \int_{x=0}^{x=3}\left(9 - x^2\right).dx$

$= 9\int_{x=0}^{x=3} dx - \int_{x=0}^{x=3} x^2.dx \;\; = [9x]_0^3 - \left[\frac{x^3}{3}\right]_0^3$

On simplifying
K.E = 18 joule

11. Consider the following statements A and B and identify the correct answer given below
A) A body initially at rest is acted upon by a constant force. The rate of change of its kinetic energy varies linearly with time.
B) When a body is at rest, it must be in equilibrium **[EAMCET 2003 E]**
1) A and B are correct 2) A and B are wrong
3) A is correct and B is wrong 4) A is wrong and B is correct
Ans:

Sol: From the def $\text{K.E} = \frac{1}{2}mv^2$

but v = at

$\therefore \text{ K.E} = \frac{1}{2}ma^2t^2$

Rate of change of $\text{K.E} = \frac{d(\text{K.E})}{dt} = \frac{d}{dt}\left[\frac{1}{2}ma^2t^2\right] = ma^2t$

$\therefore \frac{d(\text{K.E})}{dt} \propto t$

$\therefore$ A statement is correct
When the body is at rest then it may be or may not be in equilibrium
$\therefore$ B statement is wrong

12. A body of mass 4 kg is moving with momentum of 8 kg ms^{-1}. A force of 0.2 N acts on it in the direction of motion of the body for 10 seconds. The increase in kinetic energy in joules is **[EAMCET 2002 E]**

1) 10 2) 8.5 3) 4.5 4) 4

Ans : 3

Sol: m = 4 kg, p = 8 kg m/s,

F = 0.2 N, t = 10 sec

From Newton's IInd law

Force = rate of change of momentum

$$F = \frac{p_2 - p_1}{t}$$

$$0.2 = \frac{m\nu - 8}{10} \Rightarrow 2 = 4 \times \nu - 8$$

$$4\nu = 10 \Rightarrow \nu = \frac{5}{2}\,m/s$$

$\therefore$ Final momentum $p_2 = m\nu = 4 \times \frac{5}{2} = 10\,kg\,m/s$

Increase in KE, $= \frac{p_2^2 - p_1^2}{2m} = \frac{(10)^2 - (8)^2}{2 \times 4} = \frac{100 - 64}{8} = \frac{36}{8} = 4.5$ J

13. A body of mass 2 kg starts from rest and moves with uniform acceleration. It acquires a velocity 20 ms^{-1} in 4s. The power exerted on the body in 2s in watts is **[EAMCET 2002 E]**

1) 50 2) 100 3) 150 4) 200

Ans : 2

Sol: $m = 2kg, u = 0, \nu = 20\ m/s, t = 4 sec$

Acceleration $a = \frac{\nu - u}{t} = \frac{20 - 0}{4} = 5\,m/s^2$

$\therefore$ Force applied F = ma = 2 x 5 = 10 m/s

Velocity at the end of 2 sec $\nu = u + at = 0 + 5 \times 2 = 10\,m/s$

$\therefore$ Power $P = F\nu = 10 \times 10 = 100$ watt

14. A body of mass 6 kg is under a force which causes displacement in it given by "$s = \frac{t^2}{4}$" metres 't' is time. The work done by the force in 2 seconds is **[EAMCET 2001 E]**

1) 12 J 2) 9 J 3) 6 J 4) 3 J

Ans : 4

Sol: $m = 6\,kg, s = \frac{t^2}{4}$

Work done W = Force $\times$ displacement

= ma $\times$ s

Displacement $s = \frac{t^2}{4}$

$\therefore$ Acceleration = $a = \frac{d\nu}{dt} = \frac{d}{dt}\left(\frac{ds}{dt}\right)$

$$= \frac{d}{dt}\left[\frac{d}{dt}\left(\frac{t^2}{4}\right)\right] = \frac{d}{dt}\left(\frac{2t}{4}\right) = \frac{1}{2}$$

