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D.K.M.COLLEGE FOR WOMEN (AUTONOMOUS), VELLORE-1

SEMESTER EXAMINATIONS

APRIL – 2018

15CMA6B

DYNAMICS

Time : 3 Hrs

Max. Marks : 75

SECTION-A (10 x 2 = 20)

Answer ALL questions.

1. Define Resultant velocity.
2. Define Acceleration.
3. What is a projectile?
4. What is a trajectory?
5. Define epoch in S.H.M.
6. State the principle of conservation of linear momentum.
7. Define central force.
8. Define central orbit.
9. Define Moment of inertia.
10. State Parallel axis theorem.

SECTION-B (5 x 5 = 25)

Answer any FIVE of the following questions.

11. A particle has two velocities \vec{v}_1 and \vec{v}_2 . Its resultant velocity is equal to \vec{v}_1 in magnitude. Show that when the velocity \vec{v}_1 is doubled, the new resultant is perpendicular to \vec{v}_2 .
12. Find the components of velocity and acceleration of a particle in the radial and transverse directions.
13. Verify, in the case of a projectile $K.E + P.E = a \text{ constant}$.
14. Find the maximum range on an inclined plane.
15. Show that the resultant motion of two simple harmonic motions of same period along two perpendicular line, is along an ellipse.
16. Find the velocities of two smooth sphere after a direct impact between them.
17. Derive the pedal equation to the central orbit.
18. Show that the M.I. of a rectangular lamina of mass M and sides $2a$ and $2b$ about a diagonal is
$$M \frac{2a^2b^2}{3(a^2 + b^2)}$$

SECTION-C (3 x 10 = 30)

Answer ALL questions.

19. (a) *The speed of train increases at a constant rate α from 0 to v , and then remains constant for an interval and finally decreases to 0 at a constant rate β . If s is the total distance described. Prove*

that the total time T occupied is $T = \frac{s}{v} + \frac{v}{2s} \left(\frac{1}{\alpha} + \frac{1}{\beta} \right)$.

(Or)

(b) *Prove that the path of a projectile is a parabola. Hence determine its vertex.*

20. (a) *Two smooth spheres of masses m_1, m_2 and coefficient of restitution e , collide obliquely with velocities u_1, u_2 whose directions are inclined to the common normal C_1, C_2 at angles α_1, α_2 . Find the velocities of the sphere after impact.*

(Or)

(b) *Obtain the differential equation of the central orbit.*

21. (a) *State and prove perpendicular axis theorem.*

(Or)

(b) *A particle moves with a central acceleration μr^{-7} and start from an apse at a distance 'a' with a velocity which would be acquired by the particle travelling from rest at infinity the equation of its orbit is to the apse. Show that $r^2 = a^2 \cos 2\theta$.*

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