A–1–B

Roll No

[Total No of Questions 21] [Total No of Printed Pages 7

X1RKDO18

20801–B

PHYSICS

Time 3 Hours] [Maximum Marks : 70

(Long Answer Type Questions) 5 each

1 Find an expression for the time of flight, maximum height and horizontal range of a projectile fired at an angle with the horizontal When is horizontal range maximum ?

Or

Using calculas, derive (i) $v = u + at$, (ii) $s = ut + \frac{1}{2}at^2$, where the letters have their usual meanings.

2 State and explain law of conservation of linear momentum Briefly explain recoil of gun, during firing of bullet

Or

Define angle of banking of roads. Find an expression for the angle of banking for a vehicle on a curved banked road.

3 State Stokes law of viscous force. Derive the expression for viscous force acting on a sphere falling through a viscous liquid, using dimensional analysis.

Or

Define capillarity. Find an expression for the height of liquid in case of its rise in a capillary tube.

4 Define S.H.M. Find an expression for the displacement, velocity and acceleration of a particle executing S.H.M.

Or

Derive an expression for the time period and frequency of a simple pendulum.

(Short Answer Type Questions) 3 each

5. Differentiate sin x by ab-initio method

6. Find the dimensions of a and b in the equation $\left(P + \frac{a}{V^2}\right)(V - b) = RT$, where P, V, R, T are pressure, volume, universal gas constant and thermodynamic temperature respectively

7. Derive Kinetic energy-work theorem

8. State theorem of parallel and perpendicular axis in case of a rigid body in rotational motion

9. State and explain Newton's universal law of gravitation.

10. State and explain first law of thermodynamics.

11. Write six postulates of Kinetic theory of gases.

12. At what temperature, will the speed of sound in air become double of its value at 0°C

(Very Short Answer Type Questions) 2 each

13 A physical quantity (X) is related to four measurable quantities a, b, c and d as $X = a^2 b^3 c^{3/2} d^{-2}$. The percentage error in the measurement of a, b, c and d are 1%, 2%, 3% and 4% respectively. What is the percentage error in (X) ?

14. Find the angle between $\vec{A} = \hat{i} + 2\hat{j} - \hat{k}$ and $\vec{B} = -\hat{i} + \hat{j} - 2\hat{k}$.

15. Define Kinetic energy and Potential energy. Give one example of each.

16 Find the ratio angular velocity of rotation of hour hand to that of earth's rotation about its own axis.

17. Define escape velocity. Write an expression for it.

18. Define stress, strain and elasticity.

19. State second law of thermodynamics (two statements only).

20. Define two sp. heats of a gas. Write the relation between them.

(Objective Type Questions) 1 each

Q1 Do as directed

(i) If $x = at^2$ and $y = bt^2$, find $\frac{dy}{dx}$

(ii) Rocket propulsion is based on law of conservation of linear momentum (True/False)

(iii) When normal reaction is doubled, the coefficient of friction is :

(A) Doubled

(B) Halved

(C) Quadrupled

(D) Unchanged

(iv) Momentum (P) and Kinetic energy (E) are related by :

(A) $E = \frac{P^2}{2m}$

(B) $E = \frac{P}{2m}$

(C) $E^2 = \frac{P}{2m}$

(D) None of these

(v) What is the physical significance of negative value of total energy of a bound system ?

(vi) Moment of inertia is rotational analogue of mass (True/False)

(vii) If door of a refrigerator is kept open, the room becomes hot (True/False)

(viii) The degree of freedom of diatomic gas molecule is

(A) 3 (B) 5

(C) 6 (D) 7

(ix) Two tuning forks give 6 beats per second, when sounded together. The frequency of one of the tuning forks is 480 Hz. If first tuning fork is filed a little and then the number of beats becomes 8 per second, then the frequency of second tuning fork is

(A) 474 Hz (B) 486 Hz

(C) 488 Hz (D) 472 Hz

(e) The harmonics present in an open organ pipe are

(A) Odd harmonics

(B) Even harmonics

(C) Even as well as odd harmonics

(D) None of these