

Content Product

Detailed syllabus

ELECTRICAL ENGINEERING AND INSTRUMENTATION

UNIT I - DC MACHINES

Three phase system- Polyphase, Three phase system, Advantages of three phase system. **Relation between line and phase values of balanced star connection** - Phase sequence, Relation between line and phase values of current, voltages and power in star connection, Line and phase voltages of RBY sequence, Star connected source four wire system. **Relationship between line and phase values of balanced delta connection-** Delta connection -Line and phase voltages of RYB sequence -Power in delta connected system. **Measurement of power in three phase system-** Measurement of power in three phase system -Reactive power with one wattmeter - Three-phase power measurement - Measurement of reactive power in three wattmeter method. **Measurement of power by two wattmeter method-** Two wattmeter method of power measurement - Power measurement in balanced load - Relation between power factor and wattmeter readings - Reactive power. **Power measurement in balanced and unbalanced load** - Advantages of three phase system -Power measurement in unbalanced star connected load, Power measurement in unbalanced delta connected load. **Numerical problems on two wattmeter method** - Problem based on two wattmeter method. **Numerical problems on balanced three phase star connected system-** Problems based on balanced 3 phase star connected systems. **Numerical problems on balanced three phase delta connected system** - Problems based on balanced 3 phase delta connected systems. **D.C. Generator Construction** - Construction of D.C. generator - Magnetic frame or yoke - Pole cores and pole shoes - Pole coils - Armature - Commutator - Brushes - Bearings - End covers or end housings - Shaft and Pulley. **Working Principle of D.C. Generator** - Working operation of simple loop generator - Working principle of D.C. generator. **Lap and wave winding** - Armature windings - Terms used in armature winding - Coil or winding element - Terms used in armature winding - Type of D.C. armature windings. **EMF Equation** - E.M.F. equation of D.C. generator - Problems and Exercises - Flux distribution. **Types of generators** - What do you mean by excitation - Classification of D.C. generators - Types of D.C. generator - Series generator - Problem based on D.C. series generator - Exercise based on D.C. series generator. **Types of generators** - D.C. shunt generator - Problems and Exercises - Compound generator - Problems - Problem based on long shunt compound generator - Exercise based on long shunt lap wound compound generator. **Armature reaction** - Armature reaction - Demagnetizing and cross - magnetising conductors - Demagnetizing AT per pole - Cross-Magnetising AT per pole - Compensating windings. **Problem based on demagnetizing and cross magnetising of pole - Commutation** -Commutation - Methods of improving commutation - E.M.F. commutation - Equalizing connections. **Power flow diagrams** -Power stages in D.C. generator -Types of generator efficiencies. **Characteristics of D.C. generators.** Characteristics of D.C. generators - Load Characteristics D.C. Generators - Load characteristics of D.C. Shunt Generator - Load characteristics of D.C. Series Generator - Load Characteristics D.C. Compound Generators.**Applications of D.C. generators** - Applications of D.C. generators. **Working principle of D.C. Motor** - D.C. motor principle - Working of D.C. motor. **Back e.m.f, speed and torque equation** -Signification of the back E.M.F - Importance of back E.M.F. **Back e.m.f, speed and torque equation** -Torque equation - Speed-torque equation - Problems based on motor torque and speed. **Types of D.C. motor** -Classification of D.C. motor - D.C. series motor - Problems based on d.c. series motor - Exercises based on d.c. series motor - D.C. shunt motor -

Detailed syllabus

Problem based on d.c. shunt motor - Exercise based on d.c. shunt motor – **Characteristics** -D.C. Motor characteristics - Characteristics of D.C. shunt motor - Characteristics of D.C. series motor Characteristics of D.C. compound motor - Application of D.C. motor. **Speed control** - Necessity of speed control - Methods of speed control - Armature voltage control method - Voltage control method - Problem based on speed control of dc shunt motor - Speed control of series motor - Problem based on speed control of dc series motor. **Losses, efficiency and power flow** - Classification of losses in d.c. motor - Problem based on efficiency of dc motor.

UNIT II - TRANSFORMERS

Principle of single phase transformers- Necessity of transformer, Transformer and its principle, Step-up and step-down transformer. **Construction of single phase transformer**- Types of transformer, Essential parts of a transformer, Construction of transformer, Winding, Types of transformers according to the magnetic core, Difference between core type and shell type transformer. **Ideal transformer** - Ideal transformer, Elementary theory of ideal transformer. **EMF equation** - E.M.F. equation of transformer, Problem based on E.M.F equation of transformer. **Transformer ratio** – Voltage transformation ratio, Problem based on voltage transformer ratio, Exercise based on voltage transformer ratio. **Working of transformer on No load** -Transformer on No load - Importance in the study of transformer - Problem based on transformer on no load – Exercise based on transformer on no load -**Working of transformer on load** -Transformer On load – Problems and Exercises. **Real or Practical transformer** -Parameters referred to HV/LV windings - Magnetic leakage - Transformer with resistance and leakage reactance - Problem based on transformer leakage reactance – Exercise based on transformer leakage reactance. **Equivalent circuit** -Equivalent circuit - Per unit system - Problem based on equivalent circuit of transformer - Exercise based on equivalent circuit of transformer. **Parallel operation and load sharing** -Parallel operation of transformers - Parallel transformers on No-load - Division of load between transformers in parallel - Problem based on parallel operation of transformer. **Testing of transformers** -Transformer test - Open circuit or no load test - Short circuit (or) impedance test – Problems and Exercises based on testing of transformer. **Losses in a transformer** - Losses in a transformer - Problem based on losses in transformer. **Efficiency** -Transformer efficiency - Condition for maximum efficiency - Problem based on efficiency in transformer - All day efficiency of a transformer - **Voltage regulation** -Regulation of transformer - Problem based on voltage regulation of transformer - Applications of transformer -**Auto transformer** -Special purpose transformer - Saving of copper - Welding transformer.

