Kadi Sarva Vishwavidyalaya, Gandhinagar

PART-1(BASICAWARENESSANDAPTITUDEONRESEARCH)–50Marks

PART-2 Syllabus for Ph.D Entrance Test: Electronics and Communication Engineering

(Marks-50)

Unit 1: Engineering Mathematics:

Differential Calculus, Partial differentiation and its applications, Curve Tracing, Beta And Gamma Function, Integral Calculus, Multiple Integrals and its applications, Infinite Series and Introduction to Probability. Matrix Theory and Application of Matrices, Eigen value and Eigenvector and Applications, Vector Space, Linear Transformation, Vector differential Calculus, Vector Integral Calculus First Order Ordinary Differential Equations, Higher Order Ordinary Differential Equations, Partial Differential Equations and Applications, Laplace transforms, Fourier Series ,Fourier transform, Complex numbers and Calculus of Complex functions , Complex Integration, Power Series, Conformal Mapping and its applications, Interpolation, Solution of polynomial and transcendental equations, Numerical solution of Differential Equations

Unit 2: Fundamentals of Electronics Engineering:

Electronic Devices: Energy bands in semiconductors. p-n junction diode, Zener diode, tunnel diode, BJT, JFET,CMOS, LED, PIN and avalanche photo diode, Basics of LASERs. Device technology, Simple diode circuits, clipping, clamping, rectifier. Biasing and bias stability of transistor and FET amplifiers. Amplifiers and oscillators

Unit 3: Networks, Signals and Systems

Circuit analysis: Node and mesh analysis, superposition, Thevenin's theorem, Norton's theorem, reciprocity. Sinusoidal steady state analysis: phasors, complex power, maximum power transfer. Time and frequency domain analysis of linear circuits: RL, RC and RLC circuits, solution of network equations using Laplace transform.

Continuous-time signals: Fourier series and Fourier transform, sampling theorem and applications.

Discrete-time signals: DTFT, DFT, z-transform, discrete-time processing of continuous-time signals.

LTI systems: definition and properties, causality, stability, impulse response, convolution, poles and zeroes, frequency response, group delay, phase delay.

Unit 4: Digital Circuits

Number representations: Binary, integer and floating-point- numbers. Combinatorial circuits: Boolean algebra, minimization of functions using

Boolean identities and Karnaugh map, logic gates and their static CMOS implementations, arithmetic circuits, code converters, multiplexers, decoders.

Sequential circuits: latches and flip-flops, counters, shift-registers, finite state machines, propagation delay, setup and hold time, critical path delay.

Data converters: sample and hold circuits, ADCs, and DACs.

Semiconductor memories: ROM, SRAM, DRAM.

Unit 5: VLSI & Embedded Systems

VLSI: Basics of CMOS & MOSFET, Basic of Amplifiers, feedback topologies, Basics of differential amp & Op-amp, Current sinks ,sources & references, Comparators, ADC & DAC,DPLL CMOS process enhancement,. Circuit characterization and performance estimation: Delay estimation, Logical effort and transistor sizing, Power dissipation, Interconnect design margin, Reliability, DFT.

Embedded Systems: Basics of Embedded systems, Microprocessor and Microcontroller Architecture, Basics of Programming.

Unit 6: Communication

Random processes: auto correlation and power spectral density, properties of white noise, filtering of random signals through LTI systems.

Analog communications: amplitude modulation and demodulation, angle modulation and demodulation, spectra of AM and FM, super heterodyne receivers.

Information theory: entropy, mutual information, and channel capacity theorem.

Digital communications: PCM, DPCM, digital modulation schemes (ASK, PSK, FSK, QAM), bandwidth, inter-symbol interference, MAP, ML detection, matched filter receiver, SNR and BER. Fundamentals of Error Correction, Hamming codes, CRC.

Unit 7: Computer Networks

Various protocols and functions of each layers specified in OSI and TCP/IP protocol suits along with their intercommunication.

Unit 8: Control Systems

Basic control system components; Feedback principle; Transfer function; Block diagram representation; Signal flow graph; Transient and steady-state analysis of LTI systems; Frequency response; Routh-Hurwitz and Nyquist stability criteria; Bode and root-locus plots; State variable model and solution of state equation of LTI systems.

Unit6: Electromagnetic, Microwaves & Antennas

Maxwell's equations: differential and integral forms and their interpretation,

boundary conditions, wave equation, Poynting vector.

Plane waves and properties: reflection and refraction, polarization, phase and group velocity, propagation through various media, skin depth.

Transmission lines: equations, characteristic impedance, impedance matching, impedance transformation, S-parameters, Smith chart. Rectangular and circular waveguides, light propagation in optical fibers, dipole and monopole antennas, linear antenna arrays.

References:

For references of above mentioned curricula, one may refer to the references mentioned withintheindividual courses available on the site of LDRP-ITR.