# DEVI AHILYA VISHWAVIDYALAYA, INDORE INSTITUTE OF ENGINEERING AND TECHNOLOGY ELECTRONICS AND INSTRUMENTATION ENGINEERING

#### SYLLABUS FOR DOCTORAL ENTRANCE TEST (DET)

#### Effective from March 1, 2018

# **SECTION-** A

Section-A shall consist of 50 objective type compulsory questions of (01) mark each based on research aptitude. It shall be of generic nature, intended to assess the research aptitude of the candidate. It will primarily be designed to test reasoning ability, data interpretation and quantitative aptitude of the candidate.

#### **SECTION-B**

Section-B shall consist of 50 objective type compulsory questions of (01) mark each based on the syllabus of the subject as follows:

### UNIT 1- ANALOG AND DIGITAL ELECTRONICS

Binary arithmetic, Logic families, Combinational logic design, Sequential logic design, Multivibrators, Programmable logic devices, Digital design using VHDL.

Types of diodes and their applications, BJT current components, Transistor as amplifier, Eber Moll's model, CB,CE and CC configuration, transistor at low frequency, Two port devices and hybrid model, Feedback amplifier, classification of amplifiers, Operational amplifier, Basic op-amp circuits, Oscillators and signal generators, Active filters, IC voltage Regulators. Types of MOSFETS, Structure and operation of MOS transistor, CS and CD amplifier, PMOS,NMOS and CMOS, Transfer characteristics, CMOS Inverter, CMOS based low power digital circuit design

### UNIT II- SIGNALS AND SYSTEMS, CONTROL SYSTEM

LTI systems and their properties, continuous and discrete time systems, Laplace transform, Z-transform and their properties, Inverse Z-transform, Discrete Fourier transform, FFT, IIR and FIR systems.

Basic control system, Block Diagrams and their reduction, Open loop and closed loop systems and stability analysis, Signal flow graphs, transient and steady state analysis of LTI control systems and frequency response. Tools and techniques for LTI control system analysis: root loci, Routh-Hurwitz criterion, Bode and Nyquist plots. Control system compensators lead and lag compensation, elements of Proportional-Integral-Derivative (PID) control. State variable representation and solution of state equation of LTI control systems.

### UNIT III- MICROPROCESSOR, MICROCONTROLLER AND EMBEDDED SYSTEMS

Comparison among microprocessors, micro controller and computer, 8085 microprocessor its architecture, Instruction set, Addressing modes, Counter and time delay, Stack and subroutine, code conversion, Basic interfacing concept, memory interfacing, Memory mapped and peripheral mapped I/O techniques.

Microcontroller, 8051 architecture, input/output ports and circuits, data transfer, arithmetic, logical, branch instructions, bit-related instructions, Addressing modes, assembly language programming, Interrupts, Counter and timers, Serial data transmission, Interfacing with keyboard and display devices, A/D and D/A converters, waveform generation , frequency and pulse width measurement, stepper motor control.

Definition of Embedded System, Embedded Systems Vs General Computing Systems, Major Application Areas, Purpose and characteristics of Embedded Systems, Core of the Embedded System: General Purpose and Domain Specific Processors, Embedded system architecture: RISC and CISC.

## UNIT IV- COMMUNICATION AND OPTICAL INSTRUMENTATION

Amplitude- and frequency modulation and demodulation; Shannon's sampling theorem, pulse code modulation; frequency and time division multiplexing, amplitude-, phase-, frequency-, pulse shift keying for digital modulation; OSI and TCP/IP Model, Data rate limitations, Transmission Media, Data link layer Protocols, MAC Protocols, Connecting Devices, Addressing Modes, Routing Protocols, IPv4 and IPv6, UDP and TCP Protocols, QoS and Congestion control, ETHERNET, WLAN, BLUETOOTH and WIMAX.

Optical sources and detectors: LED, laser, photo-diode, light dependent resistor and their characteristics; interferometer: applications in metrology; basics of fiber optic sensing.

# UNITV-MEASUREMENT TECHNIQUES, SENSORS AND INDUSTRIAL INSTRUMENTATION

Measurement of R, Land C. Measurements of voltage, current, power, power factor and energy, Time, phase and frequency measurements. Resistive-, capacitive-, inductive-, piezoelectric-, Hall effect sensors and associated signal conditioning circuits; transducers for industrial instrumentation: displacement (linear and angular), velocity, acceleration, force, torque, vibration, shock, pressure (including low pressure), flow (differential pressure, variable area, electromagnetic, ultrasonic, turbine and open channel flow meters) temperature (thermocouple, bolometer, RTD, thermistor, pyrometer and semiconductor); liquid level, pH, conductivity and viscosity measurement.