

**Syllabus for PhD Admission Test**  
**Part - B**  
**Electronics and Communication Engineering**

**Duration: 90 Minutes**

**8 question to be attempted out of 12 question.**

**Communication Systems:**

Analogue and Digital Communication, Amplitude and Frequency Modulation, Superheterodyning, Modulators and Demodulators, Fourier and Laplace Transforms, Probability and Stochastic Processes as used in communication systems. Correlation Techniques and Matched Filtering, M-ary Modulation Techniques including MSK, Orthogonal Coding, Multi Carrier Modulation Techniques – OFDM, Multi-user Detection Theory, Spread Spectrum Techniques.

**Digital Signal Processing:**

Fourier Transform and Fast Fourier Transforms. Architecture and Features of Different Digital Signal Processors. Digital Filters and their Applications. Optimal, Stochastic and Adaptive DSP Techniques. Multidimensional Filtering and Applications.

**Electromagnetic Theory, Microwave Techniques and Antenna:**

Maxwell's Equations, Boundary Conditions, Reflection & Refraction of EM wave in different media. Wave Equations, Poynting Theorem, Polarization. Transmission lines. Waveguides, Microwave Devices and Components, Directional Coupler, Microwave Cavities, Microstrip and Stripline, Fundamental of Antennas, Dipole, Loop, Aperture Antennas, Broadband & Frequency Independent Antennas. Microstrip Antennas.

**Optical Communication:**

Loss and Dispersion Mechanism in Optical Fibers. Characteristics and Features of different Optical Wave Length Windows for Communication. Optical Sources, Detectors and Passive Devices & Components. Power and Data Rate Link Budgets. Optical Amplifiers. WDM and DWDM. Optical Networks.

### **Wireless & Mobile Communication:**

Frequency Bands for Wireless and Mobile Communications. Propagation Models and Fading. Interference and system capacity, Handoff strategies, Cellular Concept, Rayleigh and Ricean fading, GSM, CDMA and 3G Communication Systems. GPRS, Bluetooth, Wi-Fi and WIMAX. Wireless Data Networks and Standards. OFDM, MIMO Systems.

### **Telecommunication Networks:**

Circuit and Packet Switching Techniques and Systems. Digital Telephone Networks. Digital Multiplexing Hierarchy. OSI Reference Model. Data Link, Network and TCP/IP Layers and their Standards. Routing Protocols. LAN, MAN and WAN and respective standards. Broadband Telecommunication Networks – ATM. Network Security and Network Management.

### **Information and Coding Theory:**

Information theory– concept of information, Entropy, Mutual Information, Channel Capacity, Redundancy and Efficiency of channels. Source Coding– encoding techniques, purpose of encoding, Instantaneous codes, Kraft's inequality. Parity check coding, Linear block codes, Error detecting and correcting codes, Standard array and Syndrome decoding techniques, Cyclic codes– encoding and decoding of cyclic codes, BCH codes, RS codes. Convolutional codes– State, Tree and Trellis diagrams, decoding of convolutional codes- Viterbi algorithm, Turbo Codes.

### **VLSI Circuits and Digital Systems:**

Building Blocks of VLSI and Simulation Tools. MOS, CMOS and MOSFET Transistors, Circuits and Applications. CMOS Logic Circuits. Semiconductor Memories. Synchronous and Asynchronous State Machine Design, Circuits and Applications. CMOS Combinational/Sequential Circuits. Timing Constraints in CMOS design. RAM and ROM Cells. VLSI Digital ICs, embedded systems.