C. ABDUL HAKEEM COLLEGE (AUTONOMOUS),
MELVISHARAM - 632 509.
SEMESTER EXAMINATIONS, NOVEMBER - 2018

B.Sc., MATHEMATICS **SEMESTER V**

U14MMA505 – DYNAMICS

Time: Three Hours Maximum: 75 Marks

SECTION - A (10 X 2 = 20 Marks)

Answer **ALL** Questions.

1. Define relative velocity.
2. Define Rectilinear motion.
3. Define projectile.
4. What is called a trajectory?
5. Define impulsive force.
6. What is meant by coefficient of restitution?
7. What is a central force?
8. State Kepler's first law of motion.
9. Define moment of inertia.
10. Write the moment of inertia of a thin circular ring of radius a and mass M.

SECTION - B (5 X 5 = 25 Marks)

Answer **ALL** Questions.

11. a) Find the magnitude and direction of the resultant velocity of a particle possessing two velocities v_1 and v_2.

(Or)

b) Find the components in two fixed perpendicular directions.

12. a) A ball is projected so as to just clear two parallel walls, the first of height a at a distance b from the point of projection and the second of height b at a distance a from the point of projection. Supposing the path of the ball lie in a plane perpendicular to the walls, find the range on the horizontal plane and show that the angle of projection exceeds $\tan^{-1}3$.

(Or)

b) A gun is situated on an inclined plane and the maximum ranges up and down the plane are L_1 and L_2. If L is the maximum range in a direction perpendicular to the line of greatest slope, show that $1/L_1 + 1/L_2 = 2/L$.

13. a) A smooth sphere impinges directly on a fixed plane with a velocity u. Find its velocity of rebound and the loss in its kinetic energy due to impact.

(Or)

b) Two spheres A and B of same size lie on a smooth, horizontal, circular groove at opposite ends of a diameter. A is projected along the groove and after a time t impinges upon B. Show that a second impact will occur after a time $2t/e$, where e is the coefficient of restitution.

14. a) Show that the motion of a particle under a central force is coplanar.

(Or)

b) The velocities of a particle along and perpendicular to the radius vector from a fixed origin are a and b. Find the path and the accelerations along and perpendicular to the radius vector.

15. a) Find the moment of inertia of a parabolic lamina.

(Or)

b) Find the moment of inertia of a solid right circular cone.

SECTION - C (3 X10 = 30 Marks)

Answer **ANY THREE** Questions.

16. A vertical circular disc of radius a rolls on a ground without slipping along a straight line with a linear velocity u. Find the velocity of any point on its rim.
17. Prove that the path of the projectile is a parabola.
18. When two smooth spheres collide directly, find the impulse imparted to each sphere and the change in the total kinetic energy of the spheres.
19. Find the orbit of a particle moving under an attractive centre force varying inversely as the square of the distance.
20. State and prove (i) the perpendicular axes theorem and (ii) the parallel axes theorem.

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