

ENGINEERING TRIPOS PART IB

Paper 4: THERMOFLUID MECHANICS

ANSWERS

1(c) (ii) 228K (iii) 92W

2(b) (i) 12.35kPa, 81.3°C (ii) 2867kJ/kg (iii) 0.055 (iv) 8.18

(c) (i) 0.254 (ii) 1732kJ/kg

3(a) (i) $b = h - T_0 s$

(b) (i) 0, 26.5kJ/kg (ii) 408kJ/kg (iii) 39%, 60%

(c) (i) 174K, 26.5kJ/kg, 144kJ/kg (ii) 36.5kJ/kg

4(a) (ii) $u = \frac{h^2 - y^2}{2\mu} \left(-\frac{dp}{dx} \right)$ (iii) $\frac{2h^3}{3\mu} \left(-\frac{dp}{dx} \right)$

(b) $\frac{3\mu QL}{4} \frac{h_A + h_B}{h_A^2 h_B^2}$; alternatively $\frac{3\mu QL}{4(h_B - h_A)} \left(\frac{1}{h_A^2} - \frac{1}{h_B^2} \right)$

(c) $\frac{\rho Q}{\mu} \frac{dh}{dx} \ll 1$

5(a) (i) $\rho g H$ (ii) $A\sqrt{2gH}$

(b) (i) $\frac{\Delta p_T}{\rho(ND)^2} = f \left(\frac{Q}{ND^3}, \frac{\mu}{\rho ND^2} \right)$, or equivalent

(c) (ii) 0.8, 0.853, 0.426

6(b) (ii) $r\sqrt{2g/H}$ (iii) $2\rho gr^2/H$