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Electrical Engineering Syllabus for Uttarakhand State Civil Services Preliminary Exam-2011

ELECTRICAL ENGINEERING

(i) **E.M. Theory:** Analysis of Electrostatic and magnetostatic fields. Laplace, Poisson & Maxwell's equations. Electromagnetic waves and wave equations. Poynting's Theorm. Waves on transmission lines. Wave-guides. Microwave resonators.

(ii) **Networks & Systems:** Systems and signals, Networks Theorems and their applications. Transient and state analysis of system. Transform techniques in circuit analysis laplace transform, fourien transform; Couppled circuits; Resonant circuits; Balanced three-Phase circuits; Network functions. Two port network parameters. Elements of driving point immitance synthesis problem. Elementary active network. Graph theory.

(iii) **Control Engineering:** Properties of feedback. Mathematical modeling of physical dynamic systems. Block diagram and signalflow graph and transfer function. Time response and frequency response analysis of linear control systems. Bode-plot, polar plot and Nichol's chart, phase margin and gain margin. Stability analysis of linear control system. Routh-Hurwitz and Nyquist criteria. Root-Locus technique. Basic concepts of compensator design. State-variable modeling, analysis & design of linear dynamic systems. Concept of controllability and observability and their testing methods. Control system components (Potentiometers, Techometers, Synchros & servomotors.)

(iv) **Electrical & Electronic Measurement & Instrumentation :** Basic methods of measurement. Error analysis. Electrical standards. Measurement of voltage, current, power, energy, resistance, inductance, capacitance and frequency. Indicating instruments. Bridge measurements. Electronic measuring instruments. Electronic multimeter, digital voltmeter, frequency counter, Q-meter, oscilloscope techniques, special purpose CROs.

Transducers and their classification. Temp., displacement, strain, pressure, velocity transducers, thermo-couple, thermistor, LVDT, strain gauges, piezo-electric crystal etc. transducers. Application of transducers in the measurement of non-electrical quantities like pressure, temperature, displacement, velocity, acceleration,flow-rate, etc. Data-acquisition systems

(v) **Ánalog & Digital Electronics:** Semiconductors and semiconductor diodes & zener-diode. Bi-polar junction transistor and their parameters.

Transistor biasing, analysis of all types of amplifiers including feedback and d.c. amplifiers. Operational amplifiers and their applications. Analog computers.

Feed back oscillators-colpitts and Hartley types; wave form generators. Multivibrators.

Boolean algebra, Logic gates. Combinational and sequential digital circuits.

Semiconductor memories, A/D & D/A Converters. Microprocessor: Number Systems and codes, elements of microprocessors & their important applications.

Communication System:

Amplitude frequency and phase modulation, their generation and demodulation, noise.

Pulse, PCM and delta modulation. Line and radio communication systems. Satellite communication television & radar engineering, fibre optic communication (F.O.C.).

Electrical Machines:

D.C. Machines: Commutation and armature reaction, characterstics and performance of motors and generators. Applications, starting and speed control.

Synchronous generators: Armature reaction, voltage regulation, parallel operation.

Single and three-Phase induction motors: Principle of operation and performance characteristics, starting and speed control.ss

Synchronous motors: Principle of operation, performance analysis, hunting, synchronous condensers.

Transformers: construction, phasor diagram, equivalent circuit, voltage regulation, performance, auto transformer, instrument transformer, three phase transformer.

Power Electronics & Drives :

Various power semiconductor devices, single and polyphase rectifiers. Controlled convertors & invertors. Choppers. A.C.Voltage controllers. D.C. regulated power supply.

Electric drives : Fundamentals, electric braking rating estimating. Power Electronic control of d.c. motors.

Power Systems:

Transmission line parameters, modeling and Performance. Insulators, Mechanical design of overhead transmission lines, corona. Underground cables. Surge phenomena. Fault analysis. Power system stability. EHV & HVDC transmission.

Arc extinction in circuit breakers. Restriking phenomena. Protective relays and schemes for protection of power system equipments.