NAME :

Quiz 3

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(a) Consider two subsystems separated by an impermeable and immovable wall that only transfers heat. The energies of each system (U_1 and U_2 respectively) are allowed to change, but the total energy $U = U_1 + U_2$ is conserved.

Using the fact that the entropy is extremised at thermal equilibrium (i.e. $\mathrm{d}S = 0$), show that at equilibrium the temperatures of both subsystems will be the same, i.e. that $T_1 = T_2$. [3]

Hint: Remember that the total energy is conserved!

(b) Consider a gaseous system taken from A to B along a curve P^3V = constant, as shown in Figure (1). The internal energy of this system is given by $U = 2.5PV - 5kJ$. Find (i) the change in the internal energy, (ii) the work done, and (iii) the heat transferred. [6]

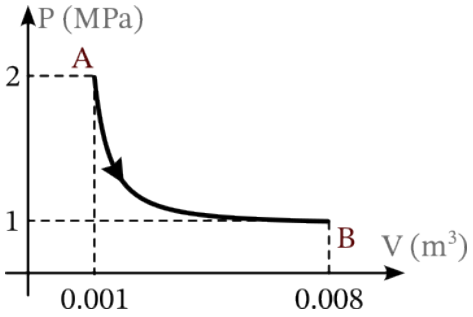

Figure 1: A thermodynamic system is taken from $A \rightarrow B$ along P^3V = constant. Note that 1MPa = 10^6 Pa.

(c) Is the process given above adiabatic? Explain, but be succinct. [1]