

Qu. 2

$$\eta_{th} = 1 - \frac{1}{r_p^{\frac{\gamma-1}{\gamma}}} \quad (\text{Ideal Joule cycle})$$

$$\therefore 0.4 = 1 - \frac{1}{r_p^{\frac{1.4-1}{1.4}}}$$

$$\text{whence } r_p = \underline{5.977}$$

$$w = C_p [T_3 (1 - r_p^{\frac{1-\gamma}{\gamma}}) - T_1 (r_p^{\frac{\gamma-1}{\gamma}} - 1)]$$

$$\therefore 200 \times 10^3 = 1010 [T_3 (1 - 5.977^{\frac{1-1.4}{1.4}}) - 288 (5.977^{\frac{1.4-1}{1.4}} - 1)]$$

$$\text{whence } T_3 = \underline{975 \text{ K}} \quad \text{or } 702^\circ\text{C}$$