Faculty of Engineering & Technology

Study and Evaluation Scheme

Of

Diploma (Engineering)

Diploma – Electrical Engineering

(Applicable w.e.f Academic Session 2016-18 till revised)

AKS UNIVERSITY, SATNA

Study and Evaluation Scheme

AKS University, Satna (MP)

Faculty of Engineering & Technology

Department of Electrical Engineering

Diploma (Electrical engineering)

III semester (2016)

S.No.	Paper Code	Subjects	L	T	P	Credit	Total Credit
1	08EE301	Electrical And Electronics Measurement And Measuring Instrument	4	1		5	25
2	08EE302	Electrical Materials And Circuits	4			4	
3	08ME306	General Mechanical Engineering	4	1		5	
4	08EE304	Non Conventional Sources of Energy	3	1		4	
5	08EE307	Electrical Engineering Drawing	3	1		4	
1	08EE351	Electrical Materials And Circuits (Lab)			2	1	
2	08EE355	General Mechanical Engineering (Lab)			2	1	
3	08EE354	Electrical And Electronics Measurement And Measuring Instrument Lab			2	1	

Diploma (Electrical engineering)

IV semester

S.No.	Paper Code	Subjects	L	T	P	Credit	Total Credit
1	08EE401	Generation Transmission And Distribution	4	1		5	26
2	08EE406	Instrumentation And Control	4			4	
3	08EE407	Electrical Machine	4	1		5	
4	08MT404	Industrial Management	3	1		4	
5	08EE408	Fundamental Of Electronics	3	1		4	
1	08EE451	Generation Transmission And Distribution(Lab)			2	1	
2	08EE455	Electrical Machine(Lab)			2	1	
3	08EE456	Instrumentation And Control (Lab)			2	1	
4	08EE457	Fundamental Of Electronics(Lab)			2	1	

Diploma (Electrical engineering)

V semester

S.No.	Paper Code	Subjects	L	T	P	Credit	Total Credit
1	08EE501	Electrical Estimating and Costing	4	1		5	
2	08EE506	Electric Traction	4			4	
3	08EE503	Power Electronics	4	1		5	
4	08EE504	Switchgear Operation And Protection	3	1		4	
5	08EE505	Utilization Of Electrical Power	3	1		4	26
1	08EE555	Electric Traction (Lab)			2	1	
2	08EE552	Power Electronics (Lab)			2	1	
3	08EE553	Switchgear Operation And Protection (Lab)			2	1	
4	08EE554	Utilization Of Electrical Power (Lab)			2	1	

Diploma (Electrical engineering)

VI semester

S.No.	Paper Code	Subjects	L	T	P	Credit	Total Credit
1	08EE602	Energy Conservation And Management	3	1		4	
2	08EE603	Testing And Maintenance of Electrical Machines	4	1		5	
3		Elective	3	1		4	24
1	08EE652	Testing And Maintenance Of Electrical Machines (Lab)			2	1	
2	08EE653	Industrial Project			20	10	

List of Elective Subject (Student can Choose any one Subject)

Sr. no.	Subject Code	Subject Name
1	**08EE604**	EXTRA HIGH VOLTAGE AC/DC
2	**08EE605**	MICROPROCESSOR AND CONTROL SYSTEM COMPONENT

Diploma (Engg.)
Electrical Engineering
Semester-III

ELECTRICAL & ELECTRONICS MEASUREMENT &MEASURING INSTRUMENTS

UNIT I: FUNDAMENTALS OF MEASUREMENTS

Introduction to Measuring Instruments, Classification of M.I. Absolute & Secondary Instruments, Analog & Digital Instruments, Different Principles used in M.I. Sensitivity, Accuracy and precision, Types of errors Deflecting, controlling and damping torque

UNIT II : MEASUREMENT OF CURRENT AND VOLTAGE

Measurement of Current and Voltage, Construction and principle of PMMC, MI & Dynamometer type Instrument.