UNIT III - INDUCTION MACHINES AND SYNCHRONOUS MACHINES

Introduction to three phase induction motor- Introduction to three phase induction motor, Advantages and disadvantages of induction motor. **Construction of three phase induction motor** - Construction of three phase induction motor, The stator, Squirrel cage rotor, Phase wound or slip ring rotor, Comparison of squirrel cage and slip ring induction motor, Application of induction motor. **Production of rotating magnetic field**- Production of rotating magnetic field, Graphical representation of resultant rotating flux, Slip and slip speed, Problem based on slip and slip speed, Effect of slip on rotor parameters, Rotor reactance, resistance and impedance, Rotor current and power factor,

Detailed syllabus

Problem based on rotor frequency. **Working Principle of three phase induction motor** - working Principle of three phase induction motor. **Concept of equivalent circuit**- Determination of equivalent circuit constants by conducting no load test and blocked rotor test, Blocked rotor test, Equivalent circuit. **Single phase induction motors** - Introduction to single phase induction motor, Construction, Working principle, Why is single phase induction motor not self starting, Starting of single phase induction motor. **Double field theory and Cross field revolving theory** - Double field revolving theory - Cross field theory. **Types of single phase induction motor** -Classification of single phase motor, Split-phase single phase induction motor. **Capacitor start type induction motor** -Capacitor-start single phase induction motor. **Capacitor run type induction motor** -Capacitor run single phase induction motor. **Capacitor start capacitor run induction motor** -Capacitor start capacitor run single phase induction motor. **Shaded pole induction motor** -Shaded pole single phase induction motor. **Starting methods of three phase induction motor** -Starting of induction motor - Direct-switching or line starting of induction motors - Necessity of starting - D.O.L. starter - Star to delta starter - Auto-transformers - Relation between starting and F.L.Torque - Rotor resistance starter. **Introduction to synchronous generator** -Introduction - Introduction to alternator - Types of alternators - Advantages of polyphase alternator - Difference between D.C. generator and alternator. **Principle of operation of alternator** - Working principle of synchronous generator, Mechanical and electrical angle, Frequency of induced E.M.F, Synchronous speed (N_s). **Construction of alternator** -Construction and classification of alternators - Stator - Rotor - Difference between salient pole and non-salient pole rotor - Advantages of stationary armature. **Chording factor** -Armature winding - Chording of winding - Pitch factor - Distribution or breadth or winding factor. **E.M.F equation** -E.M.F equation, Shape of the E.M.F. wave, Problems and Exercises based on E.M.F equation of alternator. **Voltage regulation** -Voltage regulation. Determination of voltage regulation, Regulation for large machines, EMF method or alternator test, Synchronous impedance method, Worked example using synchronous method / EMF method, Problems and Exercises. **Introduction to synchronous motor** -Introduction to synchronous motor. **Methods of starting** - Starting methods of synchronous motor, Starting of synchronous motor, Procedure for starting a synchronous motor, Synchronous Motor Applications. **Principle of operation** - Magnetic locking, Principle operation of synchronous motor. **Effect of variation of load** - Torque-Speed characteristics of synchronous motor. **Effect of excitation** -Effect of changing excitation on constant load. **V-curves and inverted V-curves** -V and inverted V-curves.

UNIT IV - BASICS OF MEASUREMENT AND INSTRUMENTATION

Characteristics of Instruments- Characteristics of Instruments, Dynamic Characteristics. **Error and it's types** - Error, Systemic error, Operational errors (human error), Performance parameters of instrument. **Transducers**- Known to Unknown, Introduction of transducer, Types of transducers and its applications, Factor to be considered while selecting transducer. **Classification of transducer** - Classification of transducers, Based upon transduction method, Factors influencing the choice of transducer. **Variable resistive Transducer** -Variable resistive Transducer, Strain gauge, Thermistor, RTD. **Variable Capacitive Transducer** -Variable Capacitive Transducer, Condenser Microphone. **Piezo Electric Transducer** - Piezo Electric Transducer, LVDT, RVDT. **Inductive Transducers** -Inductive Transducers, Principle and construction of inductive proximity sensors.

UNIT V - ANALOG AND DIGITAL INSTRUMENTS

Digital Voltmeters - Introduction, Basic block diagram of DVM, Ramp type DVM, Integrating type DVM, Continuous balance DVM, Successive approximation DVM. **Digital Multimeter**-Digital ammeter, Introduction of Digital Multimeters (DMM), Multimeter as a Ammeter. **Storage Oscilloscope** - Introduction Storage Oscilloscope. **Analog and Digital Modes of operation** - Comparison between analog and digital instruments, Comparison of Analog and Digital Modes of operation. **Applications of measurement system** - Applications of measurement system. **Errors** - Introduction. **Measurement of R, L and C"** - Introduction to Measurement of R, L and C, LCR meter. **Bridges** - wheatstone bridge, Kelvin, Maxwell Bridge, Anderson Bridge, Schering Bridge, Wien bridges. **Measurement of Inductance, Capacitance, Effective resistance at high frequency** - Measurement of Inductance, Capacitance, Effective resistance at high frequency, Resistance variation method. **Q-Meter** - Principle and Working of Q- Meterrent in a circuit, Analog multimeter.