$\therefore\ W = 6\times\frac{1}{2}\times\frac{t^2}{4} = \frac{3}{4}t^2 = \frac{3}{4}(2)^2$

$= \frac{3}{4}\times 4 = 3J$

15. A force applied by an engine on a train of mass $2.05\times10^6\,kg$ changes its velocity from 5 m/s to 25 m/s in 5 minutes. The power of the engine is **[EAMCET 2001 E]**
1) 1.025 MW 2) 2.05 MW 3) 5 MW 4) 6 MW
Ans : 2

Sol: $m = 2.05\times10^6\,kg, v_1 = 5\,m/s$
$v_2 = 25\ m/s, t = 5\,min = 5\times60 = 300\ sec$

$\text{Power} = \frac{W}{t} = \frac{\text{change in KE}}{t}$

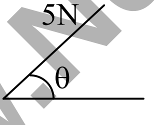
$= \frac{1}{2}\frac{m\left(v_2^2 - v_1^2\right)}{300} \Rightarrow \frac{1}{2}\frac{2.05\times10^6\left[(25)^2-(5)^2\right]}{300}$

$= \frac{1}{2}\frac{2.05\times10^6\times600}{300} \Rightarrow 2.05\times10^6\ \text{watt}$

= 2.05 MW

16. A force of 5 N making an angle θ with the horizontal acting on an object displaces it by 0.4 m along the horizontal direction. If the object gains kinetic energy of 1 J the horizontal component of the force is **[EAMCET 2000 E]**
1) 1.5 N 2) 2.5 N 3) 3.5 N 4) 4.5 N
Ans : 2

Sol: Work done by the force



$W = Fs\cos\theta = 5\times0.4\cos\theta = 2\cos\theta$

From work energy theorem work done = change in kinetic energy

$2\cos\theta = 1J;\ \cos\theta = \frac{1}{2} \Rightarrow \theta = 60°$

$\therefore$ Horizontal component = $F\cos\theta = 5\times\frac{1}{2} = 2.5\,N$

17. A ball is projected vertically down with an initial velocity from a height of 20 m on to a horizontal floor. During the impact it loses 50% of the energy and rebounds to the same height, the initial velocity of its projection is **[EAMCET 2000 E]**
1) $20\,ms^{-1}$ 2) $15\,ms^{-1}$ 3) $10\,ms^{-1}$ 4) $5\,ms^{-1}$
Ans : 1

Sol: From the equation of motion

Final velocity $\quad \nu^2 = u^2 + 2gh$

$= u^2 + 2g(20)$

$\nu = \sqrt{u^2 + 40g}$

Loss in energy = 50 %

Remaining energy = (100 – 50) = 50% of initial energy

$= \frac{1}{2}$ of initial energy $= \frac{1}{2}\left(\frac{1}{2}mv^2\right)$

$= \frac{1}{4}m \times (u^2 + 50g)$

The ball rebounds to same height.

$\therefore$ Remaining energy $= \frac{1}{2}mv'^2 = \frac{1}{2}m(2gh) = mgh$

From law of conservation of energy

$\therefore\ mgh = \frac{1}{4}m(u^2 + 40g)$

$mg(20) = \frac{1}{4}m(u^2 + 40g) \Rightarrow 80g - 40g = u^2$

$u = \sqrt{40g} \Rightarrow u = \sqrt{40 \times 10} = 20\,m/s$

18. A 1.0 HP motor pumps out water from a well of 30 m and fills a water tank of volume 2238 litres at a height of 10 m from the ground. The running time of the motor to fill the empty water tank is **[EAMCET 2000 E]**

