A–1–A

Roll No .....

Total No. of Questions : **26]** [*Total No of Printed Pages* **4**

XIARKDD20
2701–A
PHYSICS

Time : 3 Hours] **[Maximum Marks : 70**

(Very Very Short Answer Type Questions) 1 each

1. Find $\frac{dy}{dx}$, when $y = 4x^3 + 7x^2 + 6x + 9$

2. Give the dimensions of :

   (a) Velocity gradient

   (b) Angular momentum

3. Area of a rectangular field is $A = l \times b$, where $l = (200 \pm 5)$ m $b = (50 \pm 2)$ m Find percentage error in area

4. If one of the particles is heavier than the other, to which side will their centre of mass shift.

5. Can the temperature of an isolated system change ?

(Very Short Answer Type Questions) 2 each

6. Justify the statement, "Newton's second law of motion is the real law of motion."

Or

What is Friction ? State the laws of limiting friction.

7. Three pieces of iron of uniform thickness and masses m, m and $2m$ respectively are placed at three corners of a triangle having co-ordinates (2.5, 1.5); (3.5, 1.5) and (3, 3) respectively. Find centre of mass of the system.

8. Define Young's modulus of elasticity. Give its units and dimensions.

9. What do you understand by reversible and irreversible processes ?

10. How does periodic motion differ from simple harmonic motions ?

(Short Answer Type Questions) 3 each

11. The frequency ν of vibration of a stretched string depends upon (i) its length l (ii) its mass per unit length m and (iii) the tension T in the string. Obtain an expression for frequency ν by using method of dimensions.

Or

Convert 1 joule of energy into erg.

12. Differentiate e^{ax} by abinitio method.

13. A projectile is fired with a velocity 'u' making an angle with the horizontal. Derive expression for its time of flight and maximum height

14. A particle moves along x-axis from $x = 0$ to $x = 5$ m under the influence of force $F = 5 - 4x + 3x^2$ Find work done in this process.

15 Prove that power is the dot product of force and velocity

16 Define torque and angular momentum and derive a relation between them

17 Discuss the variations of 'g' with depth What happens to 'g' at the centre of earth

18. Derive an expression for orbital velocity of a satellite.

19 State and explain first law of thermodynamics Give its limitations.

20 Define degrees of freedom. Calculate the degree of freedom of monoatomic, diatomic and triatomic gas molecules.

21. Discuss the kinetic interpretation of temperature. Hence define absolute zero of temperature.

22. Distinguish between transverse and longitudinal waves.

(Value Based Questions) 4

23. A man arrived at Delhi Railway Station and wanted to go to his relative's house 10 km away from the station. He hired a taxi to reach the destination. The driver follow a long path 25 km to reach the destination in 1 hour and charged from the man for 25 km :

    (i) Comment on the behaviour of taxi driver.

    (ii) Calculate the average speed of the taxi.

    (iii) Calculate the average velocity of the taxi.

(Long Answer Type Questions) 5 each

24. Why are curved road banked ? Obtain an expression for angle of banking of a curved road.

Or

State and prove the principle of conservation of linear momentum. Give examples.

25. Derive an expression for excess pressure (i) inside a liquid drop (ii) inside a soap bubble.

Or

State Bernoulli's theorem in different forms. Name its two applications.

26. Define plane progressive wave. Derive expressions for the displacement of a plane progressive wave in different forms.

Or

What is Simple Pendulum ? Show that motion of the pendulum is SHM and hence deduce an expression for its time period.