



SHIKSHA CLASSES

Subject : Physics

Question Paper

Total Marks : 20

Class : XII

Topic: 1 Rotational Dynamics

Time : 1 Hr.

Section A

Q.1 : Select and write the most appropriate answer from given alternatives in each sub-question. 5

- i) A sphere rolls down on an inclined plane of inclination θ . What is the acceleration as the sphere reaches bottom.
- a) $5/7g \sin \theta$ b) $3/5g \sin \theta$ c) $2/7g \sin \theta$ d) $2/5g \sin \theta$
- ii) A disc and sphere of same radius but different masses roll off on two inclined planes of the same altitude and length. Which one of two objects gets to the bottom of the plane first...
- a) Disc b) Sphere
c) Both reach at the same time d) Depends on their masses
- iii) What is the minimum velocity with which a body of mass m must enter a vertical loop of radius R so that it can complete the loop?
- a) \sqrt{gR} b) $\sqrt{2gR}$ c) $\sqrt{3gR}$ d) $\sqrt{5gR}$
- iv) A cyclist goes round a circular path of circumference 34.3 m in 1 sec. the angle made by him, with the vertical, will be.
- a) 45 degree b) 40 degree c) 42 degree d) 48 degrees
- v) Calculate the M.I. of a thin uniform ring about an axis tangent to the ring and in a plane of the ring, if its M.I. about an axis passing through the centre and perpendicular to plane is 4 kg m^2 .
- (a) 12 kg m^2 (b) 3 kg m^2 (c) 6 kg m^2 (d) 9 kg m^2

Q.2 : Very short answers type questions. 2

- i) Define radius of gyration?
- ii) State two examples of the principle of conservation of angular momentum.

Section B

Attempt any THREE. 6

Q.3 : Derive an expression for minimum speed at which body remains in contact with wall of well of death.

- Q.4 :** Show that M.I. of a rod about an axis passing through one end and perpendicular to its length is $\frac{ML^2}{3}$.
- Q.5 :** What is the ratio of the radii of gyration of a circular disc to that of a circular ring, each of same mass and radius, around their respective axes?
- Q.6 :** A curve of radius 50m is banked at 30° . Will a car travelling at 60 km/hr along the curve be safe or unsafe?

Section C

Attempt any one of following.

3

- Q.7 :** Obtain the relation between the torque and angular acceleration for a rotating body.
- Q.8 :** A train of mass 10^4 kg rounds a curve of radius 200 m at a speed of 90 km/hr. Find the horizontal thrust on the outer rail if the track is not banked. What angle must the track be banked in order that there is no thrust on the rail?

Section D

Attempt any one.

4

- Q.9 :** i) State and prove the principle of parallel axes about moment of inertia.
ii) A solid sphere of mass 1kg, radius 10 cm rolls down an inclined plane of height 7m. What will be velocity of its centre as it reaches the ground level?
- Q.10 :** i) Obtain an expression for maximum speed along the banked road taking into account the friction between the tyres of vehicles and the road surface.
ii) A car can just go around a curve of 10 m radius without skidding when travelling at the speed of 18 km/hr. If the road is horizontal, find the coefficient of friction between the road surface and tyres. ($g=9.8 \text{ m/s}^2$)

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