SYLLABUS OF WRITTEN TEST FOR RECRUITMENT TO THE POST OF SCIENTIST/ENGINEER 'SC'
ADVERTISEMENT NO.: सैक SAC: 01:2026, Dated 23.01.2026

DOMAIN: ELECTRONICS AND COMMUNICATION
Post Code – 06

Digital Communication

Communication Channel modeling, AWGN channels, Signal space concepts, Geometric structure of the signal space, vector representation, signal norms, and inner product, orthogonality, Gram-schmidt orthogonalization, Analog & Digital modulation schemes and variants, Eye diagram, Channel Equalization techniques, Scrambling and descrambling, Inter-symbol interference (ISI), Matched filter and correlation receiver, Optimum receiver for AWGN channels & its performance, Timing Synchronization & frequency & Phase estimation techniques, Phased Lock Loop Design & Performance, Optimal detection and error probability for digital modulation schemes.

Digital Signal Processing

Discrete time signals and systems, Properties of LTI Systems, Convolution, Impulse response, Fourier series, Fourier Transform, Laplace Transform, Region of Convergence, Analysis of Discrete Time Signals and LTI DT systems, DTFT, Z-Transform, Uniform baseband/bandpass Sampling Theorem and aliasing, Periodic & Circular convolutions; Fast Fourier Transforms, Digital filter design, Architectures of Digital Signal Processors(DSP). Discrete Random Process, Linear Estimation and Prediction, Adaptive filters, Multirate Signal Processing, Interpolation & Decimation.

Information Theory & coding

Entropy, Joint and conditional entropies, Channel capacity, Shannon Fano coding, Huffman coding, classification of codes, Source coding theorem, Shannon limit for noisy channels, Wireless Channel SIMO, MISO, MIMO channel, Error Control Coding. Hamming codes, Linear block codes, Cyclic codes, Convolution codes, RS codes, Concatenated Codes, BCH codes, Turbo codes, LDPC codes, Polar codes & its Decoding Techniques with Performance analysis.

Wireless Communication

Rayleigh/Rician fading, Multipath Channels, Linear Time Varying Systems, Channel Delay & Doppler Spread, Concept of diversity, spatial diversity and diversity order, Spread Spectrum techniques & RAKE Receiver, Orthogonal Frequency Division Multiplexing & MIMO in wireless channel, Frequency Reuse & Mobility Management, Non-Linear and Adaptive Equalization techniques, Vocoders and GSM Codec, Wireless Systems and Standards (3G/4G/5G), Internet of Things, NTN.

Satellite Communication

Kepler's laws, Satellite Orbits & Orbital Parameters, Satellite Station Keeping, Satellite Communication Links Design, System Noise Temperature, Propagation Impairments & Atmospheric effects, Types & Elements of Satellite Transponder, Ground Earth Station subsystems & Tracking System, Telemetry & Telecommand, Channel Access methods viz: TDMA, FDMA, CDMA, SDMA methods and its applications.

Electromagnetic Theory & Microwave Theory–

Review of Basic Electromagnetic Theory, Maxwell's equations, Wave Equation, Time-Harmonic Fields, Plane waves in lossless and lossy media, Poynting's Theorem, boundary conditions, Reflection and Transmission of waves.

Theorems and Concepts: The Generalized Current Concept, Circuit-Field Relations, Auxiliary Vector potentials, The source concept, Duality, Uniqueness, Image Theory, The Equivalence Principle, Induction and Reciprocity theorems, Green's Functions. Guidance of Waves in Rectangular and circular waveguides, Microwave circuits and systems, Microwave devices, Microwave Tubes, Monolithic Microwave Integrated Circuits (MMICs).

Antennas Theory –

Fundamental: Concepts of antenna parameters, Radiation from Wires and Loops: dipole antenna and variants, Aperture Antennas: Huygens' principle, radiation from rectangular and circular apertures, design considerations, Babinet's principle, Fourier transform method in aperture antenna theory, Horn and Reflector Antennas: design concepts, parabolic reflector antennas, Microstrip Antennas: Basic characteristics, feeding methods, methods of analysis, design of rectangular and circular patch antennas, Antenna Arrays: Analysis of uniformly spaced arrays with uniform and non-uniform excitation amplitudes, synthesis of antenna arrays

Basic Electronics & Communication

Basic Electronics, Electronic Devices & Circuits, Semiconductor Physics, Network Theory, Analog and digital electronics, electrical measurement and instruments, Control Theory and systems, microprocessor and microcontroller, Analog and digital communication, Electromagnetics, Antenna & Waves propagation fundamentals, transmission lines, Maxwell' Equation, Analogue & digital modulation and demodulation techniques, FPGA & ASIC fundamentals, wired and wireless communication systems, satellite communication, Modern cellular communication systems, Engineering Mathematics.

Hindi version shall follow.