Based On
FTS-01 (A + B)

Aakash
Medical|IIT-JEE|Foundations

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CONCEPT STRENGTHENING SHEET
CSS-01
PHYSICS

Q.39 (Code-A) (Application of Laws of Motion)

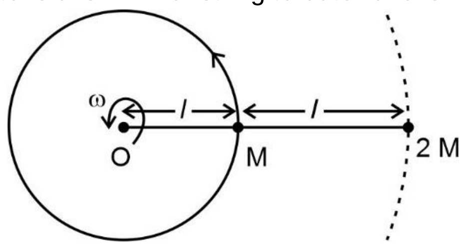
1. A tube of length 2 m is filled completely with an incompressible liquid of mass 1 kg and closed at both ends. The tube is rotated in horizontal plane about one of its ends with angular speed of 3 rad/s. The force exerted by the liquid at the other end is
(1) 6 N (2) 12 N
(3) 9 N (4) 18 N

2. A hollow tube of uniform cross-section with length 3 m is filled with mercury with mass of 2 kg and then closed at both ends. This tube is rotated in horizontal plane about one of its ends with an angular speed of 4 rad/s. The force exerted by liquid at the other end is
(1) 48 N (2) 24 N
(3) 96 N (4) Zero

3. A uniform rod of length 5 m in has mass of 10 Kg. It is fixed about one end and rotated in horizontal plane with angular speed of 2 rad/s. What is tension in rod at 3 meter from the fixed pivoted end?
(1) 32 N (2) 48 N
(3) 96 N (4) 64 N

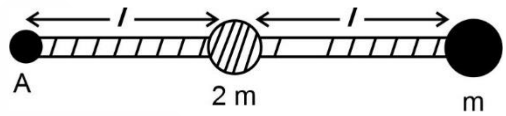
Q.41 (Code-A) (Circular Motion Tension)

1. Two particles are attached to light strings as shown in figure. The masses are rotated at constant angular speed of 5 radian per second about point A. The surface is horizontal and smooth. The ratio of tensions in inner string to outer one is



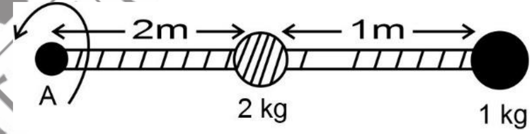
(1) 5 : 4 (2) 3 : 4
(3) 4 : 3 (4) 1 : 1

2. Two particles with masses 2 m and m are connected by light rods of negligible mass as shown in figure. The rotation is in horizontal plane about point A. If angular speed is 10 rad/s and surface is smooth, the ratio of tension in inner rod to outer rod will be



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

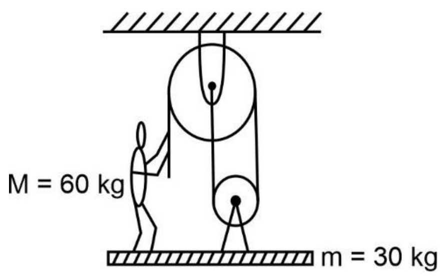
3. Two particles with masses 2 kg and 1 kg are connected through light rigid rod and is rotated in horizontal plane about the end A with angular speed of 6 rad/s. The value of tensions T_1 and T_2 in inner and outer rod respectively are



(1) 180 N, 108 N (2) 252 N, 324 N
(3) 324 B, 108 N (4) 252 N, 108 N

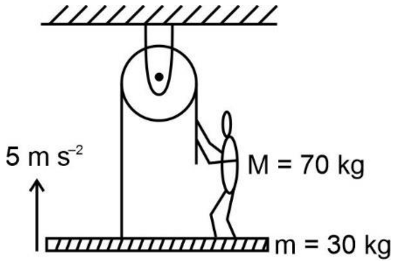
Q.29 (Code-B) (Pulley String System)

1. Both pulleys are light and string is light weight and inextensible. The person is pulling string by a constant tension and moving slowly up using trolley. What force is exerted by person on string to keep rising at constant speed? Mass of person is 60 kg and mass of trolley is 30 kg.



