DEPARTMENT OF ELECTRICAL ENGINEERING
MALAVIYA NATIONAL INSTITUTE OF TECHNOLOGY JAIPUR

Syllabus for PhD examination

Network theory:*Sources, R, L, C elements;, KCL, KVL, Node and Mesh analysis, networktheoremstransient and steady state responses,sinusoidalanalysis, resonance,twoportnetworks,balancedthreephasecircuits,star-deltatransformation,complexpowerandpower factorinaccircuits.*

ElectricalMachines:*Single phase transformer, equivalent circuit, representation and tests, regulation and efficiency; three-phase transformers and analysis, electromechanical energy conversionprinciples, DC machine of all types (generators and motors), analysis, characteristics, operation, tests and control, three-phase and single-phase induction motors, its operation and construction, characteristics, test, control, and applications, synchronous machine (generator and motor), its construction, starting, operation, characteristics, efficiency, and its protection methods.*

SignalsandSystems: *Continuousanddiscretetimesignals, sampling mechanism and its applications, Laplace transform and Z transform, R.M.S.value,averagevaluecalculationforanygeneralperiodicwaveform.*

PowerSystems: *Concepts of power generation, modelsandperformanceoftransmissionlinesandcables,economicloaddispatch, series and shunt compensation, insulators, distribution systems, per-unit quantities, bus admittancematrix, load flow methods, voltage and frequencycontrol,powerfactorcorrection,symmetricalcomponents,fault analysis, principles and operation of protection system,circuitbreakers,systemstabilityconcepts,equalareacriterion.*

ControlSystems: *Modeling and representation of systems, feedback mechanism, transferfunction,blockdiagramsandsignalflowgraphs,transientandsteady-stateanalysisof LTI systems, stability analysis, Nyquistcriteria, Bode methods, lag, lead and lead-lag compensators; P, PI and PIDcontrollers;statespacemodel,solutionofstateequationsofLTIsystem, introduction to nonlinear systems.*

PowerElectronics: *Characteristicsanddesign of thyristor circuits,MOSFET,IGBT;DC-DC conversion, single and three-phaseuncontrolled rectifiers, voltage and current commutated thyristorbased converters, bidirectional converters, magnitude andphaseoflinecurrentharmonicsforuncontrolledandthyristorbasedconverters,powerfactor and distortion factors,voltageandcurrentsourceinverters,sinusoidalpulsewidthmodulation.*

ElectromagneticFields:*Coulomb'slaw,electricfield,electricflux,Gauss'slaw,divergence, electric fieldandpotentialduetopoint,line,planeandsphericalchargedistributions,Lorentzforce,inductance,magnetomotiveforce,reluctance,magneticcircuits,selfandmutualinductanceofsimpleconfigurations.*

ElectricalandElectronicMeasurements: *Bridges and potentiometers, measurement of voltage, current, power, energy andpower factor; instrument transformers, phase, timeandfrequencymeasurement;oscilloscopes,erroranalysis.*

AnalogandDigitalElectronics: *Diode circuits, clipping, clamping, rectifiers, amplifiers, biasing, equivalent circuitand frequency response; oscillators and feedback amplifiers, active filters, combinatorialandsequentiallogiccircuits,multiplexers,sampleandholdcircuits,A/DandD/Aconverters.*