End Semester

Consider the following commutation relation between two operators

X and$P$ $[X, P] = i\mathbf{I}(\mathbf{I} \rightarrow$ identity operator).

Further consider

$H = X^2 + P^2; S = \frac{XP+PX}{2}; K = H^2.$

Then the following commutator $[P, [K, S]]$ amounts to be,

- [ ] a. XP
- [ ] b. P^2
- [ ] c. X^2
- [x] d. X^3

The classical information capacity of a bipartite state ρ_{AB} of $N * N$ dimension is given by $C(\rho) = log_2 N + S(\rho^B) - S(\rho_{AB})$ where $S(\rho) = -Tr[\rho log_2 \rho]$ and $\rho_B = Tr_A(\rho_{AB})$. Therefore the classical capacity of the bell state $|\psi >= \frac{1}{\sqrt{2}}(|00 > +|11 >)$ is

Consider the following master equation

$\frac{d\rho}{dt} = \gamma(\sigma_- \rho \sigma_+ - \frac{1}{2}\sigma_+ \sigma_- \rho - \frac{1}{2}\rho \sigma_+ \sigma_-);$

where

$\sigma_- = |0 >< 1|; \sigma_+ = (\sigma_-)^+;$

$|0 >= [0, 1]^T; |1 >= [1, 0]^T; |\pm >= \frac{|1>\pm|0>}{\sqrt{2}};$

The solution of this master equation is dynamical map Λ if ρ_s is the state,such that $\Lambda(\rho_s) = \rho_s$; then for the given operation ρ_s is

Consider the operation

$$\Lambda(\rho) = \Sigma_i A_i \rho A_i^{\dagger}$$

where

$$A_1 = \sqrt{1-N}(|0><0| - \sqrt{1-\gamma}|1><1|)$$
$$A_2 = \sqrt{\gamma(1-N)}|0><1|$$
$$A_3 = \sqrt{N}(\sqrt{1-\gamma}|0><0| + |1><1|)$$
$$A_4 = \sqrt{\gamma N}|1><0|$$

Then which of the following statements are true

- [ ] a. The operation is not completely positive if N=1
- [ ] b. The operation is completely positive under only when γ is strictly less than 1.
- [x] c. The operation is positive
- [ ] d. The operation is complete positive under the condition$\gamma, N \in [0,1]$