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DPP-3

CIRCULAR MOTION

Q.1 A motorcycle is travelling on a curved track of radius 500 m if the coefficient of friction between road and tyres is 0.5 . The speed avoiding skidding, will be :-

(A) 50 m/s (B) 75 m/s (C) 25 m/s (D) 35 m/s

Q.2 A string of length 0.1 m cannot bear a tension more than 100 N. It is tied to a body of mass 100 g and rotated in a horizontal circle. The maximum angular velocity is

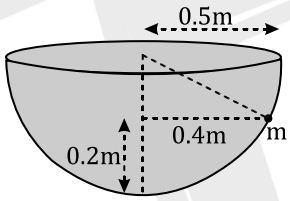
(A) 100rad/s (B) 1000rad/s

(C) 10000/s (D) 0.1rad/s

Q.3 A car when passes through a convex bridge exerts a force on it which is equal to :-

(A) $Mg + \frac{Mv}{r}$ (B) $\frac{Mv^2}{r}$ (C) Mg (D) none of these

Q.4 A small mass of 10gm. lies in a hemispherical bowl of radius 0.5 m at a height of 0.2 m from the bottom of the bowl. The mass will be in equilliburim of the bowl rotates at an angular speed of $(g = 10\ m/sec^2)$: –



(A) $\frac{10}{\sqrt{3}}$rad./s (B) $10\sqrt{3}$rad/s (C) 10rad/s (D) $\sqrt{20}$rad./s

Q.5 A particle is acted upon by a force of constant magnitude which is always perpendicular to the velocity of the particle. The motion of the particle takes place in a plane, it follows that-

(A) Its velocity is constant

(B) Its acceleration is constant

(C) Its kinetic energy is constant

(D) It moves in a straight line

Q.6 A tube of length L is filled completely with an incompressible liquid of mass M and closed at both the ends. The tube is then rotated in a horizontal plane about one of its ends with a uniform angular velocity ω. The force exerted by the liquid at the other end is

(A) $\frac{ML\omega^2}{2}$ (B) $ML\omega^2$ (C) $\frac{ML\omega^2}{4}$ (D) $\frac{ML^2\omega^2}{2}$

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Q.7 For a particle in uniform circular motion, the acceleration $\vec{a}$ at a point $P(R, \theta)$ on the circle of radius R is (Here θ is measured from the x-axis).

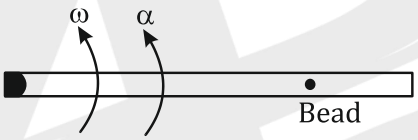
(A) $\frac{v^2}{R}\hat{i} + \frac{v^2}{R}j$ (B) $-\frac{v^2}{R}\cos\theta\hat{i} + \frac{v^2}{R}\sin\theta\hat{j}$

(C) $-\frac{v^2}{R}\sin\theta\hat{i} + \frac{v^2}{R}\cos\theta\hat{j}$ (D) $-\frac{v^2}{R}\cos\theta\hat{i} - \frac{v^2}{R}\sin\theta\hat{j}$

Q.8 A gramophone record is revolving with an angular velocity ω. A coin is placed at a distance r from the centre of the record. The static coefficient of friction is μ. The coin will revolve with the record if :-

(A) $r \geq \frac{\mu g}{\omega^2}$ (B) $r = \mu g\omega^2$ (C) $r < \frac{\omega^2}{\mu g}$ (D) $r \leq \frac{\mu g}{\omega^2}$

Q.9 A bead is constrained to move on rod in gravity free space as shown in figure. The rod is rotating with angular velocity ω and angular acceleration α about its end. If μ is coefficient of friction. Mark the correct option. (Rod rotates in the plane of paper.)



(A) If $\mu = \frac{\omega^2}{\alpha}$ friction on bead is static in nature

(B) If $\mu > \frac{\omega^2}{\alpha}$ friction on bead is kinetic in nature

(C) If $\mu < \frac{\omega^2}{\alpha}$ friction is static

(D) If bead does not slide relative to rod. Friction will not exist between bead and rod.

Q.10 A particle is projected with initial speed u and at an angle θ with horizontal. What is the radius of curvature of the parabola traced out by the projectile at a point where the particle velocity makes an angle $\theta/2$ with the horizontal?

(A) $\frac{u^2\cos^2\theta}{9}$ (B) $\frac{u^2\cos^2\theta}{g\cos^3\theta/2}$ (c) $\frac{u^2\sin^2\theta}{g\cos^3\theta}$ (D) N · O · T

Q.11. A train has to negotiate a curve of radius 400 m. By how much height should the outer rail be raised with respect to inner rail for a speed of 48 km/hr ? The distance between the rails is 1m :

(A) $\frac{1}{15}$ (B) $\frac{2}{25}$ (C) $\frac{2}{45}$ (D) $\frac{3}{17}$

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ANSWER KEY

1.	(A)	**2.**	(A)	**3.**	(D)	**4.**	(A)	**5.**	(C)	**6.**	(A)	**7.**	(D)
8.	(D)	**9.**	(A)	**10.**	(B)	**11.**	(C)						