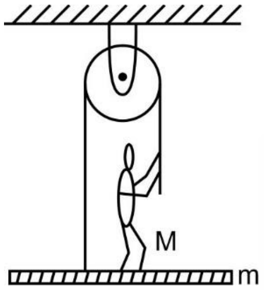
(1) 250 N (2) 300 N
(3) 450 N (4) 900 N

2. In the shown arrangement, the man with mass 70 kg is accelerating up with an acceleration of 5 m/s^2. The mass of trolley used is 30 kg and string is inextensible and light weight. What is pull exerted by man on the string? (g = 9.8 m/s^2)



(1) 620 N (2) 740 N
(3) 1000 N (4) 980 N

3. In trolley string arrangement, a painter is holding string in hands and keeps in equilibrium the entire arrangement. Mass of painter is 60 kg and mass of trolley is 20 kg. What is normal force exerted by trolley floor on painter? (g = 9.8 m/s^2)



(1) 196 N (2) 392 N
(3) 588 N (4) Zero

Q.35 (Code-B) (Significant Figures)

1. A student measures the diameter of a wire using screw gauge with the least count 0.001 cm. The measured value should be recorded as
(1) 5.3200 cm (2) 5.3 cm
(3) 5.32 cm (4) 5.320 cm

2. The mass of a box measured by grocer's balance is 2.300 kg. Two gold pieces of masses 20.15 g and 20.17 g are added to the box. The total mass of the box and the difference in the masses of gold piece should be recorded
(1) 2340.32 g, 0.02 g (2) 2.340 kg, 0.02 g
(3) 2.3 kg, 0 g (4) 2.334032 kg, 0.02 g

3. The edge of a cube is measured by a scale of least count 1 mm. The measured value is l = 1.2 cm. The volume of the cube should be recorded as
(1) (1.728 ± 0.003) cm^3 (2) (1.73 ± 0.004) cm^3
(3) (1.7 ± 0.4) cm^3 (4) (1.7 ± 0.3) cm^3

4. The addition of (34.683 +58.930 + 68.35112) with correct significant figure is
(1) 161.964 (2) 161.9
(3) 161.95 (4) 161.96

Q.41 (Code-B) (Friction)

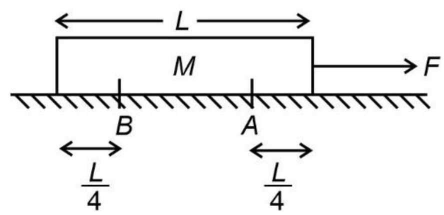
1. When a bicycle is in motion but not Pedalled, the force of friction is exerted by ground on two wheels along
(1) Backword direction on rear wheel and forward direction on front wheel
(2) Backward direction on both wheel
(3) Forward direction on both wheel
(4) In forward direction on rear wheel and back word direction on front wheel

2. A man is walking on a plane rough surface, direction of friction acting on man is
(1) Opposite to direction of motion
(2) Same as that of direction of motion
(3) Perpendicular to that of direction of motion
(4) 45° to the direction of motion

3. Frictional force acting between two bodies
(1) Supports the motion between two bodies
(2) Oppose the relative motion between the bodies
(3) sometimes helps and sometime opposes the relative motion
(4) Increases the relative velocity between the bodies

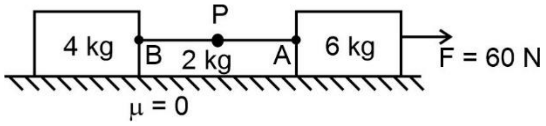
Q.33 (Code-B) (Application of Newton's Second law of Motion)

1. A wire of length L and mass M has uniform mass density. Determine the ratio of tensions at position A to position B as shown in diagram.



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

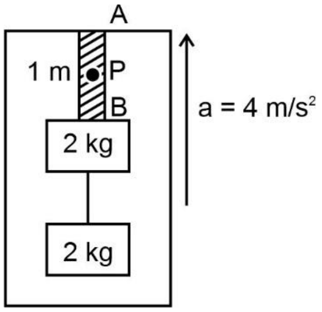
2. Determine tension at position P (mid-point) in given diagram. Consider string AB of mass 2 kg has uniform mass density.



(1) 30 N (2) 20 N

(3) 25 N (4) 40 N

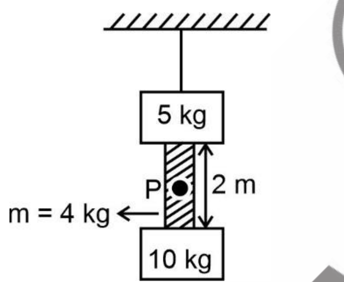
3. An elevator is moving upward with uniform acceleration a = 4 m s^{-2} as shown in diagram. Determine the tension at mid-point of wire AB of length 1 m and mass 2 kg?



