Open Quantum systems and quantum Thermodynamics

Quiz 3

November 2024

Full marks: 30
Time: 1 hour

Q1. Consider a quantum system (with Hamiltonian $H(t)$)under the influence of some environmental modes is going through a dynamics expressed by Lindblad type master equation.
a) Define heat current and power(workdone per unit time) for this system. (2+2)
b) If the system was going through a unitary evolution, what would have been its ~~heat~~ corresponding heat current? Please support your answer with mathematical clarification. (2+4)
c) What is the first law of Thermodynamics and its form in open system dynamics as described above? (5)
d) What is a monotone function - explain with an example. What is entropy production rate? What is the second law of Thermodynamics and its form in open system dynamics as described above? (3+2+10)