B.Tech. – VIEP – ELECTRONICS AND COMMUNICATION ENGINEERING (BTECVI)

Term-End Examination

ロロ525   **June, 2019**

BIELE-009 : QUANTUM COMMUNICATION

Time : 3 hours   *Maximum Marks : 70*

Note : *Attempt any* ***seven*** *questions. All questions carry equal marks. Missing data, if any, may be suitably assumed. Use of scientific calculator is permitted.*

1. State Heisenberg Uncertainty Principle. Explain its significance in context to quantum mechanics. *4+6*

2. Explain open and closed quantum state dynamics. Briefly discuss the terms : Open system measurements, Open system quantum maps, and Positive operator valued measurements. *4+6*

3. Explain, how classical bits are encoded into the z-axis spin projection of an electron. *10*

4. Explain compressing ensembles of quantum states and also discuss the relation of pure state ensemble compression with Von Neumann entropy. *10*

5. Derive an expression which establishes the relationship between mixed-state compression and Holevo's Theorem. *10*

6. Briefly explain : *5+5*

   (a) Scaling issues in Hilbert space.

   (b) Role of quantum entanglement in quantum channel capacity.

7. What are the various notions for quantum communication over quantum channels ? Briefly discuss these notions. *10*

8. (a) What is the Calderbank-Shor-Steane code ? Explain. *5*

   (b) What is Shor 9-qubit code ? State its use. *5*

9. Explain with derivations for King-Ruskai-Swarez-Werner Qubit Channel Representation theorem. *10*

10. Write short notes on *any two* of the following : *5+5*

   (a) Kraus Representation Theorem

   (b) Von-Neumann Entropy

   (c) Stinespring Theorem