

SCHEME AND SYLLABUS OF EXAMINATION FOR THE PURPOSE OF FILLING UP THE POST OF ASSISTANT ENGINEER (ELECTRICAL) UNDER SIKKIM STATE ELECTRICAL ENGINEERING SERVICE

1. The examination will consist of 2 papers:-

PAPERS	SUBJECT	FULL MARKS	TIME ALLOWED
PAPER-I	GENERAL ENGLISH & GENERAL KNOWLEDGE	100	1.00 HOUR
PAPER-II	ELECTRICAL ENGINEERING	300	3.00 HOURS
	VIVA-VOCE / PERSONALITY - 50 MARKS		

PAPER-I: GENERAL ENGLISH

The question will be designed to test the candidate's understanding and command of the English language. Mode of Examination pattern shall be objective MCQ Conventional/MCQ for both Paper-I, General English-General Knowledge and Paper-II Electrical Engineering.

GENERAL ENGLISH

Candidates will be required to answer questions designed to test their understanding of English and workman like use of words. The pattern of questions would be broadly as follows:

- 1) Comprehension of given passage.
- 2) Precise writing
- 3) Usages and Vocabulary
- 4) Short essay

GENERAL KNOWLEDGE

1. Current events of Local, National & International importance.
2. National level Schemes & Projects undertaken by Government of India.

BASICS OF ELECTRICAL ENGINEERING:

TOPICS:

- 1) DC Circuits
- 2) Magnetic Circuits
- 3) Single phase AC Circuits
- 4) Three Phase AC Circuits

Linear elements, passive elements, Bilateral Circuits elements, Voltages Sources, Current Sources, Source transformation, mesh current and node voltage analysis of DC circuits, Network Reduction Technique: Star –Delta and Delta –Star Transformation, MMF, Magnetic Flux , Reluctance, Flux density , self and Mutual inductance, Representation of sinusoidal voltages and currents, RMS value and average value, J-operator, phasors, Voltages and current relationship and instantaneous and average power in pure resistor, pure inductor and pure capacitor, Impedance , Admittance , Analysis of Circuits , Complex Power , active and reactive power, Power triangle, Symmetrical sinusoidal supply systems, Voltages , Currents and Power relationship in 3 – Phase balanced star and delta connected loads, analysis of three phase balance and unbalanced star delta connected loads.

NETWORK THEORY:

TOPICS:

- 1) KVL, KCL and Phasor calculation
- 2) Transient and Steady State Response.
- 3) Graph Theory.
- 4) Network Theorem
- 5) Two Port Networks.
- 6) Resonance.

Network graph, KCL, KVL, node and mesh analysis, transient response of dc and ac Networks, Sinusoidal steady state analysis, resonance, basic filter concepts, ideal current and voltage sources, Thevins ,Nortons and Superposition and maximum power transfer theorem, two port network, three phase circuit.

ELECTRICAL MACHINE:

TOPICS:

- 1) DC Machines
- 2) Transformers
- 3) Three Phase Induction Machines
Synchronous Machines
Single Phase Induction Motors, Special Purpose Machines and Electromechanical Energy Conversion System.

Transformer-equivalent circuit, Phasor diagram, tests regulation and efficiency, three phase transformer- connections, parallel operation, auto-transformer, energy conversion principles, DC machines-types, windings generator characteristics, armature reaction and commutation, starting and speed control of motors, three phase induction motors-principles, types, performance characteristics, starting and speed control, single phase induction motors, synchronous machines- performance, regulation and parallel operation of generators, motor starting, characteristics and application , servo and stepper motors.

POWER SYSTEM:

TOPICS:

- 1) Performance Transmission lines parameters & corona
- 2) Compensation Techniques and Voltage Profile controls.
- 3) Distribution systems , cables and Insulations
- 4) Economic Power Generation and Load Dispatch.
- 5) Fault analysis.
- 6) Power System Stability
- 7) Switch Gear and Protection
- 8) Generation Power Stations
- 9) Load Flow Studies.
- 10) High Voltages DC Transmission
- 11) Per Unit system
- 12) Power System Transients.

