SYLLABUS FOR THE POST OF ASSISTANT ENGINEER (ELECTRICAL)

1.Electrical Circuits and Measurements:-Concepts of current, voltage, power, pf, energy . resistance, specific resistance,temp. coefficient of resistance,cells and batteries, associated problems-magnetic circuits, electromagnetic induction-AC fundamentals and AC circuits (single phase & poly phase)

Measurements and Instrumentation:- Units and dimensions-measurement of resistance, inductance, and capacitance-range extension of instruments-measurement of power and energy-electronic Instruments-dual trace oscilloscope-transducers-display devices and signal generators

network analysis:- Basic concepts- network topology-network theorems-resonant circuits-transient behaviour and initial conditions-Laplace transformation and applications-two port network parameters, Bio-Medical instruments.

2. Electromagnetics:- Vector calculus, Guas's Stokes theorem. Maxwell's Equation, Electric field and potential due to point line, plain and spherical charge distribution. Ampere's law and Bio-savarts law; inductance; dielectric capacitance; Wave equation, poyinting vector, plane wave, propagation through various media , reflection, refraction, magnetic materials, semiconductors, materials for specific applications, Transmission line, skindepth, characteristics impedance, smith chart, impedance transformation waveguides, modes in rectangle waveguides, boundary conditions, cutoff frequency, dispersion reflection, propagation in dielectric waveguide.

3.Electrical Machines and Transformers:- DC generators- DC motors- losses and efficiency –testing of DC machines-synchronous machines-voltage regulation-synchronous motors.

Basic concepts of transformers--single phase transformers ,three phase transformers.

Basic concepts of 3 phase induction machines-3 phase induction motors-starting and speed control of induction motors- single phase induction motors.

4.Analog and Digital Electronics:- Diode circuits-transistor biasing-transistors at Low frequencies-transistor frequency response-general and feedback amplifiers-power amplifiers-oscillators- BJT & MOSFET amplifiers.

Linear IC and applications:-OP amps as amplifiers-OP amp frequency response and compensation-signal processing circuits-op amp non linear circuits-signal generator-active filters-specialized IC applications-DC voltage regulators.

Logic design:-Principles of combinational logic-analysis and design of combinational logic-sequential circuits-sequential design, ADA & DAC circuits.

5.Power Electronics:- Power semiconductor devices-power transistors-Thyristors-commutation techniques-controlled rectifiers-choppers-inverters-AC voltage controllers-electromagnetic

compatibility, Power Supplies, Primary and Secondary batteries, Basic battery charging concepts, Electric traction, basic concepts of adjustable speed DC & AC drives, industrial drives.

6.Microprocess &Microcontrollers:- 8 bit & 16 bit Microprocessors Introduction-8051 architecture, addressing modes, instruction set, programming, interfacing and applications, interrupts and timers and counters,serial communication,-8255 programmable peripheral interface-MSP 430 Microcontrollers- CPU architecture, Code composer studio, digital I/O-I/O ports, on chip peripherals, watchdog timer, comparator,using the low power features of MSP 430- interfacing LED, LCD, external memory, application.

7.Signals and Systems:- Introduction-time domain representation for LTI systems-Fourier representation of periodic signals-the Continuous time Fourier transform-the discrete time fourier transform-Z transforms.

Digital Signal Processing:-Discrete fourier transforms-fast Fourier transform algorithms-design of digital filters, IIR &FIR filters, realization of digital systems.

8.Electric Power Systems:-Generation-sources of power generation-hydro power generation-thermal power generation –nuclear power generation-economic aspects-substations-grounding systems.

Transmission and Distribution:-Typical transmission and distribution systems scheme-overhead transmission lines-insulators-corona-underground cables-line parameters-performance of power transmission lines- distribution.

Switch gear & Protection:-Switches and fuses-principles of circuit breakers-circuit breakers-lightening arresters-protective relaying-induction type relay-protection schemes. ELCB, ELR, MCB, Restricted Fault Current Relay, Numerical Relays.

High Voltage Engineering:- Introduction– breakdown phenomenon-generation of HV ac and dc voltage-generation of impulse voltage and current-measurement of high voltages-non-destructive insulation testing techniques-high voltage tests on electrical apparatus. symmetrical components; symmetrical three phase faults; unsymmetrical faults; fault analysis; principles of over-current, differential and distance protection; solid state relays and digital protection; principles of circuit breakers; circuit breakers; lightning arrestors; protective relaying; protection schemes; system stability concepts, swing curves and equal area criterion; HVDC transmission and Flexible A.C. Transmission systems (FACTS) concepts; testing and commissioning of electrical equipment; electromagnetic compatibility; renewable energy sources; energy auditing and demand side management; electrical power quality; distributed generation and safety management.

Electrical design estimating and costing:- General principles of estimation-residential building electrification-service connection ,inspection and testing of installation,

Earthing / Grounding, design of earth mat, step potential, touch potential, measurement of earth resistance, measurement of insulation resistance, power analyser.

9.Power System Analysis and Stability and Control:-Representation of power system components-symmetrical faults-symmetrical components-unsymmetrical faults-Stability studies-unbalanced operation of three phase induction motors.

Computer techniques in power system analysis:-Network topology-network matrices-load flow studies-economic operation of power system-transient stability studies.

Power system operation and control:- Control center operation of power systems-automatic voltage regulator-automatic load frequency control-control of voltage and reactive power-optimal system operation and unit commitment-power system security-system monitoring and control-power system reliability.

Control systems:-Modeling of systems-block diagram and signal flow graphs-time response of feed back control systems-stability analysis-root locus techniques-stability analysis in frequency domain-frequency domain analysis-Introduction to state variable analysis.

Modern Control Theory:-State variable analysis and design-transfer function-Eigen values-Eigen vectors-solution to state equation-pole placement techniques-non linear systems-stability of non linear systems.

10. Electrical Power Utilization:-Heating and welding-electrolytic process-illumination-electric traction-introduction to hybrid vehicles.

Industrial drives and applications:- Introduction to electrical drives and its dynamics-selection of motor power rating-DC motor drives-induction motor drives-synchronous motor drives-industrial drives, Illumination Laws of illumination – types of lamps, lighting schemes for indoor, outdoor, factory and street lighting, requirements of good lighting. Adequate illumination – Design of illumination schemes.

11. Management and Entrepreneurship:- Management –planning-organising and staffing-directing and controlling-entrepreneur-small scale industry-institutional support-preparation of project.