

## ANDHRA PRADESH

### RECRUITMENT OF ASSISTANT PROFESSORS IN THE UNIVERSITIES SYLLABUS FOR THE SCREENING TEST

#### ELECTRICAL AND ELECTRONICS ENGINEERING SUBJECT CODE – 18

##### **Section 1: Electric Circuits**

Network elements: Ideal current and voltage sources, KCL, KVL, Node and Mesh analysis, Thevenin's theorem, Norton's theorem, Superposition theorem, Maximum power transfer theorem, Graph theory. Transient response of dc and ac networks, Sinusoidal steady-state analysis, Resonance. Two-port networks, three phase circuits, Power and power factor in ac circuits, Passive filters.

##### **Section 2: Electromagnetic Fields**

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.

##### **Section 3: Signals and Systems**

Representation of continuous and discrete-time signals, Shifting and scaling operations, Linear Time Invariant and Causal systems, Fourier series representation of continuous periodic signals, Sampling theorem, Applications of Fourier Transform, Laplace Transform and z-Transform.

##### **Section 4: Electrical Machines**

Electromechanical energy conversion principles, DC machines: separately excited, series and shunt, motoring and generating mode of operation and their characteristics, starting and speed control of dc motors; Single phase transformer: equivalent circuit, phasor diagram, open circuit

and short circuit tests, regulation and efficiency; Three phase transformers: connections, parallel operation; Auto-transformer. Three phase induction motors: principle of operation, types, performance, torque-speed characteristics, no-load and blocked rotor tests, equivalent circuit, starting and speed control; Operating principle of single-phase induction motors; Synchronous machines: cylindrical and salient pole machines, performance, regulation and parallel operation of generators, starting of synchronous motor, characteristics; Types of losses and efficiency calculations of electric machines.

### **Section 5: Power Systems**

Basic concepts of Renewable & Non-Renewable Power generation, ac and dc transmission concepts, Models and performance of transmission lines and cables, Series and shunt compensation, Electric field distribution and insulators, Distribution systems, Per-unit quantities, Bus admittance matrix, Gauss-Seidel and Newton-Raphson load flow methods, Voltage and Frequency control, Power factor correction, Symmetrical components, Symmetrical and unsymmetrical fault analysis, Principles of over-current, differential and distance protection; Circuit breakers, System stability concepts, Equal area criterion.

### **Section 6: Control Systems**

Mathematical modeling and representation of systems, Feedback principle, transfer function, Block diagrams and Signal flow graphs, Transient and Steady-state analysis of linear time invariant systems, Routh-Hurwitz and Nyquist criteria, Bode plots, Root loci, Stability analysis, Lag, Lead and LeadLag compensators; P, PI and PID controllers; State space model, State transition matrix.

### **Section 7: Electrical and Electronic Measurements**

Measurement of voltage, current, power, energy and power factor; Instrument transformers, Digital voltmeters and multimeters, Bridges and Potentiometers, Phase, Time and Frequency measurement; Oscilloscopes, Error analysis.

## **Section 8: Analog and Digital Electronics**

Characteristics of 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; Simple active filters, VCOs and Timers, Combinational and Sequential logic circuits, Multiplexer, Demultiplexer, Schmitt trigger, Sample and hold circuits, A/D and D/A converters, 8086Microprocessor: Architecture, Programming and Interfacing.

## **Section 9: Power Electronics**

Characteristics of semiconductor power devices: Diode, Thyristor, Triac, GTO, MOSFET, IGBT; DC to DC conversion: Buck, Boost and Buck-Boost converters; Single and three phase configuration of uncontrolled rectifiers, Line commutated thyristor-based converters, Bidirectional ac to dc voltage source converters, Issues of line current harmonics, Power factor, Distortion factor of ac to dc converters, Single phase and three phase inverters, Sinusoidal pulse width modulation.