

**PSG COLLEGE OF ARTS & SCIENCE**  
(AUTONOMOUS)  
**BSc DEGREE EXAMINATION MAY 2018**  
(Fourth Semester)

Branch – MATHEMATICS

**MECHANICS – II (DYNAMICS)**

Time : Three Hours

Maximum : 75 Marks

**SECTION-A (20 Marks)**

Answer ALL questions

ALL questions carry EQUAL marks (10 x 2 = 20)

- 1 Define speed and displacement.
- 2 Define triangle of velocity.
- 3 State angular velocity.
- 4 State Newton's first law of motion.
- 5 Define lines of Quickest descent.
- 6 Define momentum.
- 7 Define angle of projection.
- 8 Define impulsive force.
- 9 State central force.
- 10 Define velocities in a central orbit.

**SECTION - B (25 Marks)**

Answer ALL Questions

ALL Questions Carry EQUAL Marks (5 x 5 = 25)

- 11 a Find the component of a velocity along two given directions.  
OR  
b State and prove triangle velocities of theorem.
- 12 a A particular slides without friction down an inclined plane and in the 4<sup>th</sup> second after starting passes over a distance of 1716.75 cm. Find the inclination of the plane to the horizon.  
OR  
b Find the line of quickest descent from a given point p to a given circle in the same vertical plane.
- 13 a If the greatest height attained by the particle is a quarter of its range on the horizontal plane through the point of projection, find the angle of projection.  
OR  
b If  $V_1$  and  $V_2$  be the velocity of a projectile at the ends of a focal chord of its path and  $U$  is the velocity at the vertex, prove that  $V_1^{-2} + V_2^{-2} = U^{-2}$ .
- 14 a A ball is thrown from a point on a smooth horizontal ground with a speed  $V$  at an angle  $\alpha$  to the horizon. If  $e$  be the co-efficient of restitution, show that the total time for which the ball rebounds on the ground is  $\frac{2v \sin \alpha}{g(1-e)}$ .

OR

Cont

- 14 b A ball of mass 8 gm moving with a velocity of 10 cm per second impinges directly on another of mass 24 gram moving out 2 cm per second in the same direction. If  $e = \frac{1}{2}$ , find the velocity after impact. Also calculate the loss in kinetic energy.
- 15 a Find moments of inertia A solid sphere about its diameter.  
OR  
b Show that the moments of inertia of a triangular lamina of mass M about a side is  $\frac{\mu h^2}{6}$  where h is the altitude from the opposite vertex.

**SECTION - C (30 Marks)**

Answer any **THREE** Questions

**ALL** Questions Carry **EQUAL** Marks (3 x 10 = 30)

- 16 To a man walking along a level road at 5 km/h, the rain appears to be beating into his face at 8 km/h at an angle  $60^\circ$  with the vertical. Find the true direction and velocity of the rain.
- 17 Find explanation and example of the first law.
- 18 A particular is thrown over a triangle from one end of a horizontal base and grazing the vertex falls on the other end of the base. If A, B are the base angles and  $\alpha$  the angle of projection, show that  $\tan \alpha = \tan A + \tan B$ .
- 19 A smooth sphere of mass  $m_1$  impinges directly with velocity  $u_1$  on another smooth sphere of mass  $m_2$  moving in the same direction with velocity  $u_2$ . If the coefficient of restitution is e, find the velocities after the impact.
- 20 State and prove parallel axes theorem.

Z-Z-Z

END