# SYLLABUS PH.D. ENTRANCE TEST(2020)

(ELECTRONICS & COMMUNICATION ENGINEERING DEPARTMENT)
(U.I.E.T., KURUKSHETRA UNIVERSITY, KURUKSHETRA)

**Instructions for Paper Setter:**
Part I shall have a minimum of 30 questions (MCQ) of 2 marks each.
Part II shall have a minimum of 70 questions (MCQ) of 2 marks each with equal distribution from the entire syllabus mentioned for Part II.
Total Marks for the paper = 200 Time=2 Hrs

**Part I:**

**Verbal Ability:** English grammar, sentence completion, verbal analogies, word groups, instructions, critical reasoning and verbal deduction.
**Numerical Ability:** Numerical estimation, numerical reasoning and data interpretation.
**Elementary knowledge of MS office**: MS word : Creating, editing, saving and printing text documents, font and paragraph formatting , inserting table, page breaks, working with images, using spelling and grammar check. MS excel: creating, editing, saving, and printing spreadsheet, working with function and formulas, graphically representing data charts and graphs. MS Power point: opening, viewing, creating and printing slides, applying to auto layouts adding custom animation, graphically representing data.

**Part II:**

**Networks:** Network solution methods: nodal and mesh analysis; Network theorems: superposition, Thevenin and Norton's, maximum power transfer; Steady state sinusoidal analysis using phasors; Time domain analysis of simple linear circuits; Solution of network equations using Laplace transform; Frequency domain analysis of RLC circuits; Linear 2 port network parameters: driving point and transfer functions.

**Signals and Systems:** Continuous-time signals: Fourier series and Fourier transform representations, sampling theorem and applications; Discrete-time signals: discrete-time Fourier transform (DTFT), DFT, FFT, Z-transform, interpolation of discrete-time signals; LTI systems: definition and properties, causality, stability, impulse response, convolution, poles and zeros, parallel and cascade structure, frequency response.
Electronic Devices: Energy bands in intrinsic and extrinsic silicon; Carrier transport: diffusion current, drift current, mobility and resistivity; Generation and recombination of carriers; Poisson and continuity equations; P-N junction, Zener diode, BJT, MOS capacitor, MOSFET, LED, photo diode and solar cell.

**Analog Circuits:** Small signal equivalent circuits of diodes, BJTs and MOSFETs; Simple diode circuits: clipping, clamping and rectifiers; Single-stage BJT and MOSFET amplifiers: biasing, bias stability, mid-frequency small signal analysis and frequency response; BJT and MOSFET

3/2/2020 Deepak 3/2/2020

Radhika 3/2/20 3/2/2020

amplifiers: multi-stage, differential, feedback, power and operational; Simple op-amp circuits; Active filters; Sinusoidal oscillators: criterion for oscillation, single-transistor and op-amp configurations; wave-shaping circuits and 555 timers.

**Digital Circuits:** Number systems; 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 and PLAs; Sequential circuits: latches and flip flops, counters, shift registers and finite state machines; Data converters: sample and hold circuits, ADCs and DACs; Semiconductor memories: ROM, SRAM, DRAM; microprocessor 8086: architecture, programming, memory and I/O interfacing.

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; Lag, lead and lag-lead compensation; State variable model and solution of state equation of LTI systems.

**Communication systems:** Random processes: autocorrelation 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, superheterodyne receivers, circuits for analog communications; Information theory: entropy, mutual information and channel capacity theorem; Digital communications: PCM, DPCM, digital modulation schemes, amplitude, phase and frequency shift keying (ASK, PSK, FSK).

**Electromagnetics:** Electrostatics; 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; Waveguides: modes, boundary conditions, cut-off frequencies, dispersion relations; Antennas: antenna types, radiation pattern, gain and directivity, return loss, antenna arrays.