

G.P Women's College

D.M University

MAT – 204

Mechanics

F.M – 50

Choose any Five questions:

1. (a) A point moves in a plane curve so that its tangential and normal accelerations are equal and the angular velocity is constant. Find the curve. (5M)

(b) If a particle describes the cycloid $s=4a \sin\Psi$ with a uniform speed v . Find its acceleration at any point. (5M)
2. Discuss the motion of a particle in a medium whose resistance varies as the velocity. (10M)
3. Show that the acceleration \vec{f} of a particle moves along a plane curve with speed \vec{v} is given by: $\vec{f} = \frac{dv}{dt} \vec{t} + \frac{v^2}{\rho} \vec{n}$, where \vec{t} is the unit tangent vector and \vec{n} is the unit vector along the normal, ρ is the radius of the curvature. (10M)
4. (a) Show that S.H.M is a periodic motion with the period $\frac{2\pi}{\sqrt{\mu}}$, which is independent of amplitude a . (4M)

(b) A particle is performing a S.H.M of period T about a centre O and it passes through a point P where $OP=b$ with velocity v in the direction OP . Prove that the time which elapses before it returns to P is

$$\left(\frac{T}{\pi}\right) \tan^{-1}\left(\frac{vT}{2\pi b}\right). \quad (6M)$$

5. (a) Define (i) angle of friction (ii) cone of friction (iii) Co-efficient of friction. (3M)

(b) How high can a particle rest inside a hollow sphere of radius a if the co-efficient of friction be $\frac{1}{\sqrt{3}}$? (7M)

6. (a) If three co-planar forces acting on a rigid body be in equilibrium, then prove that they must be either all the three meet at a point or else all must be parallel to one another. (5M)

(b) Determine the c.g of four uniform rods forming a parallelogram. (5M)