1) 5 min 2) 10 min 3) 15 min 4) 20 min

Ans: 4

Sol: P = 1 H.P. = 746 watt, V = $2238 \times 10^{-3} m^3$, h_1 = 30m, h_2 = 10 m

$m = v\rho = 2238 \times 10^{-3} \times 10^3 = 2238kg$

Total height lift by the pump = $h_1 + h_2$ = 30 + 10 = 40 m

Power $P = \frac{mgh}{t} \Rightarrow t = \frac{mgh}{P} = \frac{2238 \times 10 \times 40}{746}$ =1200 sec = $\frac{1200}{60} = 20\,min$

MEDICAL

19. A block of mass 'm' is connected to one end of a spring of 'spring constant' k . The other end of the spring is fixed to a rigid support. The mass is released slowly so that the total energy to the system is then constituted by only the potential energy, then 'd' is the maximum extension of the spring. Instead, if the mass is released suddenly from the same initial position, the maximum extension of the spring now is: (g – acceleration due to gravity) [EAMCET 2009 M]

1) $\frac{mg}{k}$ 2) 2d 3 $\frac{mg}{3k}$ 4) 4d

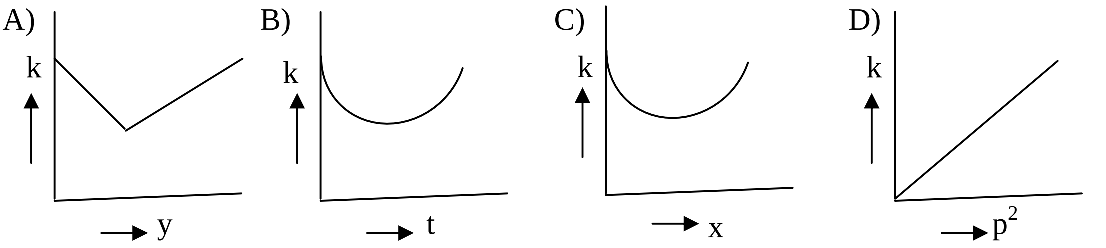
Ans: 2

Sol. According to the law of conservation of energy and law of conservation of momentum

Maximum extension in the spring

= d + d = 2d

20. A particle is projected of from a point at an angle θ with the horizontal direction. At any time 't', if p is the linear momentum, y is the vertical displacement, 'x' is horizontal displacement, the graph among the following which does not represent the variation of kinetic energy 'k' of the particle is **[EAMCET 2009 M]**



1) Graph (A) 2) Graph (B) 3) Graph (C) 4) Graph(D)

Ans: 1

Sol. All the graphs represent correctly except A.

21. A body of mass 50 kg is standing on a weighing machine placed on the floor of a lift. The machine reads his weight in Newtons. What is the reading of the machine if the lift is moving upwards with a uniform speed of 10 m/sec^2 (g = 10 m/sec^2) [EAMCET 2009 M]

1) 510 N 2) 480 N 3) 490 N 4) 500 N

Ans:4

Sol When the lift is at rest or moving up or down with uniform velocity then there is no change in weight.

$\therefore\ W = mg = 50 \times 10 = 500N$

22. A person of mass M = 90 kg standing on a smooth horizontal plane of ice thrown a body of mass m = 10 kg horizontally on the same surface. If the distance between the person and body after 10 seconds is 10 metres, the K.E of the person (in Joules) is [EAMCET 2008 M]

1) 0.45 2) 4.5 3) 0.90 4) zero

Ans: 1

Sol. According to the law of conservation of linear momentum when the body moves in forward direction person moves in backward direction.

$\therefore$ 90u = 10v $\Rightarrow$ 9u = v ………(1)

Velocity of person w.r.t body is = u + v

Displacement (s) = (velocity) $\times$ time

$10 = (u+v)10 \Rightarrow u + v = 1$……….(2)

From (1) equation u + 9u = 1

$\Rightarrow 10u = 1 \Rightarrow u = \frac{1}{10}$

$\therefore$ K.E of person = $\frac{1}{2}mu^2 = \frac{1}{2} \times 90 \times \left(\frac{1}{10}\right)^2 = 0.45J$