Production of torque : methods Principles of Voltage and Current measurement. Range Extension of Ammeter and Voltmeter, Different Methods of range extension of Ammeter and Voltmeter. Calibration of Ammeter and Voltmeter. Instrument transformers (CT & PT), wattmeter (dynameter type, induction type), energy meter (three phase 3-wire, three phase four wire) Power factor meter, dynamometer type power factor meter, Weston frequency meter, electrical resonance frequency meter, westson synchro scope, idea about M. D. Meter.

UNIT III: MEASUREMENT OF RESISTANCE

Classification of resistance, Measurement of low resistance by Kelvin's double bridge, Measurement of medium resistance by Ammeter and Voltmeter, Whetstone's bridge, Substitution methods, Measurement of high resistance and insulation resistance ,Megger, Earth tester and Ohmmeter

UNIT IV: MEASUREMENT OF CURRENT AND VOLTAGE

Potentiometers : Types of A.C. and D.C. potentiometers, Construction Standardization, Applications, Electronic Voltmeter, Study of CRO, Measurement of Current, Voltage and Frequency by CRO. Measurement of Dielectric Loss and Power Factor by Wattmeter Method.

UNIT V: A.C. BRIDGES

General equation for bridge balance, Maxwell's inductance bridge, Maxwell's inductance - capacitance bridge, Anderson's bridge, Schering Bridge, Wien's bridge for frequency measurements.

LIST OF EXPERIMENTS:-

1. Study of different electrical & electronics measuring instruments
2. Measurement of high resistance of domestic wiring and electrical machine by Megger.
3. Measurement of medium resistance by wheat stone bridge\ meter bridge
4. Measurement of inductance by Maxwell's bridge.
5. Calibration of single phase energy meter.
6. Measurement of P.F. by ammeter, voltmeter and wattmeter method.
7. Study of C.R.O
8. Use of CRO for measurement of voltage,
9. Use of CRO for measurement current, phase and frequency
10. Measurement of 3-phase power by two wattmeter method.
11. Study and use of C.T. & P.T. for extension of instrument range.
12. Measurement of Earth Resistance by Earth Tester.

TEXT BOOKS:-

1. Electrical and Electronics Measurement and Instrumentation A.K.Sawhney.
2. Electrical Measurement E.W.Golding
3. Electrical and Electronics Measurement and Instrumentation (HINDI) Mahendra Diodia Nav Bharat Pubilcation Merath (U.P)

REFERERCE BOOKS :

1. Electrical Measurement & Instruments J.B.Gupta
2. Electrical Measurement D.R.Nagpal
3. Instrumentation and System Rangan & Shar

Diploma (Engg.)

Electrical Engineering

Semester-III

ELECTRICAL MATERIALS AND CIRCUIT

UNIT I: Principles of Circuit Analysis

Network Parameters: Active and Passive , Linear and non-linear, Unilateral and Bilateral, lumped and distributed, Time varying and time invariant parameter, Voltage and Current sources (ideal and practical) Dependent and independent sources, Sources conversion techniques. Ohms Law, Series and parallel Resistive Circuits, Kirchhoff's current law, Sign Convention, Application to simple circuits. Mesh current analysis, Node Voltage analysis. (Numerical on above topics) Star delta transformation, Phase voltage, Line voltage & Phase Current, Line Current, Relationship with phasor diagram.

UNIT II: Network Theorem

Thevenin's theorem, Norton's Theorem, Superposition theorem, Maximum Power transfer theorem, Millman's Theorem, Reciprocity theorem.(Numerical based on above theorems).

UNIT III: Single phase AC Circuits

Sinusoidal A.C. voltage generation. Definition of various terms used in sine wave. Electric Circuit Elements R,L,C, Response of pure R, L, and C to AC supplies. Rectangular form. Polar form, Rectangular to polar conversion. Polar to rectangular conversion Series A.C. circuits. RL, R-C, & R-L-C circuits. Impedance, reactance, phasor diagram. Impedance triangle. Power factor, Average power, Apparent power, Reactive power, Power triangle. Series resonance, quality factor. Parallel A.C. circuits. R-L, R-C, & R-L-C circuits, Admittance, Susceptance , Resonance : Series resonance , Parallel resonance, Q-factor, bandwidth, selectivity, half power frequencies, graphical representations, Importance of resonance. (Numerical based on above topics).

