Devi Ahilya University, Indore

Syllabus for Ph.D. Entrance Exam (DET)

Faculty: Engineering Sciences **Subject: Electronics**

PART B

Unit I

Electronics Transport in semiconductors, PN Junction, Diode equation and diode equivalent circuit, Breakdown in diode. Zener diode, Tunnel diode, characteristics and equivalent circuits of BJT, JFET, MOSFET, Fabrication of Semiconductor devices and ICs.

Unit II

SMPS, UPS, inverters, converters, Biasing of Bipolar junction transistors and JFET. Single stage amplifiers, Multistage amplifiers. Feedback in amplifiers, oscillators, function generators, multivibrators, Operational Amplifiers (Op Amp) characteristics and applications, Computational Applications, Integrator, Differentiator, Wave-shaping circuits, F to V and V to F converters, Active filters, Schmitt trigger, Phase locked Loop.

Unit III

MOS Technology and VLSI, Scaling of MOS devices, NMOS and CMOS structures and fabrication, Characteristics of MOS transistors and threshold voltage, NMOS and CMOS inverters, Charge Coupled Devices (CCD) –structure, charge storage and transfer. Basics of VLSI design, stick diagrams, Layout design rules.

Unit IV

Logic families, flip-flops, Gates, Boolean algebra and minimization techniques, multiplexers and demultiplexers, Arithmetic Circuits, Multivibrators and Clock Circuits, Counters: Ring, Ripple, Synchronous, Asynchronous, Up and down, Shift registers, Memories, A/D and D/A Converters

Unit V

Superposition, Thevenin, Norton and Maximum Power Transfer Theorems, Network elements, Network graphs, Nodal and Mesh Analysis. Laplace Transform, Fourier Transform and Z-transform. Time and frequency domain response, Passive filters, Two-port Network parameters: Z, Y, ABCD and h parameters. Transfer functions, Signal representation, State variable method of circuit analysis, AC circuit analysis, Transient analysis, Zero and Poles, Bode plots.

Unit VI

Microprocessors and Microcontrollers: Architecture of 8085, Addressing Modes, 8085 instructions set, 8085 interrupts Programming, Memory and I/O interfacing.
Introduction to Microcontrollers – 8051 for embedded Systems, Architecture and register set of Microcontroller 8051, Addressing modes, Instruction set of 8051 - Data transfer instructions, Arithmetic instructions, Logic instructions, bit level and byte level instructions, 8051 assembly programming - Stack operations, subroutines, interrupts, 8051 programming as timer/counter, 8051 serial communication, 8051 interfacing : with RS232, LED/LCD display, Keyboard, Stepper Motor.

Unit VII

Maxwell's equations, Time-varying fields, Wave equation and its solution, Rectangular waveguide, Poynting vector, Antenna parameters, Half-wave antenna, Transmission lines,

mpedance, Impedance matching, Smith Chart.

Unit VIII

Basic principles of amplitude, frequency and phase modulation, Demodulation, Intermediate frequency and principle of super heterodyne receiver, Spectral Analysis and signal transmission through linear systems, Random signals and noise, Noise temperature and noise figure. Basic Concepts of information theory, Digital modulation and Demodulation PM, PCM, ASK, FSK, PSK, Time-division Multiplexing, Frequency-division Multiplexing, Data Communication Circuits, Line – codes, Error detection and correction codes, GSM, GPRS and modems.

Unit IX

Programming in C: Elements of C- Tokens, Identifiers, datatypes in C. Control Structures in C. Sequence, selection and iterations. Structured data types in C – arrays, struct, union, string, pointers, file handling in C.

Unit X

Transducers – Resistance, Inductance, Capacitance, Piezoelectric, Thermoelectric, Hall effect, Photoelectric, Measurement of displacement, velocity, acceleration, force, torque, strain, temperature, pressure, flow, humidity, thickness, pH. Measuring Equipment – Measuring of R, L, C. Bridge and potentiometers, voltage, current, power, energy, frequency/time, phase, Digital multimeters, CRO, Digital Storage Oscilloscope, Spectrum Analyzer, Biomedical Instruments – ECG, EEG, Blood Pressure Measurements, MEMS and its applications Sensors for IoT Applications.