(NO. OF PAGES: 3)

(FOR THE CANDIDATES ADMITTED
DURING THE ACADEMIC YEAR 2022 ONLY)

22UMS305

REG.NO. :

N.G.M.COLLEGE (AUTONOMOUS) : POLLACHI

END-OF-SEMESTER EXAMINATIONS : NOVEMBER-2023

COURSE NAME: B. Sc.- MATHEMATICS **MAXIMUM MARKS: 50**

SEMESTER: III **TIME : 3 HOURS**

PART - III
DYNAMICS

SECTION – A (10 X 1 = 10 MARKS)

ANSWER ALL THE FOLLOWING QUESTIONS.
MULTIPLE CHOICE QUESTIONS. (K1)

1. The _____ is the path which the particle describes.
   a) velocity b) trajectory c) range d) angle
2. Newton's second law of motion_____.
   a) $f = mF$ b) $F = mF$ c) $f = mf$ d) $F = mf$
3. Equal areas are described by the _____ vector in equal times.
   a) diameter b) central c) radius d) linear
4. The principle of energy must never be used in problems where _____ forces occur.
   a) impulsive b) velocity c) impulse d) mass
5. When a body completely regains its shape after a collision, it is said to be _____ elastic.
   a) in b) complete c) perfectly d) properly

ANSWER THE FOLLOWING IN ONE (OR) TWO SENTENCES. (K2)

6. What is the highest point of the path.
7. Define Simple Harmonic Motion .
8. Write the pedal equation.
9. Define impulsive force.
10. What is elasticity?

SECTION – B (5 X 3 = 15 MARKS)

ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS. (K3)

11. a) Define greatest height attained by a projectile and horizontal range on the projection.

(OR)

b) 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.

12. a) Write a short note on Simple harmonic Motion on a curve.

(OR)

b) Two Simple harmonic Motions in the same straight line of equal periods and differing in phase by $\frac{\pi}{2}$ are impressed simultaneously on a particle. If the amplitudes are 4 and 6, find the amplitude and phase of the resulting motion.

(CONTD……2)

13. a) Find the law of force to an internal point under which a body will describe a circle.

(OR)

b) Define circle-pole at any point in pedal equation of some of the well-known curves.

14. a) A 100gm. Cricket ball moving horizontally at 24m/sec was hit straight back with a speed of 15m/sec. If the contact lasted $\frac{1}{20}$ second, find the average force exerted by the bat.

(OR)

b) Define loss of kinetic Energy in impact.

15. a) A ball is thrown from a point on a smooth horizontal ground with a speed V at an angle α to the horizon. If e be the coefficient of restitution, show that the total time for which the ball rebounds on the ground is $\frac{2V \sin \alpha}{g(1-e)}$ and the horizontal distance travelled by it is $\frac{V^2 \sin 2\alpha}{g(1-e)}$.

(OR)

b) An ivory ball falling from a height of 100 cms. rises to a height of 46 cms. after rebounding twice. What is the coefficient of restitution?

SECTION – C (5 X 5 = 25 MARKS) (K4 (Or) K5)

ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS.

16. a) A particle 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 α the angle of projection, show that $\tan \alpha = \tan A + \tan B$.

(OR)

b) The range of a rifle bullet is 1000m. when α is the angle of projection. Show that if the bullet is fired with the same elevation from a car travelling 36km/h towards the target, the range will be increased by $\frac{1000\sqrt{\tan \alpha}}{7} m$.

17. a) Briefly explain the composition of two Simple Harmonic Motions of the same period in two perpendicular directions.

(OR)

b) A particle is attached to the midpoint of an elastic string AB tightly stretched to tension T between two fixed points A and B. If the particle be pulled slightly in a direction perpendicular to AB, and let go, show that the period of vibration is $\pi\sqrt{\frac{ml}{T}}$ where m = mass of the particle and $l = AB$.

18. a) Explain equiangular spiral.

(OR)

b) A particle moves in an ellipse under a force which is always directed towards its focus. Find the law of force, the velocity at any point of the path and its periodic time.

19. a) 8 centimetres of rain fall in a certain district in 24 hours. Assuming that the drops fall freely from a height of 109 metres, find the pressure on the ground per square kilometer of the district.

(CONTD……3)

(OR)

b) A shot (m gms.) is fired horizontally from a gun of mass M gms. with a velocity v cm. Find the steady pressure which acting on the gun will bring it to rest, when it has recoiled 'a' cm.

20.a) A smooth circular table is surrounded by a smooth rim whose interior surface is vertical. Show that a ball projected along the table from a point A on the rim in a direction making an angle α with the radius through A will return to the point of projection after two impacts if $\tan \alpha = \frac{e^{(3/2)}}{\sqrt{1 + e + e^2}}$.

(OR)

b) Two equal marble balls A, B lie in a horizontal circular groove at the opposite ends of a diameter; A is projected along the groove and after time t, impinges on B; show that a second impact takes place after a further interval $\frac{2t}{e}$.

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ETHICAL PAPER