

Revision work 1
S.5 and S.6

1. The viscous force (F) on a small sphere of radius (a) falling through a liquid of coefficient of

viscosity η with a velocity V given by $F = K \eta^x a^y V^z$

2. Use dimensional analysis to show how the velocity of transverse vibrations of a stretched string depends on its length (l) mass (m) and the tension force (F) in the string.

- 3 i) What is meant by the dimension of a physical quantity _____ (01mark)

ii) For a stream line flow of a non-viscous, incompressible fluid, the pressure

P at a point is related to the width h and the velocity v by the equation.

$(P - a) = \rho g(h - b) + \frac{1}{2} \rho (v^2 - d)$ where a, b and d are constant and ρ is the density of the fluid and g is the acceleration due to gravity. Given that the equation is dimensionally consistent, find the dimensions of a, b and d

- 4 (a) i. Distinguish between free fall and uniform deceleration. (2 mks).

ii. In the formula $T = KE^x P^y \ell^z$, E-energy, ℓ -density, P-pressure and k-constant. Using the method of dimensions, find the values of x, y and z. (5 mks).

- b) i. The moon moves in a circular Orbit of radius, R about the earth of mass M_e with period T. Show that $R^3 = \frac{g r_e^2 T^2}{4\pi^2}$, where r_e = radius of the earth, g is acceleration due to gravity on the earth's surface is dimensionally consistent.

- 5 a) i. Define thermometric property and give two examples.

ii. With reference to a platinum resistance thermometer, describe briefly how the total radiation pyrometer can be used to measure temperature of a hot body.

[5mks]

6. The resistance, R_θ of a platinum wire at temperature $\theta^\circ\text{C}$, measured on the gas scale is given by

$R_\theta = R_0(1 + \alpha \theta + \beta \theta^2)$, where $\alpha = 3.8 \times 10^{-3}$ and $\beta = -5.6 \times 10^{-7}$. Find the temperature indicated by the platinum resistance thermometer when the temperature on the gas scale is 200°C .

[4mks]

- ii. Briefly explain why the two temperature in (c i) are different.

[1mk]

7. i. State and explain the source of inaccuracies while using the mercury in-glass thermometer.
- ii. State two advantages of a thermocouple over an electrical resistance thermometer.