(1) 50 N (2) 60 N

(3) 80 N (4) 70 N

4. Determine the tension of point P. Consider system is in equilibrium condition. (g = 10 m/s^2)

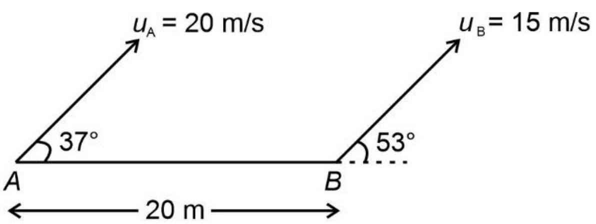


(1) 100 N (2) 120 N

(3) 140 N (4) 190 N

Q.19 (Code-B) (Relative Velocity in Two Dimensions)

1. Two particles A and B are projected as shown in diagram. The correct statement is:



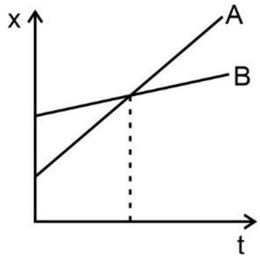
(1) Their relative velocity is along horizontal direction

(2) Their relative velocity is along vertical direction

(3) Their relative velocity is zero

(4) Their relative velocity vector is making $\theta = \tan^{-1}\left(\frac{1}{2}\right)$ angle with line joining

2. Two particles A and B are projected in a plane as shown in the figure. The incorrect statement is



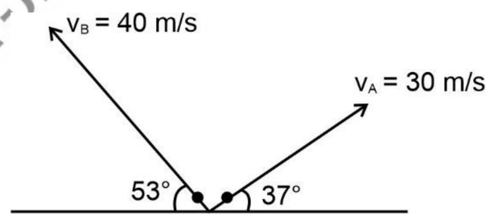
(1) Velocity of B is more than velocity of A

(2) Velocity of A is more than velocity of B

(3) Magnitude of v_{AB} will be lower than magnitude of v_A

(4) Magnitude of v_{BA} will be lower than magnitude of v_A

3. Two particles A and B are projected in air form same point. A is thrown with a speed of 30 m/s and B with a speed of 40 m/s as shown in diagram. What is the separation between then after a sec?



(1) 50 m (2) 100 m

(3) 30 m (4) 40 m

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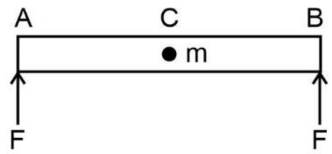
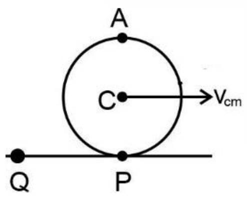
Q.37 (Code-A) (Equilibrium)

1. A rod is supported by two forces F each as shown in the figure. The rod is in equilibrium, then



(1) The net torque about A is zero
(2) The net torque about B is zero
(3) The net torque about C is zero
(4) All of these

2. A solid sphere is in pure rolling with constant speed of centre of mass (v_{cm}) as shown in the figure. Then the net torque on sphere about



(1) Point P is non zero (2) Point C is non zero
(3) Point A is non-zero (4) Point Q is zero

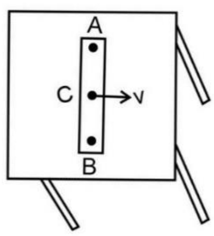
3. Consider the following statements
(a) A body is in translational equilibrium if net force on it is zero
(b) A body is in rotational equilibrium if net torque about any point is zero
Choose the correct statements
(1) (a) only (2) (b) only
(3) Both (a) and (b) (4) Neither (a) nor (b)

Q.38 (Code-A) (Rotational Motion)

1. A uniform rod of mass m and length *l* is in uniform translational motion. If one of its end is suddenly hinged then (hinge is smooth)
(1) It will continue its translational motion
(2) It will now be in pure rotational motion about hinged end
(3) It will now have combined translational and rotational motion
(4) It will stop

