ASSIGNMENT-1

NUMERICAL QUESTIONS:

Q. 1 A point P is located on the rim of wheel of radius r = 0.5 m which rolls without slipping along a horizontal surface then the total distance traversed by the point P in meters between two successive moments it touches the surface.

Q.2 A rectangular plate of mass 20 kg is suspended from points A and B as shown. If the pin B is suddenly removed then the angular acceleration in rad/sec^2 of the plate is : (g = 10 m/s^2).
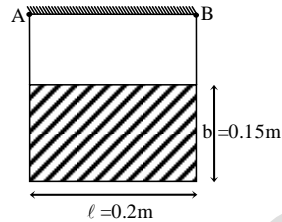

Q.3 A solid sphere rolls on a rough horizontal surface with a linear speed 7 m/s collides elastically with a fixed smooth vertical wall. Then the speed of the sphere when it has started pure rolling in the backward direction in m/s is.

Q.4 A uniform ball of radius R = 10 cm rolls without slipping between two rails such that the horizontal distance is d = 16 cm between two contact points of the rail to the ball. If the angular velocity is 5 rad/s, then find the velocity of centre of mass of the ball in cm/s.

Q.5 A wheel rotating at same angular speed undergoes constant angular retardation. After revolution angular velocity reduces to half its initial value. How many more revolution it will make before stopping ?

Q.6 A disc of radius '5cm' rolls on a horizontal surface with linear velocity $v = 1\hat{i}$ m/s and angular velocity 50 rad/sec. Height of particle from ground on rim of disc which has velocity in vertical direction is (in cm) -
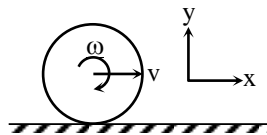

Q.7 A cubical block of mass 6 kg and side 16.1 cm is placed on frictionless horizontal surface. It is hit by a cue at the top as to impart impulse in horizontal direction. Minimum impulse imparted to topple the block must be greater than –

Q.8 A disc of mass M & radius R is placed a rough horizontal surface with its axis horizontal. A light rod of length '2R' is fixed to the disc at point 'A' as shown in figure and a force $\frac{3}{2}$ Mg is applied at

the other end. If disc starts to roll without slipping find the value of "$10 \times \mu_{min}$" where μ_{min} is minimum coefficient of friction b/w disc & horizontal surface required for pure rolling -
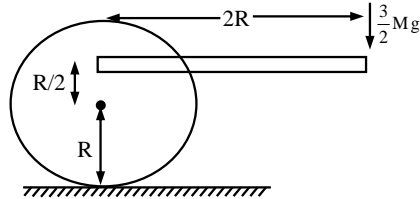
Q.9 A homogeneous rod of mass 3 kg is pushed along smooth horizontal surface by a horizontal force $F = 40$ N. The angle 'θ' (in degree) for which rod has pure translation motion minus 30 degree is $(g = 10 \text{m/s}^2)$ -
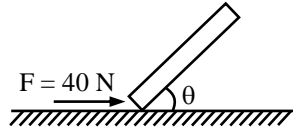
Q.10 Two identical discs are positioned on a vertical axis. The bottom disc is rotating with angular velocity ω_0. The top disc is initially at rest. It is allowed to fall and sticks to the lower disc. Ratio of K.E. before & after collision .

Q.10 A disc is rotating freely about its axis. Percentage change in angular velocity of disc if temperature decreases by 20 °C is (coefficient of linear expansion of material of disc is $5 \times 10^{-4}/°C$)

Q.11 Two wires are vibrating together to produce 10 beats/sec. Frequency of one wire is 200Hz. When tension in this wire is increased beat frequency remains unchanged. Frequency (in Hz) of other wire minus 206 Hz is equal to.

Q.12 A ball of radius $R = 20$ cm has a mass $m = 0.75$ kg and moment of inertia about its diameter $I = 0.0125$ kg m^2. The ball rolls without slipping over a rough horizontal floor with velocity $v_0 = 10$ m/s towards a smooth vertical wall. If coefficient of restitution between the wall and ball is $e = 0.7$ then the velocity of the ball in m/s after long time after collision is $(g = 10 \text{ m/s}^2)$

Q.13 A cubical block of mass 6 kg and side 16.1 cm is placed on frictionless horizontal surface. It is hit by a cue at the top as to impart-impulse in horizontal direction. Minimum impulse imparted to topple the block must be greater than.

Q.14 A rectangular plate of mass 20 kg is suspended from points A and B as shown. If the pin B is suddenly removed then the angular acceleration in rad/sec^2 of the plate divided by 16 is equal to $(g = 10 \text{ m/s}^2)$