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Test - Dimensional Analysis

Grade XI

Time 1 hr

M.M 25

1. Give the dimensional formulas of

- (i) Angular Momentum
- (ii) Gravitational constant
- (iii) Resistance
- (iv) Coefficient of elasticity
- (v) Universal Gas constant

[5]

2. Convert (i) $6.67 \times 10^{-11} \text{ Nm}^2\text{Kg}^{-2}$ to $\text{cm}^3\text{s}^{-2}\text{g}^{-1}$

(ii) $x = 5.67 \times 10^{-8} \text{ J/s/m}^2/\text{k}^4$ to cgs units

[4]

3. In the relation $y = a \sin (\omega t - kx)$ the dimensional formula for k is

- [M⁰LT] (b) [M⁰L⁻¹T⁰] (c) [M⁰LT⁻¹] (d) [M⁰L⁻¹T⁻¹]

[1]

4. Check the correctness

(i) $f = 1/2l (T/m)^{1/2}$ where f is the frequency, l is the length, T is the tension and m is the mass of unit length of the string.

(ii) $V = (2GM / R)^{1/2}$ where v- escape velocity , G- gravitational constant, R- radius of the earth

[3]

5. Find the value of a force of 100N on a system based upon the metre, the kilogram and the minute as the fundamental units.

[3]

6. The critical velocity v_c of a viscous liquid flowing through a capillary tube may depend upon the radius r of the tube, density ρ and coefficient of viscosity η of the liquid. Develop the formula dimensionally.

[3]

7. Write the dimensions of a/b

$P = (a - t^2) / bx$ where P is the pressure, x is the distance and t is the time. [3]

8. The velocity of a particle is given in terms of time t is

$V = at + b / (t + c)$ Give the dimensions of a, b, c.

[3]