

PtIA 2018 Paper 1 – numerical answers

- 1) –
- 2) –
- 3) –
- 4) a)  $W_a > 0, Q_a > 0, W_b < 0, Q_b < 0$   
b)  $4/3 \text{ m}^3$
- 5) a) 1750 K, 642.9 K  
b) 55.66 J/K/s
- 6) a) –  
b) 365.7 K, -66 kJ/kg  
c)  $1.906 \text{ kg/m}^3, 2.277 \text{ kg/m}^3$   
d) 88.2 kW, 91.8 kW  
e) 33.7%, 39.7%  
f) -

**1A Mechanical Engineering**  
**Numerical Answers – Section B**

**7 (a)**  $\frac{3g}{2\sqrt{2}l}$

**(b)**  $\sqrt{\frac{3g}{l}\left(1 - \frac{1}{\sqrt{2}}\right)}$

**8 (b)**  $\frac{mg}{2(2 - \sqrt{2})l}$

**9 (a)**  $2M(7a^2 + 7b^2 + 12ab)$

**(b)**  $2m(a + b)c(\mathbf{e}_\theta - ct^2\mathbf{e}_r)$

**10 (c)**  $m\left(\frac{\sqrt{gR^2(2gR^2 - v_o^2 r_o)} + v_o^2 r_o - 2gR^2}{v_o r_o}\right)$

**(d)**  $\frac{2mgR^2(2gR^2 - r_o v_o^2)}{r_o^2 v_o^2}$

**12 (a)** 3

**(b)**  $\sqrt{\frac{2k}{m}}$

**(d)**  $z = 2.3\frac{f_0}{2k} \cos\left(\frac{3}{4}\omega_1 t\right)$

**(e)**  $\approx \sqrt{2km}$