23. A body is thrown vertically up with certain initial velocity. The potential and kinetic energies of the body are equal at a point p in its path. If the same body is thrown with double the velocity upwards the ratio of potential and kinetic energies of the body when it crosses the same point, is [EAMCET 2007 M]

1) 1 : 1 2) 1 : 4 3) 1 : 7 4) 1 : 8

Ans: 3

Sol. Le H is the maximum height. Let h is the height above the ground at which both P.E and K.E are equal

$\therefore$ T e at the point p = K.E + P.E

$\Rightarrow\ K.E = mgH - mgh = mg[H - h]$

$\therefore \dfrac{P.E}{K.E} = \dfrac{mgh}{mg[Hh]}$

As K.E = P.E

$\therefore \dfrac{h}{H-h} = 1 \Rightarrow h = H - h \Rightarrow H = 2h$ ……………(1)

When the body is projected upwards with velocity u it reaches a maximum height H

$\therefore H = \dfrac{u^2}{2g}$

When the body is projected vertically upwards with double the velocity then it reaches a maximum height H_1

$\therefore H = \dfrac{(2u)^2}{2g} = \dfrac{4u^2}{2g} = 4H$ ………..(2)

$\therefore$ The ratio of P.E and K.E at the same point ‘P’ = $\dfrac{P.E}{K.E} = \dfrac{mgh}{mg[H_1 - h]} = \dfrac{h}{H_1 - h} = \dfrac{h}{4H - h}$

$\therefore \dfrac{P.E}{K.E} = \dfrac{h}{4[2h] - h} = \dfrac{1}{7}$

24. A body of mass 2kg is thrown up vertically with kinetic energy of 490 J. If $g = 9.8\ ms^{-2}$, the height at which the kinetic energy of the body becomes half of the original value is [EAMCET 2007 M]

1) 50 m 2) 25 m 3) 12.5 m 4) 19.6 m

Ans: 3

Sol. According to the law of conservation of energy total energy remains constant.

$\therefore$ K.E at the lowest point = P.E at the max. height

$\therefore$ Le the height is h_1 where it becomes half kinetic and half potential

$\therefore \dfrac{490}{2} = mgh_1 \Rightarrow h_1 = 12.5m$

25. The apparent weight of a person inside a lift is w_1 when lift moves up with a certain acceleration and is w_2 when lift moves down with same acceleration. The weight of the person when lift moves up with constant speed is [EAMCET 2007 M]

1) $\dfrac{w_1 + w_2}{2}$ 2) $\dfrac{w_1 - w_2}{2}$ 3) $2w_1$ 4) $2w_2$

Ans: 1

Sol. When the lift is going up with an acceleration ‘a’ then $w_1 = m[g + a]$………..(1)

When the lift is moving down with an acceleration ‘Q’ then $w_2 = m[g - a]$ ……(2)

When the lift moves up with constant speed then w = mg

$\therefore$ from (1) and (2)

$mg = \dfrac{w_1 + w_2}{2}$

$\therefore\ w = \dfrac{w_1 + w_2}{2}$

26. A body of density ‘D’ and Volume ‘V’ is lifted through height ‘h’ in a liquid density ‘d’ (< D). The increase in potential energy of the body is

1) $V(D-d)hg$ 2) VDgh 3) Vdgh 4) $V(D+d)hg$

Sol. Since the body is lifted through a distance in the liquid then work done against the buoyant force will be stored as the potential energy of the body.

