Important Questions of Chapter Units and dimensions

Revision Assignment 1

Q1) Assuming that the critical velocity Vc of a various liquid flowing through a capillary tube depends upon the radius a of the tube , the density ρ and the coefficient of viscosity η of the liquid , obtain a relation between Vc , ρ , η and a. **[Sol : a=-1 , b = -1 ,c =1]**

Q2) Assuming the frequency υ of a vibrating string may depend upon (1) applied load (F)

(2) length (l) of the string and mass per unit length (m) , prove that $\upsilon \propto \frac{1}{l}\sqrt{\frac{F}{m}}$

Q3) The fundamental mode of frequency of a stretched string is found to depend upon a) length of string (l) (b) tension in string (T) (c) mass per unit length (m). Find expression for frequency.

[Sol : a =-1 , b = 1/2 , c = -1/2]

Q4) Find by method of dimensions an expression of energy of the body executing SHM . assuming this energy depends upon (1) mass (m) (2) frequency (f)

(3) amplitude of vibration (r) **[Sol :a=1 , b=2 , c =2]**

Q5) The terminal velocity 'v' of a spherical body falling in a liquid is found to be depend upon

a) radius of body (r)
b) coefficient of viscosity (η)
c) viscous drag experienced by the body (F) **[Sol :a = -1 , b = -1 , c =1]**

Q6) Check the correctness of the following relation : $T = 2\pi\sqrt{\frac{l}{g}}$ **[correct]**

Q7) The wavelength λ associated with moving particle depend upon its mass (m) , velocity (v) and plank's constant (h) and is given by $\lambda = \frac{h}{mv}$ .Check the correctness of the given relation. **[correct]**

Q8) Find dimensions of a and b in the relation : F = $a\sqrt{x} + bt^2$ where f = force , x=dist , t=time

[Sol : a =[$ML^{1/2}T^{-2}$] , b = [MLT^{-4}]]

Q9) In the given equation y = A sin ($\omega t - Kx$) , find the dimensional formula of ω and K . Given x is distance and t is time. **[Sol : T^{-1} , L^{-1}]**

Q10) The S.I unit of universal gravitational constant is 6.67 * 10-11 Nm2 Kg-2 . convert this value in to corresponding c.g.s with the help of dimensional formulae. **[Sol : 6.67 x 10^{-8}]**

Q11. The density of mercury is 13.6 g cm^3 in CGS system. Find its value in SI units.

Q12. Write Disadvantages of Dimensional Analysis