Entrance Test Syllabus (NEP)

for

M. Sc. Electronics Programme offered at the Department of Electronics and Instrumentation Technology, *University of Kashmir, Srinagar*

(Effective from Academic Session 2025-26)

UNIT-I: Circuit Analysis

Concept of Voltage and Current Sources. Kirchhoff's Current Law, Kirchhoff's Voltage Law. Mesh Analysis. Node Analysis. Star and Delta networks, Star-Delta Conversion. Principal of Duality. Superposition Theorem. Thevenin's Theorem. Norton's Theorem. Reciprocity Theorem. Maximum Power Transfer Theorem. Two Port Networks: h, y and z parameters and their conversion.

Unit-II: Semiconductor Devices-I

Junction Diode and its applications: PN junction diode (Ideal and practical)- I-V characteristics, dc load line analysis, Quiescent (Q) point. Zener diode, Rectifiers- Half wave rectifier, Full wave rectifiers (center tapped and bridge), ripple factor and efficiency. Zener diode as voltage regulator. Bipolar Junction Transistor: Review of the characteristics of transistor in CE and CB configurations, Regions of operation (active, cut off and saturation), Current gains α and β. Relations between α and β. dc load line and Q point.

Unit-III: Semiconductor Devices-II

Unipolar Devices: JFET and MOSFET. Construction, working and I-V characteristics (output and transfer), Pinch- off voltage. Transistor biasing and Stabilization Circuits-Fixed Bias and Voltage Divider Bias. Thermal runaway, stability and stability factor S. Input and Output impedance, Current and Voltage gains. Class A, B and C Amplifiers. RC Coupled Amplifier and its Frequency Response. Concept of feedback, negative and positive feedback.

UNIT-IV: Number System and logic Gates

Decimal, Binary, Octal and Hexadecimal number systems, base conversions. Representation of signed and unsigned numbers, BCD code. Binary, octal and hexadecimal arithmetic; addition, subtraction by 2's complement method, multiplication. Logic Gates and Boolean algebra: Truth Tables of OR, AND, NOT, NOR, NAND, XOR, XNOR, Universal Gates, Basic postulates and fundamental theorems of Boolean algebra.

Unit-V: Combinational Logic Analysis and Design

Standard representation of logic functions (SOP and POS), Minimization Techniques (Karnaugh map minimization up to 4 variables for SOP). Arithmetic Circuits: Binary Addition. Half and Full Adder. Half and Full Subtractor, 4-bit binary Adder/Subtractor. Multiplexers, De-multiplexers, Decoders, Encoders.

Unit-VI: Sequential Circuits

Flip Flops: SR, D, T and JK Flip-Flops. Clocked (Level and Edge Triggered) Flip-Flops. Preset and Clear operations. Race-around conditions in JK Flip-Flop. Master-slave JK Flip-Flop.
Shift Registers: Serial-in- Serial-out, Serial-in-Parallel-out, Parallel-in-Serial-out and Parallel-in-Parallel-out Shift Registers (only up to 4 bits).
Counters: Ring Counter. Asynchronous counters, Decade Counter. Synchronous Counter.
Logic Families: Characteristics of logic families- Fan-in, Fan out, Noise Margin, Power Dissipation, Figure of merit, Speed power product, RTL, DTL, ECL, TTL and CMOS.

UNIT-VII: Operational Amplifier

Operational Amplifiers: Basic differential Amplifier, Block Diagram of Op-Amp (IC 741), Characteristics of an Ideal and Practical Operational Amplifier, Open and Closed Loop configuration, Concept of Virtual Ground.
Op-Amp Parameters: Input Offset Voltage, Input Offset Current, Input Bias Current, Common Mode Rejection Ratio (CMRR), Slew Rate, Power Supply Rejection Ratio (PSRR).
Op-Amp with Negative feedback: General concept of Voltage Series, Voltage Shunt, Current Series and Current Shunt Negative Feedback, Op Amp circuits with Voltage Series and Voltage Shunt Feedback.

