1. (25%) A 50-kg iron block (Cp=0.45 KJ/kg °C) and a 20-kg copper block(Cp=0.386 KJ/kg °C), both initially at 80 °C, and dropped into a large lake at 15 °C. Thermal equilibrium is established after a while as a result of heat transfer between the blocks and the lake water. Determine the total entropy generation (KJ/ °K) for this process.

2. (25%) Define or describe the following:
   (a) Joule-Thompson coefficient (8%)
   (b) Generalized compressibility chart (8%)
   (c) The advantage of multistage compression with inter-cooling (9%)

(背面仍有題目,請繼續作答)

3. In a Carnot heat engine, the heat addition changes the working fluid from saturated liquid to saturated vapor at T, P. The heat rejection process occurs at lower temperature and pressure (T-ΔT), (P-ΔP). The cycle takes place in a piston cylinder arrangement where the work is boundary work. Apply both the first and second law with simple approximations for the integral equal to work. Then show that the relation between Δp and ΔT results in the Clapeyron equation in the limit ΔT → dT (25%)

4. An air-standard Diesel cycle has a compresion ratio of 18, and the heat transferred to the working fluid per cycle is 1800 KJ/kg. At the beginning of the compresion procss the pressure is 0.1 MPa and the temperature is 15°C. the constant pressure specific heat is 1.0035. Determine
   (a) The pressure and temperature at each point in the cycle.
   (b) The thermal efficiency
   (c) The mean effective pressure. (25%)