**CAREER POINT**
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**LECTURE BASED PROBLEM SHEET**

**TOPICS: ROTIONAL MOTION** **FACULTY: MONI KAKATI**

**Q**.1 A sphere rolls down an inclined plane of inclination$\theta$. What is the acceleration as the sphere reaches the bottom?
(a) $\frac{5}{7}\ gsin\theta$ (b) $\frac{3}{75}\ gsin\theta$
(c) $\frac{52}{7}\ gsin\theta$ (d) $\frac{2}{5}\ gsin\theta$

Q.2. In a bicycle, the radius of rear wheel is twice the radius of front wheel. If $V_r$ and $v_f$ are the speeds of top most points of rear and front wheel respectively, then
(a) $v_r = 2v_f$ (b) $v_f = 2v_r$
(c) $v_f = v_r$ (d) $v_f > v_r$

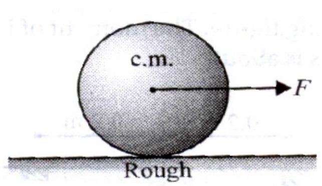
Q.3. The MI of a uniform semicircular disc of mass M and radius r about a line perpendicular to the plane of the disc through centre is
(a) $\frac{2}{5}Mr^2$ (b) $\frac{1}{4}Mr^2$
(c) $\frac{1}{2}Mr^2$ (d) $Mr^2$

Q.4. Consider a two particle system with particles having masses $m_1$ and $m_2$. If the first particle is pushed towards the centre of mass through a distance d, by what distance should the second particle is moved, so as to keep the centre of mass at same position?

(a) $\frac{m_2 d}{m_1}$ (b) $\frac{m_1 d}{m_1 + m_2}$
(c) $\frac{m_1 d}{m_2}$ (d) d

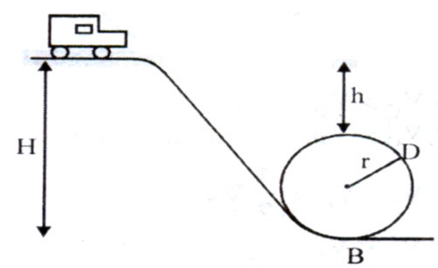
Q.5. A circular disc of radius R is removed from a bigger circular disc of radius 2R such that the circumferences of disc coincides. The centre of mass of new disc is $\frac{\alpha}{R}$ from the centre of bigger disc, the value of $\alpha$ is
(a) ¼ (b) 1/3 (c)1/2 (d) 1/6

Q.6. A solid sphere of mass M and radius R is pulled horizontally on a sufficiently rough surface as shown in the figure




Choose the correct alternative.
(a) The acceleration of the centre of mass is F/M
(b) The acceleration of the centre of mass is $\frac{2}{3}\frac{F}{M}$
(c) The friction force on the sphere acts forward
(d) The magnitude of the friction force is F/3

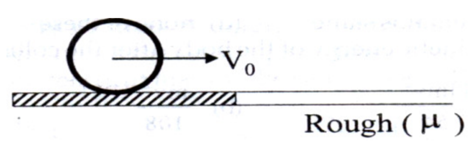
Q.7. A toy car rolls down the inclined plane as shown in the fig. It loops at the bottom. What is the relation between H and h?




(a) $\frac{H}{h} = 2$ (b)$\frac{H}{h} = 3$
(c) $\frac{H}{h} = 4$ (d) $\frac{H}{h} = 5$

Passage
A ring of mass M and radius R sliding with a velocity $v_0$ suddenly enters into rough surface where the coefficient of friction is $\mu$, as shown in fig.

Q.8. Choose the incorrect statement.



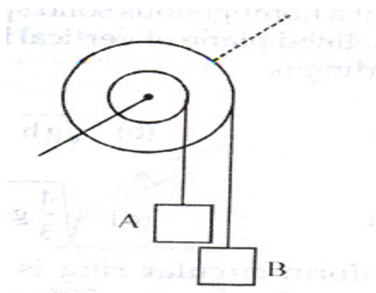

(a) The friction does negative translational work
(b) The friction does positive rotational work
(c) The net work done by friction is zero
(d) Friction force converts translational kinetic energy into rotational kinetic energy in rotational kinetic energy

Q.9. Velocity of centre of mass of the ring when it starts rolling motion is:
(a) $V_0/4$ (b) $V_0/2$
(c) $V_0/3$ (d) $2V_0/3$

Q.10. Linear distance moved by the centre of mass of the ring on the rough surface when it starts rolling is:
(a) $\frac{3V_0^2}{8\mu g}$ (b) $\frac{2V_0^2}{8\mu g}$
(c) $\frac{V_0^2}{\mu g}$ (d) $\frac{5V_0^2}{8\mu g}$

Q.11. A wheel is rotating at 900 r. p. m. about its axis. When power is cut off it comes to rest in 1 minute. The angular retardation in rad/s$^2$ is
(a) $\pi/2$ (b) $\pi/4$
(c) $\pi/6$ (d) $\pi/8$

Q.12. Figure shows a small wheel fixed co-axially on a bigger one of double the radius. The system rotates about the common axis. The strings supporting A and B do not slip on the wheels. If x and y be the distances travelled by A and B in the same time interval, then




(a) x =2y (b) x =y
(c) y= 2x (d) None of these

Q.13. A particle is confined to rotate in a circular path decreasing linear speed, then which of the following is correct?
(a) $\vec{L}$ (angular momentum) is conserved about the centre
(b)only direction of angular momentum $\vec{L}$ is conserved
(c)It spirals towards the centre
(d) its acceleration is towards the centre.

Q.14. Two bodies have their moments of inertia 1 and 21 respectively about their axis of rotation. If their kinetic energies of rotation are equal, their angular momenta will be in the ratio
(a) 2: 1 (b) 1: 2
(c) $\sqrt{2}$: 1 (d) 1: $\sqrt{2}$

**ANSWER KEY**

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|---|---|---|---|---|
| 1.-a | 2.-c | 3.-c | 4.-c | 5.-b |
| 6.-b, c | 7.-d | 8.-c | 9.-b | 10.-a |
| 11.-a | 12.-c | 13-b | 14- d | |