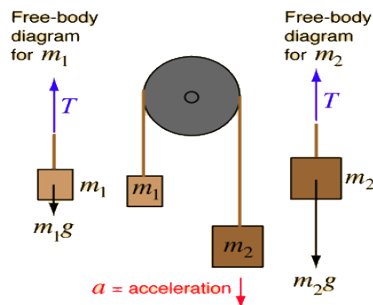


Show with appropriate calculation.

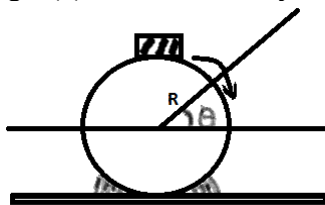
B) Using Gravitational Potential, derive the expression for Eccentricity.

C) Derive the Euler's equation of motion using rigid body Dynamics.

D) Using Atwood's Machine, calculate the motion of mass m_1 and m_2 with their acceleration.



Q.3 A) A Block of mass m is sliding from a drum which is fixed on a surface. The block starts to fall from the top of the drum. At what angle (θ) the block will fly off the drum? (07)



B) 1) Derive the equation of Effective potential ($V_{\text{eff}}(r)$) and Effective force ($F_{\text{eff}}(r)$) using Lagrangian Formulation. (06)

2) What is the equation obtained for ellipse when angle between origin and bob is 90° in s Foucault pendulum? (02)

OR

B) 1) Prove: If a particle is subjected to a central force then its angular momentum is conserved. (05)

2) Calculate Gradient, Divergence & Curl of $F=6x^2\hat{i}+5yz^3\hat{j}-4x^3y^2z\hat{k}$ at $(2, 2, 2)$. (03)

Q.4 A) A particle of mass m is placed on a frictionless table which moves in a circular direction on the table. The particle is connected with a thread which passes through a hole at center of the table which is pulled in downward direction at constant speed. Calculate how position and velocity changes with respect to time. Also calculate the force required to pull the thread down. (07)

OR

A) Derive the expression for five term acceleration formula using plane polar coordinates. (07)

B) Write a brief note about the conic orbits. Also obtain the equations for their major and minor axis with proof. (08)