$\therefore$ Potential energy of the body = work done by body during displacement – work done by the liquid against body

$\therefore$ P.E = VDgh – Vdgh = V[D – d]gh

Where D is the density of the body and 'd' is the density of liquid

27. A stationary body of mass 3kg explodes into three equal pieces. Two of the pieces fly off at right angles to each other, one with a velocity $2\bar{i}\,m/s$ and the other with a velocity $3\bar{j}\,m/s$. If the explosion takes place in 10^{-5} sec. The average force acting on the third piece in Newton is [EAMCET 2003 M]

1) $\left(2\vec{i}+3\vec{j}\right)\times10^{-5}$ 2) $-\left(2\vec{i}+3\vec{j}\right)\times10^{5}$ 3) $\left(3\vec{j}+2\vec{i}\right)\times10^{5}$ 4) $\left(2\vec{i}+3\vec{j}\right)\times10^{-5}$

Ans: 2

Sol. According to the law of conservation of linear momentum $\bar{p}_1+\bar{p}_2+\bar{p}_3=0$

$p_3=-\left(2\hat{i}+3\hat{j}\right)$

From the bef of force

$$F=\frac{dp}{dt}=\frac{-\left(2\hat{i}+3\hat{j}\right)}{10^{-5}}=-\left(2\hat{i}+3\hat{j}\right)\times10^{5}\,N$$

28. A body of mass 'm' has a kinetic energy equal to one fourth kinetic energy of another body of mass m/4. If the speed of the heavier body is increased by 4 m/s., its new kinetic energy equals the original kinetic energy of the lighter body. The original kinetic speed of the heavier body in m/s is [EAMCET 2003 M]

1) 8 2) 6 3) 4 4) 2

Ans: 3

Sol. Let u_1 and u_2 are the velocities of the two bodies

$$\therefore\ \frac{1}{2}mu_1^2=\frac{1}{4}\left[\frac{1}{2}\frac{m}{4}\right]u_2^2$$

$$u_1=\frac{u_2}{4}\Rightarrow u_2=4u_1\ \text{………(1)}$$

$\therefore$ As the speed of heavier body (m) is increased by $4ms^{-1}$

$$\therefore\ \frac{1}{2}m\left(u_1+4\right)^2=\frac{1}{2}\left(\frac{m}{4}\right)\left(u_2^2\right)\text{………(2)}$$

Sub (1) in (2) and simplifying

$V = 4ms^{-1}$

29. Two bullets of masses 5 g and 10 g moving with velocities 10 m/s and 5 m/s respectively strike and penetrate into a fixed wooden block and come to rest. Then the ratio of their respective distances moved in the block before coming to rest is [EAMCET 2002 M]

1) 1 : 2 2) 1 : 4 3) 4 : 1 4) 2 : 1

Ans: 4

Sol. Work done $Fs=\frac{1}{2}mu^2$

$$\therefore\ Fs_1=\frac{1}{2}\left(5\times10^{-3}\right)\left(100\right)\text{……..(1)}$$

$$Fs_2=\frac{1}{2}\left(10\times10^{-3}\right)\left(25\right)\text{………..(2)}$$

$\therefore \ \frac{s_1}{s_2} = \frac{2}{1} \Rightarrow s_1 : s_2 = 2:1$

30. When a body is thrown vertically upwards with a velocity of 50 m/s, the percentage of its initial kinetic energy converted into potential energy after 4 seconds is : (g = 10 m/s^2)
[EAMCET 2001 M]
1) 96% 2) 50% 3) 24% 4) 4%
Ans: 1

Sol. Vertical height reached by the body in 4 sec

$$h = \frac{v^2 - u^2}{2g} = \frac{100 - 2500}{-2(10)} = 120m$$

$\therefore$ percentage of its initial K.E

Converted into P.E is $= \left[\frac{mgh}{1/2\,mv^2}\right]100$

$$= \left[\frac{m(10)(120)}{1/2(m)(2500)}\right](100) = 96\%$$

31. A constant force acts on a body of mass 0.9 kg at rest for 10s. If the body moves a distance of 250 m, the magnitude on the force is [EAMCET 2000 M]
1) 8 N 2) 36 N 3) 4.0 N 4) 4.5 N
Ans: 4

Sol. mass = 0.9 kg , u = 0

$t = 10\sec\ a = \frac{2s}{t^2} = \frac{500}{100} = 5ms^{-2}$

s = 250 m

$\therefore$ F = ma = 4.5 N

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