# TAMIL NADU PUBLIC SERVICE COMMISSION

### Post of Principal / Assistant Director (Training)
### Included in the Tamil Nadu Employment and Training Service
### Electronics and Instrumentation Engineering (Degree Standard)

## UNIT – I   Analog Electronics:

Characteristics of Diode, BJT, JFET, SCR, UJT, MOSFET, Diode Circuits – Differential Amplifiers, Feedback Amplifiers, Oscillators – Operational Amplifiers: Characteristics and Circuit Configuration, Instrumentation Amplifier, Precision Rectifier, V to I and I to V Converter, Operational Amplifier based active filters, Oscillators and Signal Generators.

## UNIT – II   Digital  Electronics:

**Digital Logic Theory:** Number Systems – Combinational Logic Circuits – Minimization of Boolean Functions – IC Families: TTL, MOS and CMOS – Arithmetic Circuits, Multiplexer & Decoders – Sequential Circuits: Flip Flops, Counters, Shift registers, Schmitt Trigger, Timers, Multivibrators, S/H circuit, Analog to Digital and Digital to Analog Converters.

**Microprocessor and Microcontrollers:** General 8 Bit Microprocessor Architecture – 8085, 8086 Processor – Architecture, Memory, I/O Interfacing, Instruction Set, Addressing Modes, Timing Diagram & Delays, Machine Cycles, Interrupts, Counters, Assembly Language Programming, 8 Bits Microcontroller: 8051 Architecture, Bus Configuration, Instruction Sets, Programming & Applications.

## UNIT – III  Digital Signal Processing and Communication Engineering:

**Discrete Time Signals and Systems:**    LTI Systems, Causality, Convolution and Correlation – Z Transform and its Inverse – Discrete Fourier Transform – IIR and FIR Filter design.

**Communication Engineering:**    Amplitude and Frequency Modulation and Demodulation – Pulse Code Modulation.  Digital Communication System: ASK, FSK and PSK.  Digital Communication Concepts – Network Protocols – ISO/OSI reference Model - Fiber Optic Communication.

## UNIT IV   TRANSDUCER ENGINEERING:

Units and Standards - Calibration Methods - Error and Uncertainty Analysis - Static Characteristics and Dynamic Characteristics of First and Second Order Transducers for Standard Test Inputs - Resistive, Capacitive, Inductive, Piezo - Electric, Magneto - Strictive, Hall effect and Smart Sensors.

## UNIT V   ELECTRICAL AND ELECTRONIC MEASUREMENTS:

Measurement of Resistance, Capacitance and Inductance using Bridges - Power and Energy Measurements - Potentiometers, Galvanometers, Instrument Transformers - Digital Voltmeter, Multimeter - Time, Phase and Frequency Measurements - Oscilloscopes - Display and Recording Devices.

## UNIT VI      INDSUTRIAL INSTRUMENTATION:

Measurement of Force, Torque, Velocity, Acceleration, Vibration, Density, Viscosity, Humidity and Moisture. Measurement of Flow, Level, Temperature and Pressure.

## UNIT VII     ANALYTICAL AND BIO-MEDICAL INSTRUMENTATION:

**Analytical Instruments**: Spectrophotometers - Spectral Methods of Analysis - Source, Detectors and Applications – Ion Conductivity: Sampling Systems, Ion Selective Electrodes, Conductivity and pH meters - Gas Analyzers – Chromatography  - NMR and X-Ray Spectroscopy - GM and Proportional Counters - Mass Spectrometers.

**Bio Medical Instruments:**     ECG, EEG and EMG.

## UNIT VIII     CONTROL SYSTEMS:

Block Diagram Reduction - Signal Flow Graphs - Time Response - Frequency Response - Root Locus - Routh Hurwitz Criterion - Nyquist Stability Criterion - Lead/Lag Compensators.

## UNIT IX     PROCESS CONTROL:

Process Modeling:  Level, Thermal and Gas Processes - Interacting and Non Interacting Systems - Characteristics of ON/OFF, PID Control Modes - PID Controller Tuning - Control Valve Characteristics and Sizing - Cascade, Feed Forward, Ratio, Adaptive and Multi Variable Control - Transfer Function and State Space Models of Continuous and Discrete Processes.

## UNIT X     PLC,SCADA AND DCS:

**PLC:**   Architecture, Ladder and Functional Block Programming.

**SCADA:**   RTU, Master Station and Communication.

**DCS**:   Field Control Unit, Operator and Engineering Interfaces, Displays - HART and Field Bus Communication Protocols.