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 2020-21)

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), circuit diagrams, working and waveforms, ripple factor and efficiency. Zener diode as voltage regulator, Introduction to Tunnel diode, metal contact diode.

Unit-III: Semiconductor Devices - II

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. Unipolar Devices: JFET. 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.

Unit-IV: Amplifiers and Oscillators

Transistor as a two-port network, h-parameter equivalent circuit. Small signal analysis of single stage CE amplifier. Input and Output impedance, Current and Voltage gains. Class A, B and C Amplifiers. Cascaded Amplifiers: Two stage RC Coupled Amplifier and its Frequency Response. Concept of feedback, positive and negative feedback, advantages of negative feedback (Qualitative only). Barkhausen criterion for sustained oscillations. Phase shift and Colpitt's oscillator. Determination of Frequency and Condition of oscillation.

Unit- V: Linear Integrated Circuits and its Applications

Characteristics of an Ideal and Practical Operational Amplifier (IC 741), Open and closed loop configuration, Frequency Response. CMRR. Slew Rate and concept of Virtual Ground. Inverting and noninverting amplifiers, Summing and Difference Amplifier, Differentiator, Integrator, Wein bridge oscillator, Comparator and Zero-crossing detector, and Active low pass and high pass Butterworth filter (1st order only). Introduction to 555 timer.

Unit-VI: 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- VII: Combinational and Sequential 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.

SR, D, 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). Ring Counter. Asynchronous counters, Decade Counter. Synchronous Counter.

Unit- VIII: Analog Modulation

Introduction to communication – means and modes. Need for modulation. Block diagram of an electronic communication system Amplitude Modulation, modulation index and frequency spectrum. Generation of AM (Emitter Modulation), Amplitude Demodulation (diode detector), Concept of Single side band generation and detection. Frequency Modulation (FM) and Phase Modulation (PM), modulation index and frequency spectrum, equivalence between FM and PM, Generation of FM using VCO, FM detector (slope detector), Qualitative idea of Super-heterodyne receiver

Unit- IX: Digital Modulation

Channel capacity, Sampling theorem, Basic Principles-PAM, PWM, PPM, modulation and detection technique for PAM, PWM and PPM, Multiplexing. TDMA, FDMA. Need for digital transmission, Pulse Code Modulation, Digital Carrier Modulation Techniques, Sampling, Quantization and Encoding. Concept of PCM, DPCM and Delta modulation, introduction to digital pass band modulation schemes.

Unit- X: Mobile Telephony System

Basic concept of mobile communication, frequency bands used in mobile communication, concept of cell sectoring and cell splitting, SIM number, IMEI number, need for data encryption, architecture (block diagram) of mobile communication network, idea of GSM, CDMA, TDMA and FDMA technologies.

Unit- XI: Microcomputer Organization and 8085 Architecture

Input/Output Devices. Data storage (idea of RAM and ROM). Computer memory. Memory organization & addressing. Memory Interfacing. Memory Map. Main features of 8085. Block diagram. Pin-out diagram of 8085. Data and address buses. Registers. ALU. Stack memory. Program counter.

Unit- XII: 8085 Programming

Instruction classification, Instructions set (Data transfer including stacks. Arithmetic, logical, branch, and control instructions). Subroutines, delay loops. Timing & Control circuitry. Timing states. Instruction cycle, Timing diagram of MOV and MVI. Hardware and software interrupts.

Unit- XIII: 8051 Microcontroller Architecture and Programming

Introduction and block diagram of 8051 microcontroller, architecture of 8051, overview of 8051 family, 8051 assembly language programming, Program Counter and ROM memory map, Data types and directives, Flag bits and Program Status Word (PSW) register, Jump, loop and call instructions.

8051 I/O port programming: Introduction of I/O port programming, pin out diagram of 8051 microcontroller, I/O port pins description & their functions, I/O port programming in 8051 (using assembly language), I/O programming: Bit manipulation, Embedded systems and general purpose computer systems.

Unit- XIV: Instrumentation

Accuracy and precision. Significant figures. Error and uncertainty analysis. Shielding and grounding. Electromagnetic Interference. DC measurement-ammeter, voltmeter, ohm meter, Wheatstone bridge, Anderson's bridge, De Sauty's bridge, Wien's bridge. Power Supply, Oscilloscope, Signal Generators.

Unit- XV: Photonic Devices and Power Electronics

Light Emitting Diode (LED), LASERs, Photodetectors, Solar Cell, Power MOSFET, Silicon Controlled Rectifier (SCR)- structure, I-V characteristics, Turn-On and Turn-Off characteristics, ratings, Gate-triggering circuits, Diac and Triac- Basic structure, working and V-I characteristics.

NOTE:

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