PSG COLLEGE OF ARTS & SCIENCE
• . . (AUTONOMOUS)
BSc DEGREE EXAMINATION MAY 2017
(Fourth Semester)

Branch- MATHEMATICS

<u>MECHANICS - II (DYNAMICS)</u>

Time : Three Hours   '   Maximum : 75 Marks

<u>SECTION-A (20 Marks)</u>
Answer ALL questions
ALL questions carry EQUAL marks (10x2 = 20)

1   State parallelogram law of velocities.

2   Give the magnitude and direction of the resultant of several simultaneous coplanar velocity of a particle.

3   State the principle of conservation of linear momentum.

4   Define potential energy of a particle.

5   Define the time of flight.

6   Define the angle of projection.

7   State principle of conservation of momentum in the case of two impinging bodies.

8   State Newton's experimental law on impact.

9   State the theorem of parallel axes.

10   . Define moment of inertia of a particle about a line.

<u>SECTION - B (25 Marks)</u>
Answer ALL Questions
ALL Questions Carry EQUAL Marks (5 x 5 = 25)

11   a   Find angular velocity of a particle moving along a circle with uniform speed.
              OR •
     b   Find the components of a velocity along two given directions.

12   a   State Newton's laws of motion.
              OR
     b   Find the work done by a varying force.

13   a   A stone is drawn with a velocity of 39.2 m/sec at 30° to the horizontal. Find at what times it will be at a height of 14.7 m.
              OR
     b   A body is projected with a velocity of 98 metres per sec in a direction making and angle $\tan^{-1}3$ with the horizon. Show that it rises to a vertical height of 441 metres and that its time of flight is about 19 secs. Find also horizontal range through the point of projection.

14   a   A ball of mass 8 gm moving with a velocity of 10 cm per sec. impinges directly on another of mass 24 gm, moving at 2 cm per sec. in the same direction. If e = Vi, find the velocity after impact. Also calculate the loss in kinetic energy.
              OR
     b   Define the following (i) Perfectly elastic body (ii) Line , of impact (iii) Force of restotution.

15 a State and prove that theorem of perpendicular axes.

OR

b Find the moment of inertia of a uniform circular ring about a (i) Diameter
   (ii) Tangent line.

SECTION - C (30 Marks)
Answer any THREE Questions
ALL Questions Carry EQUAL Marks (3 x 10 = 30)

16   A ship P is sailing due east at a speed of 16 km/h when another ship Q
      which is due north of P at a distance of 10 km from it, starts at a speed of
      12 km / hr in a southern direction. Find the velocity of Q relative to P.
      What is the least distance apart that Q will attain from P and how long
      after starting will it attain it?

17   Find the power required to pump $6m^3$ of water per minute from a depth of
      20m and deliver it through a pipe of cross sectional area $0.004m^2$ (The
      mass of lm^3 of water is 10^3 kg). -

18   Find the range of a projectile on an inclined plane.

19   An elastic sphere is projected from a given point 0 with given velocity v at an
      inclination a to the horizontal and after hitting a smooth vertical wall at a

      distance d from a returns to 0. Prove that $d = \dfrac{v^2 \sin 2a}{g} \cdot \dfrac{e}{1+e}$ where e is the

      coefficient of restotution.

20   Show that the Moment of Inertia of a triangular lamina of mass M about a

      side is $\dfrac{Ivfli}{}$ where h is the altitude from the opposite vertex.

                    Z-Z-Z   END

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