UNIT IV: Poly phase AC Circuits

Generation of three phase e. m. f, Phase sequence, polarity marking, Types of three-phase connections, Concept of unbalanced load and balanced load Line, phase quantities and power in three phase system with balanced star and Delta connected load & their interrelationship Advantages of polyphase circuits over single phase circuits.

UNIT V: Electrical materials

Materials: Conducting materials, Insulating materials & Semiconducting materials, Low resistivity materials : copper, aluminum and steel, Low resistivity copper alloys: brass, bronze, High resistivity materials: manganin, constantan, nichrome, carbon, tungsten, Insulating materials and their application: Thermo setting materials, Thermo Plastic materials, Natural Insulating Materials , Electric lamp materials, Brush contact materials Thermocouple materials, Fuse materials, Special Purpose Materials : Materials used in transistor, Ferrous and non ferrous materials.

Text Books:

1 M.E. Van Valkenburg, “Network Analysis”, Prentice Hall of India
2 A.Chakrabarti, “Circuit Theory” Dhanpat Rai & Co.
3 C.L Wadhwa, “Network Analysis and Synthesis” New Age International Publishers,
4 D.Roy Choudhary, “Networks and Systems” Wiley Eastern Ltd.
5 Donald E. Scott: “An Introduction to Circuit analysis: A System Approach” McGraw Hill

Reference Books:

6 M.E. Van Valkenburg, “An Introduction to Modern Network Synthesis”,Wiley Eastern Ltd
7 N.C. Jagan and C. Lakshminarayana, “Newwork Analysis” B.S. Publications, 2008.
8 K.S. Suresh Kumar, “Electric Circuits and Networks” Pearson Education, 2009.
9 A Ramakalyan, “Linear Circuits: Analysis and Synthesis” Oxford University Press, 2005.

LIST of EXPERIMENTS

1. To observe Response of R,L and C to A.C supply. Observe the current and voltage wave forms on C. R. O. and determine magnitude and phase angle of voltage and current.
2. To verify the superposition theorem applicable to D.C. circuit.
3. To verify Thevenins theorem applicable to D.C circuit
4. To verify Norton’s theorem applicable to D.C circuit

Electrical Engineering
Semester-III
GENERAL MECHANICAL ENGINEERING

UNIT-I

Properties and Testing of Materials: Introduction, Mechanical properties- Stress, strain, strength, Elasticity, plasticity, Ductility, Toughness, brittness, hardness, malleability, formability, weldability, tensile, strength, fatigue, Hardenasibity, stiffness, fenacity, Modulus of elasticity, Modulus of rigidity, endurance, persso's ratio, proportional limit, yield point, ultimate strength.

Materials: Introduction, Ferrous, Ferrous materials cast iron- Classification, wrought iron, steelclassification- Alloy steel Major alloying elements, stainless steel, - low carbon medium carbon and high carbon steels- Classification of allow steel, tool steels, Non- ferrous metal,- cooper properties, application and classification, Brass-types, Bronze-types and application, special alloys-high tensils brass german silver, monel metal, bearing alloys- Aluminium- Classification and application, Zinc-properties, zinc alloys, Tin properties-application, plastic- classification, application, Lubrication- properties and selection.

UNIT-II

Shearing and Bending Moment: Introduction, definition, bending, pure bending, transverse welding, shear force and bending moment, S.F. & B.M. diagrams for cantilever, simply supported and overhanging with paint and U.P.L.

UNIT-III

Stress in Frames: Introduction, classification, perfect, imperfect and redundant frame, stress calculation-graphical method only.

Power & Transmission: Introduction, belt drive gears-types, velocity ratio, Max. power fen belt drive.

UNIT-IV

Hydrostatics: Introduction- fluids and their properties liquid pressure, intensity of pressure, pascal's law, pressure head of liquid, total pressure, centre of pressure, Determination of centre of pressure in case of inclined plane. Concept of atmospheric and gauge pressure, Absolute pressure.