2. In Q-1, If rod has translational velocity of centre of mass as v, then after hinging of one end, the angular velocity of the rod will be
(1) $\frac{3v}{2l}$ (2) $\frac{v}{2l}$
(3) $\frac{v}{l}$ (4) $\frac{2v}{3l}$

3. A uniform rod on a smooth horizontal table is moving with uniform horizontal speed v. Suddenly rod is hinged at centre of rod. The angular velocity of rod now will be



(1) $\frac{2v}{3l}$ (2) $\frac{3v}{2l}$
(3) $\frac{v}{l}$ (4) Zero

4. In Q-(3), the angular momentum of rod will be conserved about point
(1) A
(2) B
(3) C
(4) Angular momentum will not conserve about any point

Q.17 (Code-A) (The Work Energy theorem for a variable force)

1. A force F = $4x^3 - 3x^2 + 5$ is acting on a body of mass 2 kg. The change in kinetic energy of the body when it moves from (0,0,0) to (1,2,3) m, will be

   (1) 0 J (2) 5 J

   (3) 10 J (4) 20 J

2. A block of mass 5 kg, moving in the positive x-direction with a constant speed of 10 m s^{-1}. It is subjected to a retarding force F = 0.2 x N during its travel from x = 10 m to x = 20 m. Its final kinetic energy will be

   (1) 250 J (2) 200 J

   (3) 220 J (4) 280 J

3. A force $F = 4x\hat{i} + 3y\hat{j}$ is acting on a body of mass 1 kg. The change in kinetic energy of body when it moves from (0,0) to (1,2) m, will be

   (1) 6 J (2) 8 J

   (3) 10 J (4) 7 J

4. A force $\vec{F} = y\hat{i} + x\hat{j}$ is acting on a body of mass 2 kg. Determine the work done to move a body from (0,0) to (1,1) m.

   (1) 0 J (2) 1 J

   (3) 2 J (4) 4 J

Q.1 (Code-B) (The scalar product)

1. The angle between the vectors $a_1\hat{i} + b_1\hat{j} + c_1\hat{k}$ and $a_2\hat{i} + b_2\hat{j} + c_2\hat{k}$ will be

   (1) $\theta = \cos^{-1}\left(\dfrac{a_1a_2 + b_1b_2 + c_1c_2}{\sqrt{a_1^2 + b_1^2 + c_1^2}\sqrt{a_2^2 + b_2^2 + c_2^2}}\right)$

   (2) $\theta = \sin^{-1}\left(\dfrac{a_1a_2 + b_1b_2 + c_1c_2}{\sqrt{a_1^2 + b_1^2 + c_1^2}\sqrt{a_2^2 + b_2^2 + c_2^2}}\right)$

   (3) $\theta = \cos^{-1}(a_1a_2 + b_1b_2 + c_1c_2)$

   (4) $\theta = \sin^{-1}(a_1a_2 + b_1b_2 + c_1c_2)$

2. The angle between the vector $2\hat{i} - 2\hat{j} + \hat{k}$ and $3\hat{j} - 4\hat{k}$ will be

   (1) $\theta = \cos^{-1}\left(\frac{1}{3}\right)$ (2) $\theta = \cos^{-1}\left(-\frac{1}{3}\right)$

   (3) $\theta = \cos^{-1}\left(\frac{2}{3}\right)$ (4) $\theta = \cos^{-1}\left(-\frac{2}{3}\right)$

3. Two forces, F_1 and F_2 are acting on a body. One force is doubled of the other force and the resultant is equal to the greater force. Then the angle between the two forces is

   (1) $\theta = \cos^{-1}\left(\frac{1}{2}\right)$ (2) $\theta = \cos^{-1}\left(\frac{1}{4}\right)$

   (3) $\theta = \cos^{-1}\left(-\frac{1}{2}\right)$ (4) $\theta = \cos^{-1}\left(-\frac{1}{4}\right)$

4. The magnitude of vector sum of two vectors is equal to the magnitude of difference of the two vectors, the angle between these vectors is

