

## Syllabus for Electrical and Electronics Engineering

### ELECTRICAL & ELECTRONICS ENGINEERING (100 Marks)

#### **Unit-I: BASIC ELECTRICAL ENGINEERING**

Ohms and Kirchoff's Laws, series and Parallel resistance circuits, star/delta transformation, Network theorems, Work Power and Energy, Heating effects of Electric current, Magnetic effects of Electric current, Electromagnetic Induction, Electrostatics, Types of Electrical Engineering materials-Conducting, Semi conducting, Magnetic, Insulating, Dielectric, Special purpose materials- Properties and uses. Batteries-Types, Properties and applications.

#### **Unit-II: ELECTRICAL & ELECTRONIC MEASURING INSTRUMENTS**

**Measuring Instruments:** Classification, Deflection, Controlling and damping torques, shunts and multipliers - Construction, Working Principle of Operation of moving Coil, Moving Iron, Dynamometer type, Induction type meters, Errors, Instrument Transformers, Induction type Energy meter, Shunts and Multipliers, Measurement of Resistance, Megger, Potentiometer, Transducers and Sensors – Types, Thermistor, Thermocouple, LVDT and Strain gauges. Electronics and digital instruments. Rectifier type, Digital Multi meter, Digital Energy meter, Digital Frequency meter and Clamp meter.

#### **Unit-III: D.C. MACHINES**

**D.C. Generators:** Construction, Operation, types, EMF Equation, Windings, Armature reaction, Characteristics, Efficiency and Parallel operation, Applications.

**DC Motors:** Principle of operation, Back EMF, Torque Equation, Types, Characteristics, Starters, Speed Control, Losses, Efficiency and Testing.

#### **Unit-IV: A.C. CIRCUITS**

**A.C. Circuits:** Fundamentals, Average value, RMS value, form factor and peak factor of periodic wave forms. Series and parallel AC Circuits, Resonant circuits, Poly-phase Circuits, Measurement of power by Two Wattmeter's method for balanced loads.

#### **Unit-V: A.C. MACHINES**

**Transformers:** Single-phase Transformer -Construction, Operation, EMF Equation, Testing, Equivalent circuit, regulation, All day efficiency, Applications. Auto-Transformers, Special purpose Transformers Three-phase Transformers and their applications.

**Alternators:** Construction, Operation, EMF equation, regulation, testing and parallel Operation.

#### **Unit-VI: A.C. MOTORS**

**Synchronous Motors:** Operation and performance, effects of field excitation, 'V'-Curve and inverted 'V'- Curve, methods of Starting and uses. Hunting and its effects.

**Three-Phase Induction Motors:** Construction, Principle of Operation, Torque Equation, Slip-torque characteristics, losses, efficiency, testing, circle diagram, speed control methods, starters and applications, double-cage motors.

**Single-phase Induction Motors:** Types, Principle of operation, applications. Single Phase

Commutator motors- Types, Principle of operation and applications. Special purpose Motors-working and applications.

### **Unit-VII:-ELECTRICAL POWER SYSTEMS**

**Generating Stations:** Conventional and Non-conventional sources of energy, working, Components, Thermal, Hydel, Nuclear and Gas Power stations, types, Comparison Renewable energy sources, Solar, Photovoltaic and windmill, Pollution control, Combined Working, Power Stations auxiliaries.

**Transmission and Distribution:** Types of supply systems, Transmission line parameters, inductance and capacitance, performance of short and medium lines, regulation, Ferranti effect, Corona, Skin effect, Basic concepts of HVDC. Transmission, types, advantages and disadvantages of HVDC Transmission. Components of lines, supports, conductor spacing, ground clearance and sag, insulators, voltage distribution across the string, string efficiency, methods of improving string efficiency. Types of sub-stations and Substation equipment. Cables - Classification, insulation resistance, specifications. Distribution – Radial and ring distributors, variation of load voltage, micro and smart grids.

### **Unit-VIII: - PROTECTION OF POWER SYSTEMS**

**Switch gear** – Switches, Fuses and Isolators. Circuit Breakers – Types, Principles of operation and uses- Current Limiting reactors.

**Relays:** Classification, Principle of Operation of Induction type over current relay, Directional over current relays, distance relays.

Protection of alternators, Transformers, Bus-bars, Transmission lines and feeders, Lightning arrestors, neutral grounding.

### **Unit-IX: - ELECTRICAL ESTIMATION AND UTILISATION**

**Electric Wiring:** Tools, Wires, Types of wiring, Accessories, wiring systems Lamp Circuits. Estimating and costing of domestic, industrial, power, irrigation pump sets, overhead lines and 11kV Substations. Rural electrification, departmental tests, earthing, maintenance of electrical machines.

**Electric Lighting:** Requirements of good lighting different types of lamp fittings, laws of illumination.

**Electric heating:** Requirements of good heating element, Types of resistance heating, Electric arc furnaces, Types of induction heating, Dielectric heating-Principle of operation and Applications.

**Electric welding:** Types of welding, welding generator and welding transformer, Applications.

**Electric Traction:** Systems of Train Electrification, Speed-time Curves for different services, Schedule speed, Tractive Effort, Traction system auxiliaries, Traction motor, Supply systems, MAGLEV.

### **Unit-X: - BASIC ELECTRONICS**

Semi-Conductor devices, PN diode, Zener diode, Characteristics, PNP and NPN Transistors, Transistor configurations and biasing methods, characteristics, Half and Full wave rectifiers, Bridge rectifiers, Filters, Zener diode regulation. Special devices: UJT, FET, JFET, MOSFET, Amplifiers- Types, Principles of operation, Characteristics, Multistage, Coupled amplifiers,

Power amplifiers, and Feedback amplifiers. Oscillators- Types, working, principle of operation and applications.

#### **Unit-XI: - DIGITAL ELECTRONICS**

**Digital Electronics-** Various number systems, inter conversions, Boolean Algebra, Logic families, performance of AND, OR, NOT, NOR, NAND, EX-OR gates, combinational Logic Circuits, sequential logic circuits, Registers, A/D and D/A converters, counters, timers and flip-flops.

#### **Unit-XII: - POWER ELECTRONICS**

**Power Electronic Devices:** Construction and working of SCR, DIAC, TRIAC, IGBT, LASCR, Volt- ampere characteristics, Triggering of SCR using UJT, Protection of SCR, Converters, AC regulators, Choppers, Inverters, UPS, SMPS.

#### **Unit-XIII. PLC AND C - LANGUAGE**

**PLC-** Components and concepts of Ladder diagrams.

**C Language-**key words & Identifiers, constants & variables, Operators & Expressions- basic programming.

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