(1) Data :

$F = ?$

$R = 0.01 m$

$T = 0.075 N/m$

Solution :

$F = T \cdot L$

$= T \cdot 2\pi R$

$= 0.075 \times 2 \times 3.14 \times 0.01$

$= 0.00471 N$

(2) Data :

$A_1 = 16 cm^2$

$= 16 \times 10^{-4} m^2$

$A_2 = 20 cm^2$

$= 20 \times 10^{-4} m^2$

$W = ?$

$T = 3 \times 10^{-2} N/m$

Solution :

$W = T \cdot \Delta A$

$= T \cdot (A_2 - A_1) \times 2$

$= 3 \times 10^{-2} (20 \times 10^{-4} - 16 \times 10^{-4}) \times 2$

$= 3 \times 10^{-6} (20 - 16) \times 2$

$= 24 \times 10^{-6} J$

$= 2.4 \times 10^{-5} J$

(3) Data :

$r = 0.5 \times 10^{-3} m$

$T = 0.04 N/m$

$\rho = 0.8 \times 1000 kg/m^3$

$h = ?$

$\theta = 10^\circ$

$g = 9.8 m/s^2$

Solution :

$h = \frac{2T\cos\theta}{r \cdot \rho \cdot g}$

$= \frac{2 \times 0.04 \times \cos 10^\circ}{0.5 \times 10^{-3} \times 0.8 \times 1000 \times 9.8}$

$= 0.02009 m$

(4) Data :

$R = 0.5 \times 10^{-2} m$

$n = 10^6$

$h = ?$

$\rho = 13600 kg/m^3$

$T = 0.465 N/m$

Solution :

$R^3 = nr^3$

$(0.5 \times 10^{-2})^3 = 10^6 \times r^3$

$(0.5 \times 10^{-2}) = 10^2 \times r$

$r = 0.5 \times 10^{-4} m$

$dE = T \cdot dA$

$mgh = T \cdot (n \cdot 4\pi r^2 - 4\pi R^2)$

$\left(\frac{4}{3}\pi R^3 \times \rho\right) \times g \times h = T \cdot 4\pi (n r^2 - R^2)$

$h = \frac{T \times 3}{\rho \times R^3 \times g} (10^6 \times r^2 - R^2)$

$= \frac{0.465 \times 3 \times [10^6 \times (0.5 \times 10^{-4})^2 - (0.5 \times 10^{-2})^2]}{(0.5 \times 10^{-2})^3 \times 9.8 \times 13600}$

$= \frac{0.465 \times 3 \times 0.5^{-2} [10^{-2} - 10^{-4}]}{(0.5)^3 \times 10^{-6} \times 9.8 \times 13600}$

$= \frac{0.465 \times 3 \times 10^6}{13600 \times 0.5 \times 9.8} \left(\frac{1}{100} - \frac{1}{10,000}\right)$

$= \frac{0.465 \times 6 \times 10^6}{13600 \times 9.8} \left(\frac{99}{10000}\right)$

$= 0.2072 \text{ m}$

(5) Data :

$T_0 = 70 \text{ dyne/cm}$

$T = ?$

$\theta_0 = 0^\circ C$

$\theta = 25^\circ C$

$\alpha = 0.0027 \, ^\circ C^{-1}$

Solution :

$T = T_0 (1 - \alpha\theta)$

$= 70 [1 - 0.0027 (25 - 0)]$

$= 70 (1 - 0.0027 \times 25)$

$= 65.27 \text{ dyne/cm}.$

(6) Data :

$n = 8$

$r = 0.2 \times 10^{-3} \text{ m}$

$dE = ?$

$T = 0.072 \text{ N/m}$

Solution :

$R^3 = n r^3$

$R^3 = 8 (0.2 \times 10^{-3})^3$

$\therefore R = 2 (0.2 \times 10^{-3})$

$\therefore R = 0.4 \times 10^{-3} \text{ m}$

$dE = T (n \cdot 4\pi r^2 - 4\pi R^2)$

$= 0.072 (4\pi) [8 \times (0.2 \times 10^{-3})^2 - (0.4 \times 10^{-3})^2]$

$= 0.072 \times 4\pi \times 10^{-6} (8 \times 0.04 - 0.16)$

$= 1.446 \times 10^{-7} \text{ J}$

(7) Data :
$R = 0.02\,m$
$F = 0.0113\,N$
$T = ?$

Solution :
$T = F/L$
$= F/(2\pi R + 2\pi R)$
$= \frac{0.0113}{2\pi(0.02)\times 2}$
$= 0.04498\,N/m$

(8) Data :
$r = 0.5\times10^{-2}\,m$
$h = ?$
$T = \frac{435.5\times10^{-5}}{10^{-2}}\,N/m$
$= 435.5\times10^{-3}\,N/m$
$= 0.4355\,N/m$
$\theta = 140°$
$\rho = 13600\,kg/m^3$

Solution :
$h = \frac{2T\cos\theta}{r\cdot\rho\cdot g}$
$= \frac{-2\times0.4355\times\cos(180-140)}{0.5\times10^{-2}\times13600\times9.8}$
$= 0.001001\,m$

(9) Data :
$r = 0.5\times10^{-2}\,cm$
$R = 0.55\times10^{-2}\,cm$
$F = ?$
$T = 75\ldots : dyne/cm$

Solution :
$F = T\cdot L$
$= T(2\pi R + 2\pi r)$
$= 75\times2\times3.14(0.55\times10^{-1} + 0.5\times10^{-1})$
$= \frac{75\times6.28}{100}(0.55+0.5)$
$= 75\times0.28(1.05)$
$= 49.45\,N$

(10) Data :
$dE = 2\times10^{-4}\,\pi T$
diameter $= 2R = ?$

Solution :
$dE = T\,dA$
$dE = T\times4\pi R^2$

$\therefore R^2 = \frac{dE}{T \times 4\pi}$

$R^2 = \frac{2 \times 10^{-4} \pi T}{T \times 4\pi}$

$= 0.5 \times 10^{-4}$

$\therefore R = 0.7072 \times 10^{-2}\ m$

$\therefore 2R = 1.4144 \times 10^{-2}\ m$

(11) Data :

$f = ?$

$r = 0.125 \times 10^{-3}\ m$

$T = 0.0245\ N/m$

$h = 0.04\ m$

$\theta = 28^\circ$

$g = 9.8\ m/s^2$

Solution :

$h = \frac{2T\cos\theta}{r\rho g}$

$\therefore \rho = \frac{2T\cos\theta}{h r g}$

$= \frac{2 \times 0.0245 \times \cos 28^\circ}{0.04 \times 0.125 \times 10^{-3} \times 9.8}$

$= 882.9\ kg/m^3$

(12) Data :

diameter : $2R = ?$

$dP = 51.2\ N/m^2$

$T = 3.2 \times 10^{-2}\ N/m$

Solution :

$dP = \frac{4T}{R}$

$51.2 = \frac{4 \times 3.2 \times 10^{-2}}{R}$

$\therefore R = 0.0025\ m$

$\therefore 2R = 0.005\ m$

$= 5\ mm.$