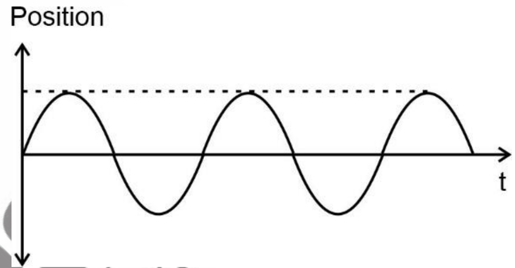
   (1) 0° (2) 45°

   (3) 90° (4) 180°

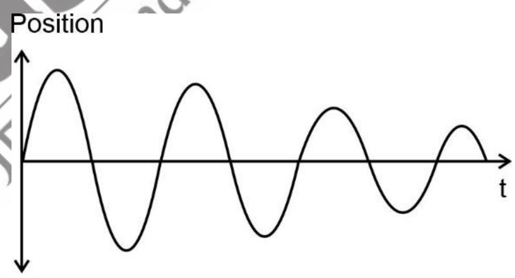
Q.9 (Code-B) (Damped simple harmonic motion)

1. Which of the following graph best represents the damped harmonic motion?

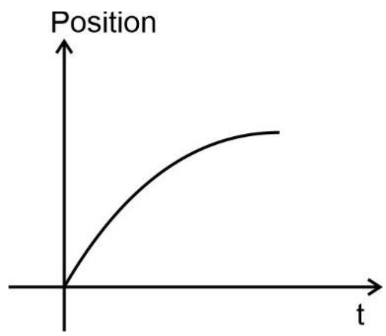
   (1)



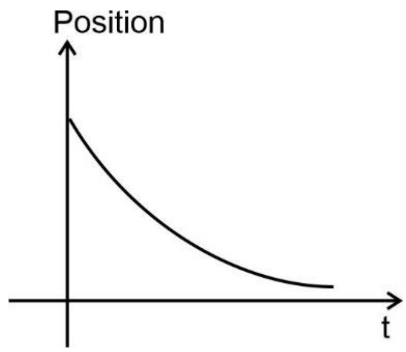
   (2)



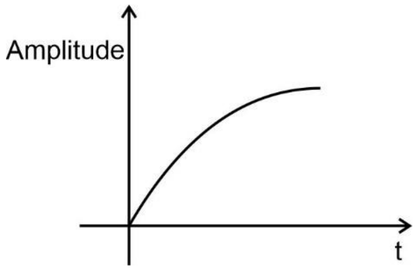
   (3)

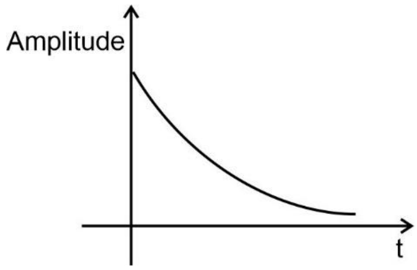


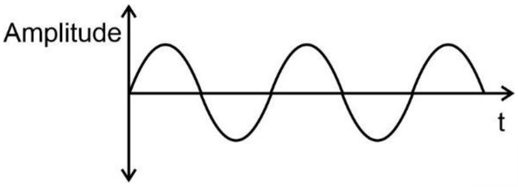
   (4)



2. Which of the following graph best represent the damped simple harmonic motion?

(1)


(2)


(3)


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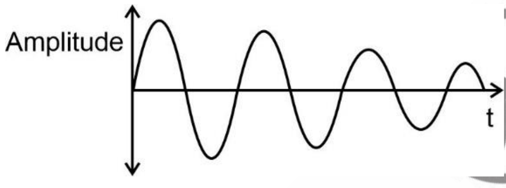
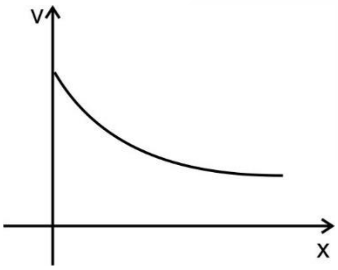
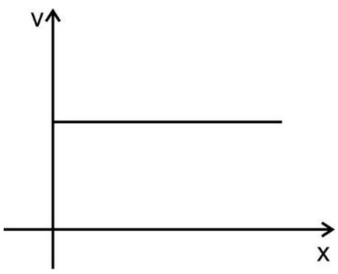


3. In damped oscillation, the graph between velocity and position will be like

(1)


(2)


