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JSS Mahavidyapeetha

JSS Science And Technology University

(Established Under JSS Science and Technology University Act No. 43 of 2013)

(Formerly Known as SJCE)

JSS SCIENCE AND TECHNOLOGY UNIVERSITY MYSURU

SYLLABUS FOR ENTRANCE EXAM FOR Ph.D. ADMISSIONS – 2019

ELECTRICAL AND ELECTRONICS ENGINEERING (PART-2)

Duration of Part-2: 1 Hour; Maximum Marks: 50; MCQ-based exam.

1. Electric Circuit, Field Theory, and Electrical Machines (10 Marks)

(a) Network topology.Node and mesh analysis. Transient response of D.C. and A.C. networks. Coupled circuits. Sinusoidal steady state analysis, resonance. Network theorem – Thevenin's/Norton's theorem, Superposition theorem, Maximum power transfer theorem. Two-port networks. Three-phase circuit analysis. Power and power factor in A.C. circuits.

(b) Coulomb's Law. Electric Field Intensity. Electric Flux Density.Gauss's Law. Divergence. Electric field and potential due to point, line, plane and spherical charge distributions. Effect of dielectric medium. Capacitance of simple configurations. Biot-Savart's law. Ampere's law. Curl, Faraday's law. Lorentz force. Inductance. Magnetomotive force. Reluctance. Magnetic circuits. Self and mutual inductance of simple configurations.

(c) Theory, modeling, performance characteristics, testing and operation of the following – single/three phase transformers, D.C. machines (separately excited, series and compound types), induction machines (squirrel-cage type and wound rotor type), synchronous machines (generators and motors). Methods of speed control of D.C. motors and induction motors.

2. Analog Electronics and Logic Design (10 Marks)

(a) Characteristics and modeling of the following – diodes, BJT, MOSFET. Simple diode circuits: clipping, clamping, rectifiers. Amplifiers –biasing, equivalent circuit and frequency response. Oscillators and feedback amplifiers. Operational amplifiers – characteristics and applications like simple active filters, VCOs, monostable and astable multivibrators.

(b) Combinational and sequential logic circuits. Multiplexers, demultiplexer , Schmitt trigger, sample and hold circuits, A/D and D/A converters.

3. High Voltage Engineering and Power Systems (10 Marks)

(a) Phenomenon of over voltages, types and impact on power system. Surge impedance. Tower top potential. Insulation coordination – basic impulse level, lightning arrestors and selection, voltage sharing. Breakdown phenomena in gaseous, liquid, and solid dielectrics. Corona. Generation of high voltage A.C., high voltage D.C. and high voltage impulses by different techniques. Techniques of measurement of high voltages and currents. Non-destructive insulation testing and high voltage tests on electrical apparatus. Applications of high voltage in electrostatic precipitators.

(b) Power generation concepts. A.C. and D.C.transmission concepts. Models and performance of transmission lines and cables. Electric field distribution and insulators. Distribution systems. Series and shunt compensation. Per unit quantities. Bus admittance matrix. Gauss-Seidel and Newton-Raphson methods of load flow. Voltage and frequency control. Power factor correction. Symmetrical components. Symmetrical and unsymmetrical fault analysis. Principles of overcurrent, differential and distance protection. Circuit breakers. System stability concepts. System stability concepts. Introduction to solar photo voltaic systems, wind power systems.

4. Power Electronics and Embedded Systems (10 Marks)

(a) Characteristics and modeling of semiconductor power devices – Diode, Thyristor, Triac, GTO, MOSFET, IGBT. D.C. to D.C. conversion – Buck, Boost and Buck-Boost converters. Single and three-phase configuration of uncontrolled rectifiers. Line commutated thyristor based converters. Bidirectional A.C. to D.C.voltage source converters. Issues of line current harmonics, power factor. Distortion factor of A.C. to D.C. converters, Single phase and three-phase inverters. Sinusoidal pulse width modulation.

(b) Fundamentals of microprocessor and microcontroller architectures. Architecture, programming and interfacing of 8051 or compatible MCU. Architecture, programming and interfacing of Atmega328P or compatible MCU.

5. Signal Processing and Control Systems (10 Marks)

(a) 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, group delay, phase delay, digital filter design techniques.

(b) Basic control system components. Feedback principle. Mathematical modeling and representation of systems. Transfer function. Block diagram representation. Signal flow graph. Transient and steady-state analysis of LTI systems. Frequency response. Routh - and Nyquist stability criteria. Bode and root-locus plots. Lag,lead and lag-lead compensation. P, P-I, P- I-D controllers. State variable model and solution of state equation of LTI systems.