Test 2

Dimensional Analysis (1 Mark Questions)

MM:20 **Time: 20 min.**

1. (a) Can there be a physical quantity, which has no units and no dimensions?
   (b) Can a quantity have units, but still be dimensionless?
2. Name a scalar and a vector quantity having same dimension?
3. If 'slap' times speed equals power, what is dimensional formula for 'slap'?
4. Choose the pair of quantities which have same dimensions: Impulse, force, work, momentum, moment of force, tension?
5. Which of the following has same dimensions as Planck's constant: torque, gravitational constant, angular momentum?
6. What are the dimensions of a and b in the relation: $F = a + bx$, where F is force and x is distance?
7. The rotational K.E. of a body is given by $\frac{1}{2} I\omega^2$. Use this equation to obtain the dimensions of I?
8. Do all physical quantities have dimensions? If no, name 4 physical quantities which are dimensionless?
9. Name three physical quantities, which have same dimensions?
10. Write the dimensions of each of the following: Reynold number, Rigidity modulus, rate of flow
11. Can a quantity have constant value and be dimensionless?
12. Write the dimensions of a and b in the formula $v = a + bt$, where v is the velocity and t is time?
13. In the equation $y = A\sin(\omega t - kx)$, obtain dimensional formula of ω and k. Given x - distance & t - time.
14. Name the quantities represented by the dimensional formula: $[ML^2T^{-1}]$, $[ML^2T^{-2}]$, $[ML^{-3}]$?
15. Find the dimensional of Planck's constant. If its value in SI units is 6.63 x 10^{-34}, Find its value in c.g.s ?
16. Calculate the dimensions of universal gravitational constant. If its value in SI units is 6.67 x 10^{-11}, what will be its value in c.g.s system?
17. Calculate x in the equation: $(velocity)^x = (Pressure\,diff.)^{3/2} \times (density)^{-3/2}$
18. The rate of flow (V) of a liquid through a pipe of radius (r) under a pressure gradient (P/l) is $V = \frac{\pi}{8}\frac{\mathrm{Pr}^4}{l\eta}$

    Where n is coefficient of viscosity of the liquid. Check whether the formula is correct or not?
19. Find the value of x in the relation: $Y = \frac{\mathrm{T}^x \cos\theta\tau}{L^3}$, where Y is Young's modulus. T is time period, τ is torque and L is length?
20. The dimensions of quantities in one or more of the following pairs are the same. Identify the pairs.
    (a) Torque and work
    (b) Angular momentum and work
    (c) Energy and Young's modulus
    (d) Light year and wavelength