Applied math – Model 2

1. A Force of magnitude 15 kg · ωt. acts in the direction $\overline{AB}$ where $A(-3,1), B(1,4)$, then the moment of $\vec{F}$ about the origin $= \cdots$

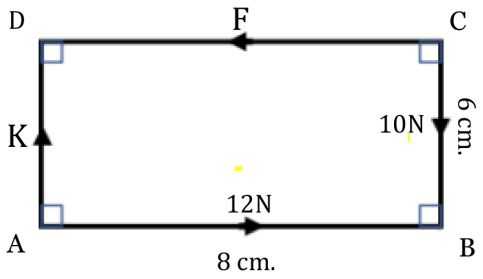
a) $39\vec{k}$ b) $-39\vec{k}$ c) $-3\vec{k}$ d) $49\vec{k}$

2. A car of mass 2 Tons moves in a straight line such that its position vector $\vec{x} = (3t^2 - 4t + 1)\vec{c}$ Where $\vec{c}$ is a unit vector in the direction of motion and x is in meter, then its momentum after 3 seconds from the beginning of motion equal .... kg · m/sec.

a) 28 b) 280 c) 8000 d) 28000

3. In the given figure
$ABCD$ is a rectangle, $AB = 8$ cm, $BC = 6$ cm
Forces 12,10, F, k acts along $\overrightarrow{AB}, \overrightarrow{CB}, \overrightarrow{CD}, \overrightarrow{AD}$ respectively. If their resultant acts along $\overleftrightarrow{AC}$, then $F.k = \cdots$

a) 100 b) 110
c) 120 d) 130

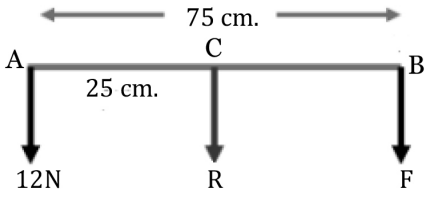


4. A locomotive of mass 30 tons, if the force of its engine is 15 ton. wt. and pulls a number of wagons, each of mass 10 tons to ascend a road inclined to the horizontal by an angle of measure 30° with uniform velocity, if the resistance to the whole train is 10 kg. wt for each ton, then the number of wagons $= \cdots$

a) 5 b) 7 c) 8 d) 9

5. In the opposite figure
F and 12 are two parallel forces with resultant R.
if $AB = 75$ cm, $AC = 25$ cm
then the values of F and $R = \cdots$

a) 18,30
b) 4,16
c) 16,28
d) 6,18

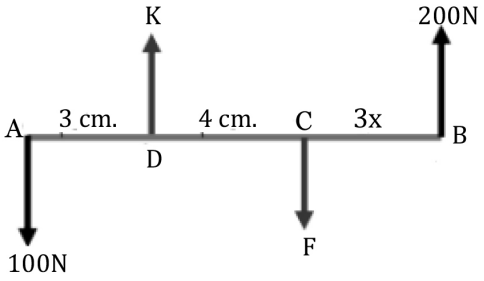


6. A body of mass 3 kg. moves under the action of three coplanar forces $\vec{F}_1 = 2\vec{\imath} - b\vec{\jmath}, \vec{F}_2 = a\vec{\imath} + \vec{\jmath}, \vec{F}_3 = 3\vec{\imath} + 2\vec{\jmath}$, if the displacement vector is given as a function of time by the relation $\vec{S} = (t^2 + 1)\vec{\imath} + (2t^2 + 3)\vec{J}$, then $a \times b = \cdots$

a) -9 b) 9 c) 10 d) -10

7. In the opposite figure
If the resultant of the forces shown in figure acts at point M upward where $AM = 4$ cm, then $F + 3\text{K} = \cdots$ newton

a) 700 b) 800
c) 900 d) 1600

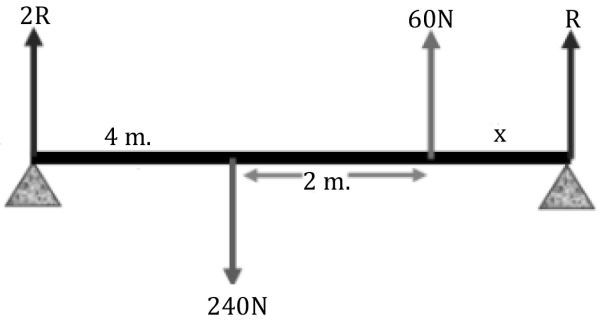


8. A body moves on a straight line such that its Position vector at any instant is given by the relation $\vec{x} = (t^2 - 5t + 4)\vec{c}$, then the average velocity vector from $t = 0$ to $t = 4$ is ...

a) $-\frac{7}{2}\vec{c}$ b) $2\overset{c}{C}$ c) $-\frac{3}{2}\vec{c}$ d) $-\vec{c}$

9. In the opposite figure
If the rood is in equilibrium horizontally, then $x = \cdots$

a) 2
b) 3
c) 4
d) 5



10. A body moves in a straight line such that its position vector $\vec{r} = (4t - t^2 - 3)$ where r is measured in meter, t in seconds, then the motion is accelerating on...

a) [0,2[b)]2, ∞[c) [0, ∞[d) R^+

11. The two forces $\overrightarrow{F_1} = a\vec{\imath} + b\vec{\jmath}, \vec{F}_2 = 5\vec{\imath} - 2\vec{\jmath}$, acts at the points $C(-2,1), D(3,1)$. if the two forces form a couple, then the perpendicular distance between C and f_2 is...

