Practice Assignment

1. Verify dimensionally the relation $t = 2\pi\sqrt{\frac{l}{g}}$ for the time period of a simple pendulum. Here l is the length of the pendulum and g is acceleration due to gravity. [Correct]
2. The frequency v of a string of length l vibrating under tension F is given by $\mathrm{v} = \frac{1}{2\mathrm{l}}\sqrt{\frac{\mathrm{F}}{\mathrm{m}}}$, where m is the mass per unit length. Check whether the equation is correct or not. [Correct]
3. Check the correctness of the relation: $\rho = \frac{3g}{4\pi rG}$ [Correct]
4. The escape velocity v of a body depends upon: (i) the acceleration due to gravity (g) of the planet, (ii) the radius (R) of the planet. Establish dimensionally the relation between them. [$v = k\sqrt{gR}$]
5. A body of mass m is moving in a circle of radius r with angular velocity ω. Find the expression for centripetal force acting on it using method of dimensional analysis. [$F=mr\omega^2$]
6. The terminal velocity depends upon weight (mg) and radius r of a ball. It also depends upon the coefficient of viscosity η. By the method of dimensions, determine the relation expressing terminal velocity. [$v = k\frac{mg}{\eta r}$]
7. The density of a material in cgs system is $8gcm^{-3}$. In a system of units, in which unit of length is 5cm and unit of mass is 20g, what is the density of material? [50]
8. Young's modulus of steel is 19×10^{10} Nm^{-2}. Express it in cgs units. [19×10^{11} $dynecm^{-2}$]
9. When 1m, 1kg and 1 minute are taken as fundamental units, the magnitude of a force is 36 units. What is the value of this force on cgs system? [10^3 dyne]