Biniyam Sishah

Homework - 1

i) $\eta = (\frac{\nu^3}{\epsilon})^{\frac{1}{4}}$ Where $\eta = L$; $\nu = \frac{L^2}{T}$; $\epsilon = \frac{L^2}{T^3}$

$$\eta = (\frac{\nu^3}{\epsilon})^a \quad ; \quad L^1T^0 = (L^{6a}T^{-3a})(L^{-2a}T^{3a}) \quad ; \quad L^1T^0 = L^{4a}T^0 \quad \text{from L} \quad a = \frac{1}{4} \tag{1}$$

Since **a** is $\frac{1}{4}$ the equation is dimensionally consistent.

ii) $\tau_\eta = (\frac{\nu}{\epsilon})^{\frac{1}{2}}$

$$\tau_\eta = (\frac{\nu}{\epsilon})^a \quad ; \quad L^0T^1 = (L^{2a}T^{-a})(L^{-2a}T^{3a}) \quad ; \quad L^0T^1 = L^0T^{2a} \quad \text{from T} \quad a = \frac{1}{2} \tag{2}$$

Since **a** is $\frac{1}{2}$ the equation is dimensionally consistent.

iii) $u_\eta = (\nu\epsilon)^{\frac{1}{4}}$

$$\eta = (\frac{\nu^3}{\epsilon})^a \quad ; \quad L^1T^{-1} = (L^{2a}T^{-a})(L^{2a}T^{-3a}) \quad ; \quad L^1T^{-1} = L^{4a}T^{-4a} \quad \text{from L or T} \quad a = \frac{1}{4} \tag{3}$$

Since **a** is $\frac{1}{4}$ the equation is dimensionally consistent.

iv) $E(\kappa) = C_\mu \epsilon^{\frac{2}{3}} \kappa^{\frac{-5}{3}}$ Where $E(\kappa) = \frac{L^3}{T^2}$; $\epsilon = \frac{L^2}{T^3}$; $\kappa = \frac{1}{L}$

$$E(\kappa) = \epsilon^a \kappa^b \quad ; \quad L^3T^{-2} = (L^{2a}T^{-3a})(L^{-b}) \quad ; \quad L^3T^{-2} = L^{2a-b}T^{-3a} \quad \text{Solving..}$$
$$a = \frac{2}{3} \quad ; \quad b = \frac{-5}{3} \tag{4}$$

Since **a** is $\frac{2}{3}$, **b** is $\frac{-5}{3}$ and C_μ is a constant the equation is dimensionally consistent.