Indian Institute of Science

Quantum Information Theory

Instructor: Shayan Srinivasa Garani
Homework #4, Fall 2023

Late submission policy: Points scored = Correct points scored $\times e^{-d}$, d = # days late

Assigned date: Nov. 22nd, 2023   **Due date:** Nov. 30th, 2023, in the class

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PROBLEM 1: Obtain the mutual information of the following: (a) dephasing channel with parameter p (b) erasure channel with parameter ϵ. (8 pts.)

PROBLEM 2: Prove that pure states $\phi^{AA'}$ are sufficient to determine the mutual information of a quantum channel. (7 pts.)

PROBLEM 3: In the class, we proved $P(\mathcal{N}_1 \otimes \mathcal{N}_2) \leq P(\mathcal{N}_1) + P(\mathcal{N}_2)$. Prove the other way around so as to establish the additivity result for the private information of a degraded wiretap channel. (5 pts.)