

ENGINEERING TRIPOS PART IIA 2009
MODULE 3A5 – THERMODYNAMICS AND POWER GENERATION

ANSWERS

1. (b) (i) Compressor : -765.5 kW , 43.0 kW , 0.0
 Turbine : 1310.5 kW , 43.5 kW , 0.0
 (ii) Cooler : 0.0 , 7.4 kW , 231.4 kW
 (iii) Heater : 870.2 kW
 (iv) 48.3% , 62.6% , 77.1%

2. (a) (i) $X_{\text{H}_2} = 0.481$, $X_{\text{H}_2\text{O}} = 0.376$, $X_{\text{CO}} = 0.091$, $X_{\text{CO}_2} = 0.052$
 (ii) $X_{\text{CH}_4} = 0.0037$

3. (a) (ii) 393.84 kJ/kg air , (iii) 0.364
 (b) 51.3 , 0.402

- 4 (b) (i) 0.1281
 (ii) $152.8 \text{ }^\circ\text{C}$
 (iii) $167.8 \text{ kJ/kg of gas}$
 (iv) 39.4%
 (c) 43.9% , The 40 bar pressure level cycle.