<p style="text-align:center">Paper-I</p>

ELECTRICAL ENGINEERING
<p style="text-align:center">(Degree Standard)</p>

<p style="text-align:right">CODE NO:-103</p>

UNIT – I: ELECTRICAL CIRCUITS

Circuit elements – Kirchoff's Laws – Mesh and Nodal Analysis - Network Theorems and Applications for DC and AC circuits: Thevenin's Theorem, Norton's Theorem, Superposition Theorem, Maximum Power Transfer Theorem – Sinusoidal Steady State Analysis of RL-RC-RLC Circuits- Resonant Circuits - Natural and Forced Response – Transient Response of RL-RC-RLC Circuits - Two - port networks– Three Phase Circuits-Star-delta transformation-real and reactive power-power factor.

UNIT – II: ELECTRIC AND MAGNETIC FIELDS

Coulomb's Law-Electric Field Intensity-Electric Flux Density-Gauss's Law-Divergence – Electric Field and Potentialdue to Point, Line, Plane and Spherical Charge Distributions - Effect of Dielectric Medium - Capacitance of Simple Configurations - Magnetic Circuits- Magnetomotive force – Reluctance - Faraday's laws-Lenz's law– Biot-Savart's law - Ampere's law - Fleming's Left and Right Hand Rule-Lorentz force - Inductance - Self and Mutual Inductance - Dot Convention-Coupled Circuits.

UNIT – III: MEASUREMENTS AND INSTRUMENTATION

Units and Standards – Static and Dynamic Characteristics – Types of Errors-Error Analysis – Measurement of Current, Voltage, Power, Power-factor and Energy – Indicating instruments – Measurement of Resistance, Inductance, Capacitance and Frequency – Bridge Measurements – Instrument Transformers-Electronic Measuring Instruments – Multi meters-True RMS meter-Spectrum Analyzer- Power Quality Analyzer- Recording Instruments-X-Y Recorder-Magnetic Recorders-Digital Data Recorder-Oscilloscopes-DSO-LED and LCD Display- Transducers and their applications to the Measurement of Non-Electrical Quantities like Temperature, Pressure, Flow-rate, Displacement, Acceleration, Noise level – Data Acquisition Systems – A/D and D/A Converters- Data Transmission Systems-PLC –smart meters.

UNIT – IV: CONTROL SYSTEMS

Mathematical Modelling of Physical Systems – Transfer Function - Block Diagrams and Signal Flow Graphs and their Reduction using Mason's Rule – Time Domain and Frequency Domain Analysis of Linear Time Invariant (LTI) System – Errors for Different Type of Inputs and Stability Criteria for Feedback Systems – Stability Analysis Using Routh-Hurwitz Array – Nyquist Plot and Bode Plot – Root Locus – Gain and Phase Margin – Basic Concepts of Compensator Design – PI, PD and PID Controllers-State Variable formulation- state transition matrix- Eigen values and Eigen vectors-free and forced responses of Time Invariant systems-controllability and observability.

UNIT –V: ELECTRICAL MACHINES

D.C. Machines – Construction, Excitation methods – Armature Reaction and Commutation – Characteristics and Performance Analysis – Generators and Motors–Starting, Speed Control and braking – Testing– Losses and Efficiency. Transformers-Types-Construction and Operation- Testing – Equivalent Circuits–Losses and Efficiency-All day efficiency – Regulation – Parallel Operation – Three Phase Transformers – Auto-transformer. Induction Machines – Construction, Principle of operation – Rotating Magnetic Field – Performance, Torque-Speed Characteristics, No-load and Blocked Rotor tests, Equivalent Circuit, – Starting, Speed Control and braking – Single-Phase Induction Motors – Linear Induction Motors – Hysteresis Motors – Reluctance Motors. Synchronous Machines – Construction – Operating characteristics and Performance analysis – Efficiency and Voltage regulation – Parallel operation – V and inverted V curves of synchronous motors – Power factor improvement- permanent magnet synchronous motor-Permanent magnet brushless DC motor – stepper motor

