ELECTRICAL ENGINEERING
(For both objective and conventional
types papers)
PAPER - I
1. EM Theory
Electric and magnetic fields. Gauss'sLaw and Amperes Law. Fields in dielectrics,conductors and magneticmaterials. axwell's equations. Timevarying fields. Plane-Wave propagatingn dielectric and conducting media.Transmission lines.

2. Electrical Materials
Band Theory, Conductors, Semi-conductorsand Insulators. Super-conductivity.nsulators r lectrical and electronicapplications. Magnetic materials.erro and ferri magnetism. Ceramics,Properties and pplications. Hall effectand its applications. Special semi conductors.

3. Electrical Circuits
Circuits elements. Kirchoff's ws.Mesh and nodal analysis. NetworkTheorems and applications. Naturalresponse and forced response. Transientresponse and steady state responsefor arbitrary inputs. Propertiesof networks in terms of poles and zeros.Transfer function. Resonant circuits.Threephase circuits. Two-portnetworks. Elements of two-elementnetwork ynthesis.

4. Measurements and Instrumentation
Units and Standards. Error analysis,measurement of current, oltage,power, Power-factor and energy. Indicatinginstruments. Measurement ofresistance, inductance, Capacitanceand frequency. Bridge measurements.Electronic measuring instruments.Digital Voltmeter and frequencycounter. Transducers and their applicationsto the measurement of nonelectricalquantities like temperature,pressure, flow-rate displacement, acceleration,noise level etc. Data acquisitionsystems. A/D and D/A onverters

5. CONTROL SYSTEMS
Mathematical modelling of physical systems. Block diagrams and signalflow raphs nd their reduction. Timedomain and frequency domain analysisof linear dynamical system. Errorsfor different type of nputs and stabilitycriteria for feedback systems. Stabilityanalysis using Routh-Hurwitz array,Nyquist plot and Bode ot. oot locusand Nicols chart and the estimation ofgain and phase margin. Basic conceptsof compensator design. State ariablematrix design. Sampled data systemand performance of such a system withthe samples in the error channel. tabilityof sampled data system. Elementsof non-linear control analysis.Control system components, lectromechanical,hydraulic, pneumatic components.

PAPER – II
1. **Electrical Machines and PowerTransformers**Magnetic Circuits - Analysis and Designof Power transformers. Constructionand testing. quivalent circuits.Losses and efficiency. Regulation.Auto-transformer, 3-phase transformer.Parallel operation.Basic oncepts in rotating machines.EMF, torque, basic machine types.Construction and operation, leakagelosses and fficiency.D.C. Machines. Construction, Excitationmethods. Circuit models. Armaturereaction and commutation. haracteristicsand performance analysis. Generatorsand motors. Starting and speedcontrol. Testing, Losses and fficiency.Synchronous Machines. Construction.Circuit model. Operating characteristicsand performance analysis. ynchronousreactance. Efficiency. Voltageregulation. Salient-pole machine,Parallel operation. Hunting. Short circuittransients.Induction Machines. Construction.Principle of operation. Rotating fields.Characteristics and erformanceanalysis. Determination of circuitmodel. Circle diagram. Starting andspeed control.Fractional KW motors. ingle-phasesynchronous and induction motors

.**2. Power systems**Types of Power Stations, Hydro, Thermaland uclear Stations. Pumpedstorage plants. Economics and operatingfactors.Power transmission lines. Modelingand erformance characteristics. Voltagecontrol. Load flow studies. Optimalpower system operation. Load frequencycontrol. Symmetrical short circuitanalysis. Z-Bus formulation. SymmetricalComponents. Per Unit epresentation.Fault analysis. Transient andsteady-state stability of power systems.Equal area criterion.Power system ransients. Power systemProtection Circuit breakers. Relays.HVDC transmission.

3. ANALOG AND DIGITAL LECTRONICSAND CIRCUITS
Semiconductor device physics, PNjunctions and transistors, circuit modelsand arameters, FET, Zener, tunnel,Schottky, photo diodes and theirapplications, rectifier circuits, voltageregulators and ultipliers, switchingbehavior of diodes and transistors.Small signal amplifiers, biasing circuits,frequency response and mprovement,multistage amplifiers and feed-backamplifiers, D.C. amplifiers, couplingmethods, push pull amplifiers, perationalamplifiers, wave shaping circuits.Multivibrators and flip-flops and theirapplications. Digital logic gage amilies,universal gates- combinational circuitsfor arithmetic and logic operational,sequential logic circuits. Counters, egisters,RAM and ROMs.

4. MICROPROCESSORS
Microprocessor architecture-Instructionset and simple assembly anguageprogramming. Interfacing for memoryand I/O. Applications of Micro-processorsin power system.

5. OMMUNICATION SYSTEMS
Types of modulation; AM, FM and PM.Demodulators. Noise and bandwidthconsiderations. Digital communicationsystems. Pulse code modulation anddemodulation. Elements of ound ndvision broadcasting. Carrier communication.Frequency division and timedivision multiplexing, Telemetry systemin ower engineering.

6. POWER ELECTRONICS Power Semiconductor devices. Thyristor. Power transistor, GTOs and OSFETs. Characteristics and operation. C to DC Converters; 1-phase nd 3-phase DC to DC Converters. AC regulators. Thyristor controlled reactors; switched capacitor networks. Inverters; single-phase and 3-phase. Pulse idth modulation. Sinusoidal modulation with uniform sampling. Switched mode power supplies