Fluid Mechanics & Machinery: Introduction, type of flow, Bernoulli's theorem- statement, and its Application. U-tube differential manometer, venturimeter, pilot tube, orifice meter, Cc, Cv & Cd, Batches- rectangular, triangular and trapezoidal notch- determination of discharge, wire-types, determination of discharge, loss of heads due to sudden contraction, sudden expansion, loss of heads due to friction, hydraulics gradient, total energy, reciprocation pump, centrifugal pump, comparison, water turbines-purpose, type- construction and working of pelton wheel, Franliz and Keplan turbines Hydel power plant.

UNIT-V

I.C. Engines: Introduction, worlding principle of petrol and diesel engines, 2 & 4 stroke cycle engines, coeling, lubricating systems, specification of I.C. engines.

Steam Power Plants: Boilers and accessories, Introduction, Basic steam power cycle, classification of boilers, boiler mountings, boiler accessories, syper-heater, Economizer, air preheaters, roof blower, Modern high pr. Boilers.

Steam Turbine: Introduction, working principle, Types functions and applications

REFERENCE BOOK

1- THERMODYNAMICS BY R. YADAV(CENTRAL BOOK DEPOT.)

2- HYDRAULICS & HYD. M/cs BY K.P. SAXENA
3- GENERAL MECHANICAL ENGG. BY HAZRA & CHOUDHARY

TEXT BOOK

1- BASIC MECHANICAL ENGG. (HINDI) BY S.M. PANDEY, K.K. JAIN(DEEPAK PRA.)
2- STRENGTH OF MATERIAL BY R.S. KHURMI

LIST OF EXPERIMENTS :-

1- STUDY OF UNIVERSAL testing machine
2- Study of hardness tester and impact testing M/c
3- To perform hardness test on Brinelle hardness testing m/c and Charpy/ izod test on impact testing m/c
4- To prepare joint by welding, soldering and brazing
5- Study of reciprocation pump
6- Study of centrifugal pump
7- Determination of discharge through venturimeter
8- Study of fire tube boiler
9- Study of fiber tube boiler
10- Study of water tube boiler
11- Study of 2/4 stroke petrol engine
12- Study of stroke diesel engine..

Diploma (Engg.)
Electrical Engineering
Semester-III
Non Conventional Sources of Energy

UNIT-I
Introduction: Limitations of conventional energy sources, need and growth of alternate energy sources, basic schemes and applications of direct energy conversion. MHD Generators: Basic principles and Hall Effect, different types of MHD generators, applications and economic aspects.

UNIT-II
Solar Energy: Photovoltaic effect, characteristics of photovoltaic cells, conversion efficiency, solar batteries and applications. Solar energy in India, solar collectors, solar furnaces & applications. Wind Energy: History of wind power, wind generators, theory of wind power, characteristics of suitable wind power sites, scope in India, advantages and limitations.

UNIT-III
Thermo-electric Generators: Seeback effect, peltier effect, Thomson effect, thermoelectric convertors, brief description of the construction of thermoelectric generators, applications and economic aspects.

UNIT-IV
Fuel Cells: Principle of action, gibbs free energy, general description of fuel cells, types, construction, operational characteristics and applications.

UNIT-V
Miscellaneous Sources: Geothermal system, characteristics of geothermal resources, choice of generators, electric equipment and precautions. Low head hydro plants, definition of lowhead hydro power, choice of site and turbines. Tidal energy, idea of tidal energy, tidal electric generator, limitations.

Reference Books:
1. G.D. Rai, „Non-conventional energy sources‟, Khanna Publishers
2. B.H.Khan, „Non Conventional Energy Resources‟ TMH.

Text Books:
1. Sambhu Ratan Awasthi, “Renewable Energy”

Diploma (Engg.)
Electrical Engineering
Semester-III

ELECTRICAL ENGINEERING DRAWING

UNIT-I

SYMBOLS AND NOTATIONS : Symbols of practical units , multiple and submultiples , types of supplies , single phase , three phase three wire , three phase four wire , D.C. supply etc. Accessories like main switches , distribution board , fan , light fixture , bell , buzzer , lighting arrestor . All types of motor starter , instruments , electronic component etc .Rating plate of machines.