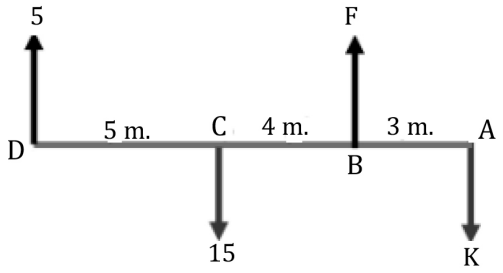
a) 10 b) $\frac{\sqrt{29}}{10}$ c) $\sqrt{29}$ d) $\frac{10}{\sqrt{29}}$

12. If the mass of a body moving along a straight line is given by the relation $m = 3t + 2$, and its displacement $\vec{S} = \left(\frac{1}{3}t^3 + 2t\right)\vec{C}$ where $\vec{C}$ is a unit vector in the direction of the acting Force, then magnitude of the force at $t = 1$ is ...

a) 19 b) 20 c) 21 d) 22

13. In the opposite figure
If the set of forces shown acts on the rod $\overline{AD}$ to form a couple whose moment is -75 newtons, then $F + k = \cdots$

a) 50 b) 60
c) 70 d) 80



14. If Force $\vec{F}$ acts on a body of mass 1 kg. moving in a straight line starting from the origin where $f = 5\text{x} + 6$ where x is the distance from the origin measured in meters and F in newton, then its velocity when $\text{x} = 4$ m is equal to ... m/sec.

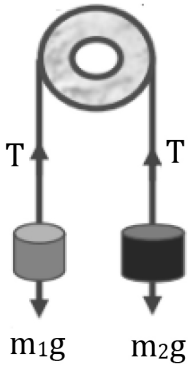
a) $8\sqrt{2}$ b) $-8\sqrt{2}$ c) $\pm 8\sqrt{2}$ d) $\pm 2\sqrt{8}$

15. If the line of action of $\vec{F}$ is parallel to $\overrightarrow{AB}$, and $\vec{M}_A = 12\vec{K}$, then $\vec{M}_B = \cdots$

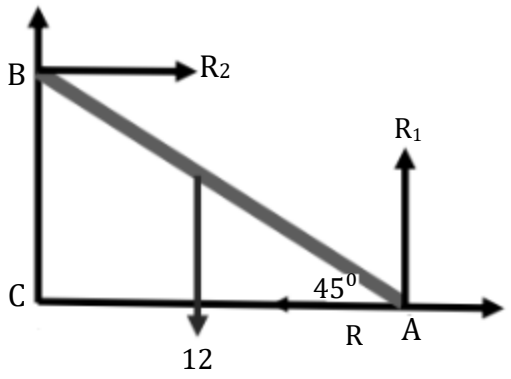
a) $-12\vec{k}$ b) $12\vec{k}$ c) $24\vec{k}$ d) $-24\vec{k}$

16. Two bodies of masses m_1 and m_2 kg. Where $m_1 > m_2$ are attached to the two ends of a rope passing through a smooth pulley such that the two masses where on the same height from the ground at the beginning of motion and after 1 second, it was found that the vertical distance between the two bodies became 20 cm , then $m_1 : m_2 = \cdots$

a) 15: 13 b) 24: 25 c) 25: 24 d) 21: 25



17. In the opposite Figure
$\overline{AB}$ is a uniform rod with weight 12 kg · wt.
its end A rests on a rough horizontal ground
and its end B on a Smooth vertical wall,
If the rood was in equilibrium when its angle
of inclination with the horizontal was 45°,
then the friction force between the rod
and the ground $= \cdots$ kg · wt.



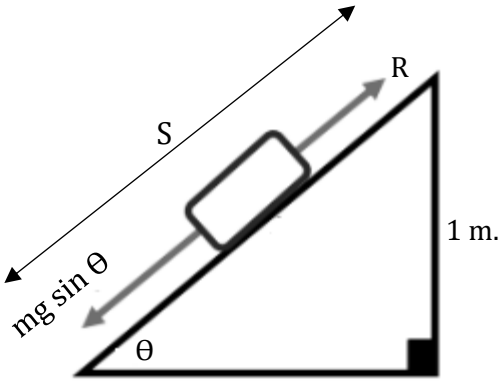
a) 1 b) 3
c) 5 d) 6

18. A car of mass 5 Tons moving with uniform velocity of magnitude 36 km/h ascending a road inclined ts the horizontal by an angle whose sine is $\frac{1}{40}$ against a resistance equal to 2.5% from the Car's weight, then its power $= \cdots$ horses.

a) 33 b) $33\frac{1}{3}$ C) $35\frac{1}{3}$ d) 34

Essay Questions

19. In the opposite figure:
A body of mass 300 gm places on the top
of an inclined Plane whose height is 1 m.
find the velocity by which it reaches the
base if given that the work done against
resistance of the plane $= 1.59$ Joul



20. In the given figure
$\overline{AB}$ is a uniform rod of weight 10 kg · wt.
if $AB = 20$ cm and rotate in a vertical
plane about A. If the rod became in equilibruim
under the action of a couple whose moment
is 50 kg · wt. cm and acts in the same vertical plane,
Find the measure of the angle of inclination
of the rod with the vertical.