Unit- VIII: Linear and Non-linear Applications of Operational Amplifier

Applications of Op-Amps: Inverting and Non-inverting Amplifiers, Summing and difference Amplifier, Instrumentation Amplifier, Differentiator and Integrator, Comparator and Schmitt Trigger.
Data Converters: Analog-to-Digital (Flash and Successive Approximation type), Digital-to-Analog Converters (Weighted Resistor and R-2R Ladder type).

Unit-IX: Operational Amplifier Based Filters, Oscillators and Timers

Active Filters using Op-Amps: First and Second Order Active Low Pass, high Pass, Band Pass and Band Stop Butterworth Filters.

Oscillators and Signal Generators: Barkhausen criterion for Sustained Oscillations, Phase Shift Oscillator, Wien-bridge oscillator, Square Wave Generator, Triangle Wave Generators.
IC 555 Timer: Introduction, Block diagram, Astable and Monostable multivibrator circuits.

UNIT-X: Signals and Systems

Representation and Classifications of Continuous and Discrete Time Signals and Systems; Linear and Nonlinear systems, Causal and non-causal Systems, Time varying and Time Invariant systems, Singularity Functions; Convolution Operation of Continuous and Discrete Time Signals; Impulse Response and Its Properties.
Fourier Transform and its Properties; System Analysis Using Fourier Transform; Representation and Analysis of Bandpass Signals and Systems: Review of Laplace Transform; Two-Sided Laplace Transform; System Analysis of I and II Order Systems; Transfer Function; Frequency Response of I and II Order Systems.

Dr. Pankaj Kr. Upadhyay Dr. J. A. Sheikh Dr. Shabir A. Parah

Unit-XI: Discrete Time Systems (15 HOURS)

Sampling: Representation of a Continuous-Time Signal by its Samples, Sampling Theorem. Reconstruction of a Signal from its Samples, Aliasing, Discrete-Time Processing of Continuous-Time Signals: Arithmetic operations on discrete time signals. Solutions of Discrete time systems using Z-transform. Introduction to Random Variables; Probability Distribution and Probability Density Functions.

UNIT-XII: Microprocessor Architecture and Programming

Computer System: Central Processing Unit, Memory, I/O, System Bus; Von Neumann and Harvard Architectures, CISC and RISC Architectures; Introduction to Microprocessors, Characteristics of Microprocessors, Programmer's Model of Microprocessors. Introduction and Architecture of 8085 Microprocessor, 8085 Bus Structure, Addressing Modes, 8085 instructions set (Data transfer including stacks. Arithmetic, logical, branch, and control instructions), Subroutines, delay loops, Instruction and Data Formats. Instruction Timing Diagram, Memory read/write Timing Diagrams. 8085 Interrupts. Programming of 8085 using Data Transfer, Arithmetic and logic Instructions.

Unit-XIII: Microcontroller Architecture and Programming

Introduction/Evolution and Applications of Microcontrollers, Comparison of Microprocessor and Microcontroller, Introduction and Architecture of 8051 microcontroller, Pin description of 8051 microcontroller, Input/Output Ports and Port circuits, Timers and counters, Serial data input/output Interrupts, register set and Addressing Modes of 8051, Instruction set of 8051 (data transfer/arithmetic/logic/bit level and byte control transfer instructions), Introduction to 8051 Assembly Language Programming.

Unit-XIV: Analog Modulation and Demodulation

Basic Mathematical theory of A. M modulation, Time domain and Frequency domain representation, Generation and demodulation of AM Signal, Double Side band Suppressed Carrier, (DSB- SC) System, Generation and Demodulation of DSB- SC signals, Advantages of SSB transmission, Generation of SSB; Vestigial Side-Band Modulation (VSB). SSB and VSB demodulation, independent sideband transmission and reception. Concept of Angle Modulation, FM Generation and Detection

Unit-XV: Digital Modulation and Demodulation

Introduction to PCM, PAM and PWM. Review of Sampling Theorem, Signal Reconstruction: The Interpolation Formula, Elements of Pulse Code Modulation (PCM), Quantization: Uniform and Non-uniform Quantization, Companding Characteristics, Encoding. Differential PCM, Delta Modulation.

NOTE:

1. **Four multiple-choice questions will be set from each of the above units. Each question shall carry one mark.**