UNIT-II

DOMESTIC WIRING: All types of lighting circuits. Fluorescent tube circuits , intermediate switch circuits , fan circuits , wiring of a residential building. Sodium vapor lamp , mercury vapor lamp.

POWER WIRING : Internal wiring diagrams of single phase motor. Wiring diagrams of D.C. and A.C. motors starters like three phase points shunt motor starter , four point compound motor starter , direct on line (D.O.L.) starter , star-delta starter , contactor type and auto transformer starter. Internal Connections of D.C.series , shunt , and compound motors. Three phase motors : squirrel cage , slip ring , synchronous ,etc. Plate earthing and pipe earthing as per I.S.S.

UNIT-III

WINDING DIAGRAM : Simplex type lap and wave diagram for D.C. machines. Single phase and three phase motors winding diagrams.

ELECTRICAL MACHINE DRAWING : Parts of D.C. machine like , magnetic poles , commutator, armature, etc. A.C. machine rotor, slip rings ,etc. Various cable sections. Bushing of the transformer .Assembly diagrams of the D.C. machine ,A.C. machines and transformer.

UNIT-IV

INSTRUMENT CIRCUITS : Connections of meters in circuits. Ammeter , Bolt meter , Watt meter, energy meter, power factor meter, frequency meter, synchroscope, etc. Current Transformer , Potential Transformer, etc.

ALTERNATOR PANEL DIAGRAM : Panel diagram with circuit breaker , isolator, measuring instruments , synchroscope . Over current and earth fault protection , differential protection , voltage regulator , etc.

UNIT-V

TRANSMISSION AND DISTRIBUTION : All types of transmission towers and distribution poles. Arrangement of various type of cross arms , with insulators , jumpers . Electrical layout of 33Kv/11Kv substation , with all protective devices , etc.

TEXT BOOK :-

1. ELECTRICAL DRAWING BY K.L. NARANG
2. VAIDYUT ABHIYANTRIKI DRAWING (HINDI) BY M.F. QURAISHI, DEEPAK PRAKASAN

REFERENCE BOOK :-

1. ELECTRICAL ENGINEERING DRAWING BY SURJEET SINGH
2. ELECTRICAL ENGINEERING DRAWING WORKBOOK BY T.T.T.I. BHOPAL

Diploma (Engg.)
Electrical Engineering
Semester-IV
GENERATION TRANSMISSION & DISTRIBUTION

UNIT-I

Generation : Conventional & Non Conventional energy sources, Thermal, Hydro and Nuclear power generation (its working principle & layout diagram, site selection, component, equipments), Brief description of MHD, Tidal, Wind, Geothermal, Biogas, photo voltaic.
Hydro power station - Types of water turbines, hydro projects. Nuclear power station - Types of reactor, fuel used.

UNIT-II

Transmission: Concept of transmission, single line diagram of complete power system, standard voltage of A. C. transmission. Concept of HVDC transmission system.
Overhead lines (i)) Electrical design: R, L, C of single & three phase line, transposition, corona discharge, and power loss. Type of insulator, string efficiency & voltage distribution, grading ring & arcing horns.
(ii) Transmission line calculation: Lumped and distributed constant "π" & "T" line concept, voltage regulation, transmission efficiency, Ferranti effect.
(iii) Mechanical design: Concept sag – calculation, calculation of sag on equal level support . Effect of wind and temperature on sag. Types of line supports, joints, clamps, earth wires & guards, vibration dampers.
(iv) Under ground cables: classification construction of L.T. & H.T. cable advantages & disadvantages of cables selection of cables, method of laying.

UNIT-III

Distribution : Classification of distribution line, ring main, radial. Permissible voltage drops, calculation, extension of existing lines. IS codes of clearance of conductor, conductor clearance from telephone lines, railway lines, building etc. earthing of lines, stay wire, stay rod etc.
Service Mains: Service line to small building, big institution and factories.

UNIT-IV

Tariffs: Types, Flat, Block, Two – part, Maximum demand, power factor tariffs, their merits & demerits, selection of tariffs

UNIT-V

Economics : concept of terms like – Maximum demand**,** Connected load, load curves, maximum demand factor, load factor, diversity factor, plant factor, plant capacity, plant utilization factor, base load, peak load, reserve capacity. Numericals on above terms.

