

1. 什麼是辛烷值(Octane number)? 它與汽油引擎的壓縮比有何關係? 通常柴油引擎的熱效率會比汽油引擎的熱效率高嗎? 試說明之。 (10%)
2. 空壓機(compressor)與泵(pump)有何異同? 如何計算它們各別所需要的功? (10%)
3. 如何定義冷凍機與熱泵的性能係數? 理論上何者較大? 它的熱力學第二定律效率又是如何呢? (10%)
4. compressed steadily by a reversible compressor from an inlet state of Pa and 300 K to an exit pressure of 900 kPa. Determine the compressor per unit mass for (a) isentropic compression with $k = 1.4$, (b) polytropic resion with $n = 1.3$, (c) isothermal compression, and (d) ideal two-stage resion with intercooling with a polytropic exponent of 1.3. (20%)

5. Show that any flow of heat between two heat reservoirs at temperatures T_H and T_C , where $T_H > T_C$, must be from the hotter to the cooler reservoir. (15%)
6. Fig. A shows the relation of pressure to volume for a closed PVT system during a reversible process. Calculate the work done by the system for each of the three steps 12, 23 and 31 and for the entire process 1231. (15%)
7. For any closed PVT system show that (10%)
- (a) $ds = \frac{C_v dT}{T}$ for a process at constant volume.
- (b) $ds = \frac{C_p dT}{T}$ for a process at constant pressure.
8. Show that for an ideal gas with constant heat capacities the slope of a PV curve for a reversible, adiabatic process is negative and that it has a larger absolute value than the slope of a PV curve for an isotherm at the same values of P and V. (10%)

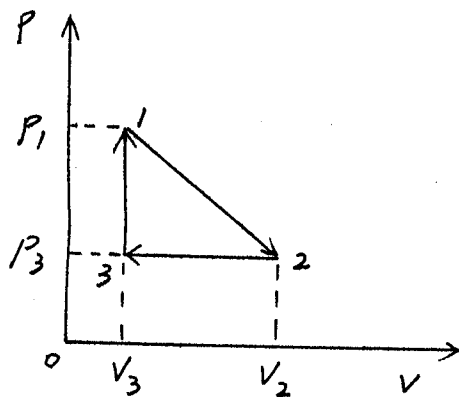


Fig. A