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BIELE-009

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

Term-End Examination

June, 2015 00451

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.*

1. Explain the following theorems as applicable for open system quantum evolution : *5+5=10*

   (a) Stinespring Theorem

   (b) Kraus Representation Theorem

2. In the context of quantum mechanics, what is the significance of open and closed system dynamics ? Give their definitions and signify unitary evolution of density matrix. *10*

3. What is the procedure for transmission of classical information over quantum channels ? How are classical bits encoded into z-axis spin projection of an electron ? *5+5=10*

4. With the help of a suitable example, explain Von Neuman Entropy in the context of Quantum Information Theory. *10*

5. Explain "Holevo-Schumacher-Westmoreland Theorem" for classical channel capacities of quantum channels. *10*

6. Clearly explain the Qubit channel representation theorem as given by King-Ruskai-Swarez-Werner in context to Quantum State Compression. *10*

7. Briefly signify "SHOR result on entanglement assisted channel capacities for transmission of quantum states over quantum channels." *10*

8. Define the following : $4 \times 2\frac{1}{2} = 10$

   (a) Hilbert Space

   (b) Density Matrix

   (c) Heisenberg Uncertainty Principle

   (d) Pure and Mixed States

9. What are SHOR–9 Qubit codes for protection against bit flips and phase flips ? Explain in brief. *10*

10. Write short notes on any ***two*** of the following : $2 \times 5 = 10$

    (a) Calderbank-Shor-Steane (CSS) Codes

    (b) Scaling Issues in Hilbert Space

    (c) Compressing Ensembles of Quantum States