Text Books :-

1 . C.L.Wadhwa , " Electrical Power Systems", New age international Ltd. Third Edition , S.Chand & Co.
2. I.J.Nagrath and D.P. Kothari , " Power System Engineering", Tata McGraw Hill.
3. V.K.Mehta and Rohit Mehta , " Principles Of Power System.

Reference books :-

1 . W.D. Stevenson , " Elements of Power System Analysis" , McGraw Hill.
2 . M.V. Deshpande , " Electrical Power System Design" , Tata McGraw Hill.

LIST OF EXPERIMENTS :

1. To find out the performance of short and medium transmission line by forming simulative network .
2. To study different types of line insulators.
3. To find out voltage distribution and string efficiency by using a simulating network.
4. To study various types of cables and A.C.S.R.
5. To study of current transformer and potential transformer.
6. To find out fusing factor of different types of fuses.
7. Visit to any substation and write a report on it.
8. Visit to any generating station and write a report on it.

Diploma (Engg.)
Electrical Engineering
Semester-IV
INSTRUMENTATION & CONTROL

Unit-I

Measuring System Elements of a measuring system, Block diagram of system configuration, performance, standards, time lag, error, distortion and distortion meters, noise and noise factor.

Unit -II

Transducers definition and classification, mechanical devices as primary detectors, Characteristic & choice of Transducers, Electrical transducers, Advantages of electric transducers, Active and passive transducers, Classification, Resistive, inductive and capacitive transducers, Potentiometric, Metallic and semiconductor strain gauges, Gauge factor, types, material used and applications. Thermistor, RTD, Inductive, LVDT, RVDT and Capacitive transducers and their application. Thermocouples, Piezo-Electric transducers, principle, materials used, mode of operation and application. Frequency generating transducers. Hall effect transducers, Opto-electronic transducers such as photo voltaic, Photo conductive, and photo conductive cells, constructional details, characteristics and applications. Photo diodes and transistors, characteristics and applications. Digital transducers,.

Unit -III

Signal Conditioners: Purpose of signal conditioning, Classification, Input modifier, Operational amplifiers circuits used in instrumentation, D.C. amplifier, chopper amplifier. Instrumentation amplifier, characteristics, three amplifier configuration. A/D and D/A converters.

Unit -IV

Measurement of Physical Quantities: Measurement of Pressure-Types of pressure measurement devices, Force summing devices, Secondary transducers, Low pressure measurement, Pirani gauge and thermocouple gauge. Resistive, Inductive and Capacitive pressure measuring devices.

Measurement of speed: Measurement of speed by stroboscope, photoelectric and reluctance pick-up devices for speed measurement.

Measurement of Temperature-Temperature measuring devices, Resistance thermometers. Radiation and Optical Pyrometers.

Measurement of Flow-Turbine and electromagnetic flow meters, Ultrasonic flow meter,

Measurement of Humidity-Humidity, absolute and relative humidity, Resistive and Capacitive hygrometers.

Measurement of pH Value-Concept, pH scale, pH cell, pH meter. Measurement of Thermal Conductivity (gas analyzer).

Measurement of Force and Torque- Electronic weighing system,

Unit V

Telemetry: Necessity, Principle, classification, current and voltage telemetry, Position telemetry, synchros. Frequency and pulse telemetry, Principle of frequency and pulse modulation, PAM, PPM and PCM. Idea about landline and R.F. telemetry and multiplexing. Pulse code format, Modulation techniques of digital data transmission, Digital multiplexers.