UNIT –VI: POWER SYSTEMS

Single Line Diagram of Power System-Per Unit Quantities-Power Generation Types- Hydro, Thermal and Nuclear Stations – Pumped storage plants – Co generation – Economic and operating factors – Modelling and performance characteristics of Power transmission lines and Cables-HVDC transmission–Mechanical Design of Transmission Lines-Sag-Insulators – Z_{Bus} and Y_{Bus} formulation-Load flow studies – Shunt and Series Compensation - Symmetrical and Un symmetrical Faults Analysis -Transient and Steady - State Stability of Power Systems – Equal Area Criterion-Voltage and Frequency Control – Power System Transients – Power System Protection – Circuit Breakers – Relays, classification of protection schemes-overcurrent, distance, differential and carrier-Equipment protection-transformer, generator, motor, busbars and transmission line –AC and DC Distribution-deregulation-energy conservation and energy auditing.

UNIT –VII: ANALOG AND DIGITAL ELECTRONICS

Semi conductor Devices – PN junctions – Transistors – FET – Zener, Photo diodes and their applications – Rectifier circuits – Voltage regulators – Multipliers. Biasing circuits – Small signal amplifiers – Frequency response – Multistage amplifiers – Coupling methods – Large signal amplifiers – Push-pull amplifiers – Feedback amplifiers – Oscillators – Operational amplifiers and its applications – Precision rectifiers – Multivibrators - Voltage Controlled Oscillator-Timer. Digital logic gate families (DTL,TTL,ECL,MOS,CMOS) – Logic gates - Simplification of Logic Functions- Design of Combinational circuits - Sequential logic circuits-latch–Flipflops– Counters – Registers – multiplexers and demultiplexers- Schmitt triggers-Memories (ROM, PLA and FPGA).

UNIT – VIII: POWER ELECTRONICS AND DRIVES

Principle of Operation and Static and dynamic behaviour of Power Semi conductor devices – Power Diode, DIAC, SCR, TRIAC, GTO, MOSFET and IGBT-

Single and Three Phase AC to DC Converters –uncontrolled and controlled rectifiers- performance parameters– Single and Three Phase AC to AC converters – Switched Mode Power Supplies–buck, boost and buck-boost converter topologies - switching losses-Inverters - Single and Three Phase Inverters – Voltage control-Pulse Width Modulation techniques - harmonic elimination techniques – Uninterrupted Power Supplies- Electrical drives-motor load dynamics-load torque characteristics - Speed Control of DC Drives– Converter / Chopper fed DC motor drives- Speed control of AC drives- induction motor drives –stator voltage control and V/f control-synchronous motor drives-V/f control, self control, margin angle control and power factor control.

UNIT –IX: DIGITAL PROCESSORS AND COMMUNICATION

Architecture of 8085, 8086 and 8051 – Instruction Sets – Assembly Language Programming – Interfacing for memory and I/O: 8255 Programmable Peripheral Interface 8253 Programmable Timer Interface–8279 Programmable Keyboard and Display Interface–8257 Direct Memory Access Interface - Embedded processors (ARM and PIC basics only). Classification of Signals and systems–Properties of Discrete Fourier Transforms-FFT Computation – FIR Filters – IIR Filters: Butterworth Filters – Chebyshev Filters. Digital Communication Systems Pulse Code Modulation and Demodulation– Adaptive Delta Modulation - Frequency Division and Time Division Multiplexing – Data Communication Network Topologies - 7-layer OSI Protocol - IoT concepts.

UNIT –X: RENEWABLE ENERGY SOURCES AND STORAGE DEVICES

Renewable Energy – Sources and Features - Solar Radiation Spectrum-Radiation Measurement - Solar Photovoltaic Cell – principle of operation - types-MPPT – Microhydel - Operating principle - Wind Energy – components - wind power turbine types - MPPT- Site Selection - Types of Wind Generators – smartgrid - Electric vehicles -V2G and G2V- Fuel Cells- Batteries - types and characteristics-Super Capacitors.