



# NATIONAL INSTITUTE OF TECHNOLOGY TIRUCHIRAPPALLI - 620015

## DEPARTMENT OF INSTRUMENTATION AND CONTROL ENGINEERING

### SYLLABUS FOR WRITTEN TEST

Engineering Mathematics: Linear Algebra, Calculus, Differential Equations, Analysis of Complex Variables, Probability and Statistics, Numerical Methods.

Electrical Circuits: Mesh and nodal analysis, Superposition, Thevenin, Norton and other basic theorems. Transient and steady state RLC circuit analysis.

Signals and Systems: Periodic, aperiodic and impulse signals; Laplace, Fourier and z-transforms; transfer function, frequency response, impulse response of systems; convolution, correlation. Discrete time system.

Control Systems: Feedback principles, signal flow graphs, transient response, steady-state errors, bode plot, phase and gain margins, Routh and NY Quist criteria, root loci, design of compensators, state-space representation of systems. On-off, P, PI, PID, cascade, feed forward, and ratio controllers, tuning of PID controllers and sizing of control valves.

Digital Electronics: Combinational logic circuits, minimization of Boolean functions. timers and counters; sample-and-hold circuit, multiplexer, analog-to-digital and digital-to-analog converters. Characteristics of ADC and DAC

Embedded Systems: Microprocessor and microcontroller applications, memory and input-output interfacing; basics of data acquisition systems, basics of distributed control systems (DCS) and programmable logic controllers (PLC).

Measurements: SI units, standards, systematic and random errors in measurement, expression of uncertainty - accuracy and precision, propagation of errors, linear and weighted regression. Bridges for measurement of R, L, C and frequency, Q-meter. timer/counter, time, phase and frequency measurements, digital voltmeter, digital multimeter; oscilloscope, shielding and grounding.

Sensors and Industrial Instrumentation: Resistive-, capacitive-, inductive-, piezoelectric, Hall effect sensors and associated signal conditioning circuits; transducers for industrial instrumentation: displacement, pressure (including low pressure), flow (variable head, variable area, electromagnetic, ultrasonic, turbine and open channel flow meters) temperature (thermocouple, bolometer, RTD (3/4 wire), thermistor, pyrometer and semiconductor); liquid level, 4-20 mA two-wire transmitter.