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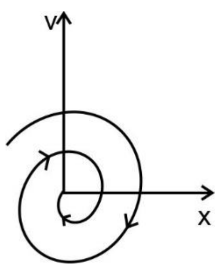
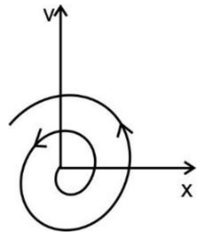
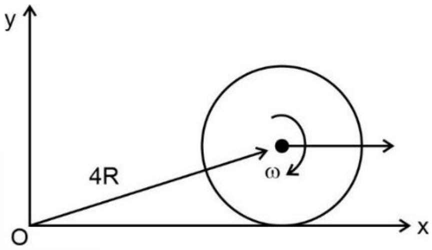


(4)


Q.31 (Code-B) (Angular momentum of bodies)

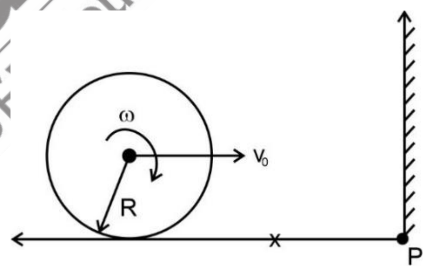
1. A solid cylinder of mass m and radius R is rolling with angular velocity ω rad/s on rough, horizontal surface. The magnitude of angular momentum about origin is



(1) $\frac{mR^2\omega}{2}$ (2) $\frac{3mR^2\omega}{2}$

(3) $\frac{2mR^2\omega}{3}$ (4) $\frac{mR^2\omega}{4}$

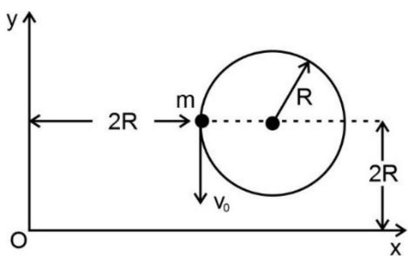
2. A solid sphere is in pure rolling motion with centre of mass moving with velocity v_0 its angular momentum about point P shown in diagram is



(1) $\frac{2}{5}mv_0R$ (2) $\frac{1}{5}mv_0R$

(3) $\frac{7}{5}mv_0R$ (4) mv_0R

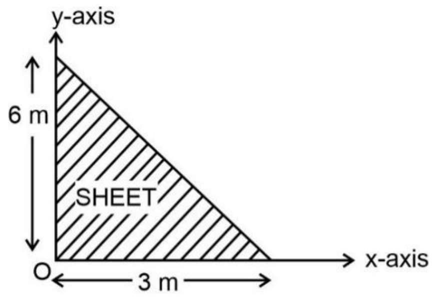
3. A particle is moving on circle as shown. Its angular momentum about O is



(1) $3mv_0R$, clock wise
(2) $2mv_0R$, clock wise
(3) mv_0R, anticlockwise
(4) $2mv_0R$, anticlockwise

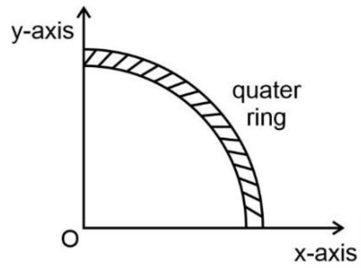
Q.34 (Code-B) (Centre of mass)

1. A triangular sheet of uniform thickness is shown in figure. The co-ordinate of centre of mass are



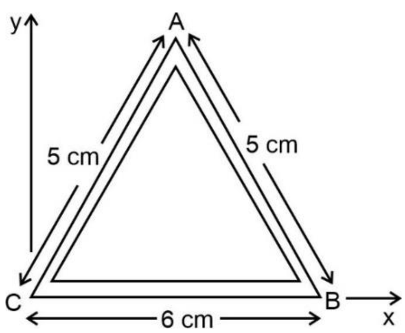
(1) (1 m, 3 m) (2) (2 m, 3 m)
(3) (1 m, 2 m) (4) (1.5 m, 3.0 m)

2. A quarter ring of uniform linear density is placed in x-y plane as shown. The co-ordinate of centre of mass of the given ring is



(1) $\left(\frac{R}{\pi},\frac{R}{\pi}\right)$ (2) $\left(\frac{R}{2},\frac{R}{2}\right)$
(3) $\left(\frac{R}{\sqrt{2}},\frac{R}{\sqrt{2}}\right)$ (4) $\left(\frac{2R}{\pi},\frac{2R}{\pi}\right)$