Basic power generation concept, transmission line models and cable performance, insulation, corona and radio interference, distribution system, per unit quantities, bus impedance and admittance matrices , load flow, voltage control , power factor correction, economic operation, symmetrical components, fault analysis , principles of over current , differential and distance protection, solid state relays and digital protection, circuit breakers, system stability concept, swing curves and equal area criterion, HVDC transmission and Fact Concepts.

CONTROL SYSTEM

TOPICS:

- 1) Mathematical model of physical system.
- 2) Feedback characteristics of control system
- 3) Time response analysis
- 4) Concept of stability
- 5) Root locus Techniques
- 6) Frequency Response Analysis
- 7) Design Of control System
- 8) State Variable Analysis.

Principle of feedback, transfer function, block diagrams, steady state errors, Routh and Niquist techniques, Bode plots, Polar plots, root loci, lag, lead and lag-lead compensation, state space model, state transition matrix, controllability and observability.

ELECTRICAL AND ELECTRONIC MEASUREMENTS:

TOPIC:

Characteristics of instruments and measurement system
Galvanometers, Voltmeters and Ammeters.
Measurement of Resistance and Potentiometers
AC Bridges.
Measurement of energy and power.
CRO and Electronic Measurements.
Instrument Transformer.

Bridges and potentiometers, PMMC, moving iron and induction type instrument , measurement of voltage, current, Power, energy and Power factor, instrument transformer ,digital volt meter and multimeters, phase time and frequency measurement, Q-meters, oscilloscopes, potentiometric recorder, error analysis.

ANALOG ELECTRONICS:

TOPICS:

- 1) Diode and their Applications.
- 2) BJT, FET and their Biasing Circuits.
- 3) Small Signal Analysis.
- 4) Operational Amplifiers,
- 5) Oscillators and Feedback Amplifiers.

Characteristics of diodes, BJT, FET, amplifiers-biasing, equivalent and frequency response, oscillators and feedback amplifiers, operational amplifiers- Characteristics and application, simple active filters, VCOs and timers.

DIGITAL ELECTRONICS:

Topic:

- 1) Boolean Algebra & Minimization
- 2) Logic Gates.
- 3) Combinational Logic Circuits.
- 4) Sequence Logic Circuits.
- 5) Logic Families
- 6) A/D and D/A Converters

Combinational and sequential logic circuits, multiplexer, Schmitt trigger, multi-vibrators, Sample and hold circuit, A/D and D/A converters.

POWER ELECTRONICS:

TOPIC:

- 1) Power Semiconductor Devices and Commutation Techniques.
- 2) Phase Controlled rectifiers.
- 3) Choppers
- 4) Inverters.
- 5) Electrical Drives

Semiconductor power diodes, transistors, diodes, triacs, GTOs, MOSFETs and IGBTs- Static Characteristics and Principal Of operations, Triggering Circuits, Phase Control rectifiers, bridge converters-fully controlled and half controlled, Principles of choppers and inverters, basic concept of adjustable speed dc and ac drives.

ELECTROMAGNETIC THEORY:

TOPIC:

Coordinate system and vector calculus.
Electrostatic Field,
Magnetostatic Fields.

- 5) Electromagnetic wave propagations.

Gauss Theorem, electric field and potential due to point, line plane and charge distributions, Amperes and Bio Savarat's laws, inductance, dielectrics and capacitance.

ENGINEERING MATHEMATICS:

Linear Algebra-Matrix algebra, System of linear equation, Eigen values and Eigen Vectors.

Calculus- First order equations(linear and non linear), Higher order linear differential equations with constant coefficient, Initial and boundary value problems, partial Differential Equations and variable separation method.

Complex Variable- Analytic functions, Cauchy's integral theorem and integral formula, Taylor and Laurent series, residual theorem, solutions integrals.

Probability and statistics: Sampling theormos, Conditional Probability, mean, median, mode and standard deviation, Random Variable Discrete and continuous distribution, Poisson, Normal and Binomial Distribution, correlation and regression analysis.

Transform theory- Fourier transform, Laplace transform and Z transform.

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