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 – 05

Specialization Module (Extended):

Semiconductor Devices and modelling:

Energy bands in solids, intrinsic and extrinsic semiconductors, carrier concentration and statistics, drift and diffusion currents, continuity equation, recombination-generation mechanisms, PN junction diode characteristics, depletion capacitance, breakdown mechanisms, MOS capacitors, threshold voltage, body effect, MOSFET I–V characteristics, regions of operation, channel length modulation, mobility degradation, velocity saturation, subthreshold conduction, short channel effects, leakage mechanisms, scaling laws,

Analog IC Design:

MOSFET large and small signal models, biasing techniques, current mirrors, differential amplifiers, multi stage amplifiers, frequency response and pole-zero analysis, compensation, stability analysis; Op-amps, slew rate and large signal behaviour, noise analysis, feedback concepts; bandgap reference circuits, PLL /DLL , Oscillators, RF basics (LNA. Mixers etc.) low-power analog design techniques, layout considerations

Mixed Signal IC Design:

Sampling theory, sample-and-hold circuits, quantization and noise, ADC architectures including Flash, SAR, Pipeline and basics of Sigma-Delta converters, DAC architectures, non-idealities., performance parameters, mixed-signal layout considerations,

Digital IC and system Design:

CMOS gate characteristics, switching threshold and noise margins, propagation delay and power dissipation, latches and flip-flops, timing parameters such as setup time, hold time and clock skew, metastability, dynamic logic, pass transistor logic, transmission gates, logical effort, low-power design techniques, clock generation and distribution.

Boolean algebra and logic minimization, combinational and sequential circuit design, finite state machines, state Machine encoding , datapath and control unit design, pipelining , retiming, arithmetic circuits including adders, multipliers, multiplexers, counters, registers, memory types and organization, cache basics, hardware description languages basics, FPGA architecture, ASIC design flow, synthesis , layout, VHDL, Verilog fundamentals timing performance parameters.

VLSI Fabrication, Testing and Verification:

Silicon wafer processing, oxidation, diffusion, ion implantation, photolithography, etching processes, thin film deposition (CVD, PVD basics), CMOS fabrication steps, latch-up basics, scaling trends, process variations.

Fault models including stuck-at, transition and delay faults, fault simulation, test pattern generation techniques, design for testability (DFT), scan chain design, boundary scan, built-in self-test (BIST), JTAG concepts, yield analysis, verification methods

Embedded Systems

Embedded system architecture, microcontroller and processor architectures, memory and peripherals, interfacing techniques, communication protocols including UART, SPI, I2C, CAN, real-time embedded system design, interrupt handling, hardware-software co-design, low-power embedded systems, system-level design considerations.

Real-time system concepts, scheduling algorithms, task management, inter-process communication, synchronization issues, deadlocks, priority inversion, context switching, interrupt latency,

Processor architecture, instruction set design, addressing modes, assembly language basics, pipelining concepts, interrupts and exception handling, memory, cache basics, bus architecture, ARM architecture fundamentals, embedded processor interfacing.

Digital Signal Processing

Discrete-time signals and systems, linear time-invariant systems, convolution, sampling theorem, aliasing, Z-transform, Fourier transform, convolution, correlation, Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT), FIR and IIR filter design, windowing techniques, filter realization structures, quantization effects, DSP applications.

Basic Electronics and 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.

Hindi version shall follow.