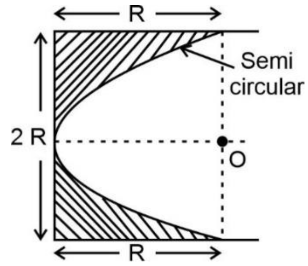
3. A thin uniform wire is bend to form two equal sides AB and AC of triangle ABC where AB = AC = 5 cm. The third side BC, of length 6 cm is made from uniform wire of twice the density of the first. The distance of centre of mass from A is



(1) $\frac{9}{11}$ cm (2) $\frac{34}{11}$ cm
(3) $\frac{27}{11}$ cm (4) $\frac{10}{11}$ cm

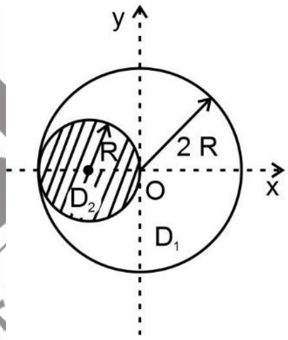
Q.38 (Code-B) (Centre of mass of Remaining part)

1. A semicircular portion of radius R is cut from uniform rectangular plate as shown. The distance of centre of mass C of remaining plate. From point O is



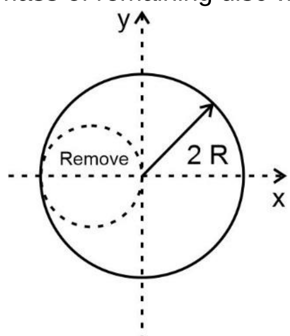
(1) $\frac{2R}{3(4-\pi)}$ (2) $\frac{3R}{4\pi}$
(3) $\frac{2R}{(2-\pi)}$ (4) $2R\left(\frac{\pi}{3}-1\right)$

2. A uniform metal disc of radius R is placed on a large disc of 2 R made of same material with half thickness. The peripheries of two discs touch each other. Locate the centre of mass of remaining disc from origin O.



(1) R/18 to left of origin on x-axis
(2) R/5 to left of origin on x-axis
(3) R/5 to right of origin on x-axis
(4) R/15 to right of origin on x-axis

3. A uniform metal disc of radius R is taken out of a large disc of radius 2 R from its end as shown. The centre of mass of remaining disc will be



(1) R/4 from centre
(2) R/5 from centre
(3) R/3 from centre
(4) R/6 from centre

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Based on
FTS-01 (A & B)

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CONCEPT STRENGTHENING SHEET

CSS-01 (Physics)

Answers Key

Q.39 (Code-A) (Application of Laws of Motion)

1. (3)
2. (1)
3. (4)
4. (1)

Q.41 (Code-A) (Circular Motion Tension)

1. (1)
2. (2)
3. (4)

Q.29 (Code-B) (Pulley String System)

1. (2)
2. (2)
3. (1)

Q.35 (Code-B) (Significant Figures)

1. (4)
2. (2)
3. (3)

Q.41 (Code-B) (Friction)

1. (2)
2. (2)
3. (2)

Q.33 (Code-B) (Application of Newton's Second law of Motion)

1. (3)
2. (3)
3. (4)
4. (2)

Q.19 (Code-B) (Relative Velocity in Two Dimensions)

1. (1)
2. (1)
3. (1)

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OYM

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CONCEPT STRENGTHENING SHEET
CSS-01 (PHYSICS)
Answers Key

Q.37 (Code-A) (Equilibrium)

1. (4)
2. (4)
3. (3)

Q.38 (Code-A) (Rotational Motion)

1. (2)
2. (1)
3. (4)
4. (3)

Q.17 (Code-A) (The Work Energy theorem for a variable force)

1. (2)
2. (3)
3. (2)
4. (2)

Q.1 (Code-B) (The scalar product)

1. (1)
2. (4)
3. (4)
4. (3)

Q.9 (Code-B) (Damped simple harmonic motion)

1. (2)
2. (2)
3. (3)

Q.31 (Code-B) (Angular momentum of bodies)

1. (2)
2. (3)
3. (2)

Q.34 (Code-B) (Centre of mass)

1. (3)
2. (4)
3. (2)

Q.38 (Code-B) (Centre of mass)

1. (1)
2. (1)
3. (4)

❑ ❑ ❑