Entrance Test Syllabus

for

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

(Effective from Academic Session 2017)

Unit I: Network Analysis

Voltage and current sources, Network Laws: KCL-KVL-Current and voltage division theorems-Node and Mesh analysis-Applications to T and Π networks-Thevenin's and Norton's Theorems-Source transformation-Superposition Theorem. Time and Frequency Domain Analysis: RC-RL-LC and LCR circuits.

Unit-II: Semiconductor Materials and Devices

Qualitative Treatment of semiconductors: Metals-semiconductors and insulators, direct and indirect semiconductors, Charge carriers in semiconductors: Electrons and Holes, Intrinsic and Extrinsic Semiconductors, n-material and p- Semiconductors, Carrier concentration: Fermi level-EHPs-temperature dependence-conductivity and mobility-drift and resistance effect of temperature and doping on mobility. Qualitative treatment of PN junction: Barrier height, Depletion region and junction capacitance, Forward and reverse bias characteristics, Cut-in and breakdown voltages, Applications of diode as rectifier (half and full), Clipper and clamper, Special purpose diodes: Zener diode-Photodiode-LED and Tunnel Diode.

Unit-III: Transistors

NPN and PNP transistor action, h-parameter model analysis: expression of voltage and current gain-input and output impedance, Transistor configurations: CE-CB and CC, α and β of a transistor and their determination from characteristics. Need of Biasing, Biasing Techniques: base-feedback resistor -emitter resistor and voltage divider, bias stability, load line and operating point, Active-Saturation and cutoff, Transistor as an Amplifier and Switch. Field effect transistors (JFET and MOSFET): operation-pinch off and saturation-pinch off voltage- gate control- volt-ampere characteristics, n-channel and p-channel FETs, Enhancement and depletion types. FET biasing and application as an amplifier.

UNIT IV: Combinational Logic Design

Review of Number systems and Boolean Algebra, Logic gates, Representation of logic functions, Simplification using Karnaugh map, Tabulation method, Implementation of combinational logic using standard logic gates, Multiplexers and Demultiplexers, Encoders and Decoders, Code Converters, Adders, Subtractors, Parity Checker and Magnitude Comparator.

UNIT V: Sequential Logic Design

Flip Flops - SR. JK. D and T-Flip Flop: - Level triggering and edge triggering. Excitation tables - Counter - Asynchronous and synchronous t) pc Modulo counters. design with state equation state diagram. Shift registers, type of registers. circuit diagrams. Memory organia1tion, Classification. and characteristics of memories, Sequential memories, ROMs, R/W memories, Digital Logic Families: Introduction to bipolar Logic families: RTL, DTL, TTL.

Unit VI: Amplifiers

Classification of Amplifiers, RC coupled amplifiers, Analysis at low, mid and high frequencies, Direct coupled amplifiers, Frequency response, difference amplifiers, power amplifiers, class A, Class B , Push Pull, Efficiency and Cross over distortion in each , design of single stage and multistage RC coupled amplifiers.

Unit VII: Feedback and Oscillators

Positive and negative feedback, Effect of negative feedback on amplifiers gain, distortion, bandwidth, input and output impedances, Barkhuasans Criteria for sustained oscillations, Wein Bridge oscillator, RC Phase shift oscillator, Hartley's and Colpitts oscillator, Piezo electric effect, Crystal oscillators(Transistorized) Expression for oscillators condition and frequency of oscillations.

Unit VIII: Operational Amplifiers

Differential amplifier, OP-Amp building blocks, Characteristics (ideal and practical), Applications of OP- amp: inverting and non- inverting amplifier, phase shifter, adder, voltage follower, scale changer, comparator, Zero crossing detector, voltage to current converter, current to voltage converter, integrator, differentiator, difference amplifier and Phase shift oscillator (analysis in each circuit) Astable, Monostable and Bistable Multivibrators (Transistorized), Functional block diagram and pin diagram of 555 Timer. 555 timer applications: Astable and Monostable Multivibrator, Voltage control oscillator.

Unit IX: Measurement Fundamentals and DC Meters

What is measurement? Significance of measurement, methods of measurement. Basic definitions of instruments, Classification of instruments, Performance parameters: Accuracy, Precision, Sensitivity, Resolution, Errors, Significant figure, D'Arsonval movement, Construction and working, Dynamic behaviour, Damping mechanism, Temperature compensation, DC ammeter and voltmeter, Galvanometer sensitivities (Current , voltage Mega ohm , Ballistic), Ammeter and voltmeter loading, DC ohmmeters, Series and Shunt type ohmmeters.

Unit X: Bridges, AC meters and Oscilloscope

DC bridges: Wheatstone bridge, Kelvin double bridge, AC bridges: Maxwell bridge, Hay bridge, Schering bridge, Wein bridge, Electrodynamometer, Rectifier type of instruments (half wave and full wave) Multi range AC voltmeter, Peak to peak AC voltmeter, Thermocouple meter. CRO: Construction, operational principle and working, Measurement of voltage, Frequency and phase angle.

Unit-XI: Microprocessor Architecture and Instruction Set

Evolution of microprocessors, single chip microcomputers, Intel 8085, registers, flags, architecture and Pin Configuration, instruction cycle, timing diagram, memory/ I/O read and write operations, Instruction and data formats, addressing modes, Intel 8085 instruction set.

Unit-XII: Programming of Microprocessors and Interfacing

Introduction to programming, Machine, Assembly and high-level languages, ALP programming of 8085 μp, use of stacks, subroutines and Macros in ALP, some important commands: software dependent, Interrupts, Introduction to memory and I/O interfacing.

Unit XIII: Amplitude Modulation

Review of Electronic Communication systems. Wired and Wireless Communications, Need for modulation, Amplitude modulation, Mathematical representation of AM wave, Phasor representation of AM waves, Time domain representation of AM wave, Power relations in AM wave. Generation and demodulation of AM wave, High and low level modulation, square law modulation and Demodulation of AM wave, Envelope detector. Concept of super heterodyne receiver.

Unit XIV: Frequency Modulation

Concept of Angle modulation, meaning of instantaneous frequency, frequency deviation, modulation index, types of frequency modulation, Single tone FM, Mathematical analysis of single tone narrow band FM and wide band FM, Generation and detection of NBFM and WBFM, Direct method of FM generation, Indirect FM generation method, Discriminator method for FM demodulation, Ratio detector, Bandwidth requirement of FM signals.

Unit XV: Pulse Modulation and Mobile Communications

Sampling Theorem (Statement and Proof), Natural Sampling, Flat Top Sampling, Pulse Amplitude Modulation, PAM Modulator and Demodulator, Generation and Demodulation of Pulse Width and Pulse Position Modulated signal, Introduction to Pulse Code Modulation, Concept of Cellular Communications, Cell fundamentals, The Frequency reuse concept, Frequency reuse ratio, Roaming and Handoffs.

NOTE:

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