Process Control- Importance and definition of variables ,open loop & closed loop control system, Block diagram, servomechanism ON-OFF center

List of Practicals: (Any Ten)

1. Measurement of Distortion using wave distortion meter.
2. Measurement of load/weight using strain gauge and cantilever.
3. Measurement of linear displacement by LVDT and draw its characteristics.
4. Measurement of temperature by-

(a) Thermocouple (b) Resistance Thermometer

5. Measurement of pressure using LVDT and diaphragm gauge.
6. Study and use of data conversion using ADC and DAC.
7. Measurement of pH value using pH meter.
8. Measurement of Humidity by hygrometer.
9. Study and use of synchros in position telemetry system.
10. Measurement of Vibration using piezoelectric/LVDT transducer.
11. Study and flow measurement using electromagnetic flow meter.
12. Study of time division and frequency division multiplexing.
13. Measurement of liquid level by resistive/capacitive transducer.
14. Study and measurement of temperature using optical and radiation pyrometer.
15. Study of strip chart recorder and magnetic tape recorder.

References:

1. Instrumentation By Cooper
2. Instrumentation Devices and Systems by C S Rangan, G R Sharma and V S V Mani

Textbook:

1. Electrical and Electronic Measurement and Instrumentation by A.K. Sawhney.

Diploma (Engg.)
Electrical Engineering
Semester-IV
Electrical Machine

Unit I: ENERGY CONVERSION PRINCIPLES
Law of conservation of energy, electromechanical energy conversion classification of machines, role of electrical energy and uses, electro-mechanical energy conversion principles conditions of production of E.M.F., rotor action, singly excited and doubly excited field system.

UNIT II: D.C. Machine
DC GENERATOR: D.C. Generator Construction of D.C. machine Lap and wave winding (Brief idea) Principle of D.C. generator, Excitation methods and different types of D.C. Generator E.M.F. equation D.C. generator characteristics Losses , Efficiency and condition for maximum efficiency, Concept of armature reaction Effect of armature reaction on commutation and generated voltage. Parallel operation of DC generators and load sharing. DC MOTOR: Different types of D.C. motor, Principle of D.C. motor, Concept of back emf, Torque, speed and power relations, Starters for D.C. shunt and compound motors, Characteristics of D.C. motor, Speed control of D.C. motor, Field control, Armature control, Series parallel control, Testing of D.C. machine by Direct loading Swinburne's test Hopkinson's test and Calculation of efficiency as a generator and motor

UNIT III: TRANSFORMER
Principle of working, Construction and types, material used in different parts of transformer, Emf equation and transformer ratio, no load and on load vector diagram, voltage drop in transformer, equivalent circuit, O.C & S.C Test, regulation of transformer, losses & efficiency, Sumpner test, parallel operation, auto transformer, basic procedure and steps for design of single phase transformer.
Construction and types of connection of 3-phase transformer, comparison of a bank of 3 no. single phase transformer and three phase transformer, parallel operation of 3-phase transformer, accessories of transformer, cooling of transformer.

UNIT-IV: **INDUCTION MOTOR**

3-PHASE INDUCTION MOTOR: Production of rotating magnetic field , principle ,and types of induction motors. Equivalent circuit , torque equation , torque-slip characteristics. Types of starters , DOL ,star delta ,Autotransformer type , rotor resistance type , contactor type starter , speed control. No load and blocked rotor test , losses and efficiency , crawling and cogging. Braking and its applications. Double cage IM & its advantages.
1-PHASE INDUCTION MOTOR: Principle, double revolving field theory. Types of motors with their construction , characteristics and applications. Comparison of three phase with single phase induction motors.

UNIT-V: SYNCHRONOUS MACHINE
SYNCHRONOUS GENERATOR: Principle, construction, salient and cylindrical rotors, speed-frequency relationship, EMF equation, distribution and pitch factor, equivalent circuit ,synchronous impedance , regulation , O.C.C. and S.C.C. , load characteristics , phasor diagram , parallel operation. Method of synchronization, power-angle characteristics.
SNCHRONOUS MOTOR**:** Principle, construction, phasor diagram, effect of change in Excitation, V-curves & Inverted V-curves, synchronous condenser, starting of motors , hunting

And its prevention, coding of synchronous machines.
A.C. COMMUTATOR MOTORS**:** Introduction, series motor, compensated series motor , Commutating poles, universal motor, repulsion motor, stepper motor.

TEXT BOOKS:
1. Electrical Technology By B.L. Theraja. Vol-II.
2. Electrical Machines by Ashfaq Hussain. (Dhanpat Rai & Co.)

REFERENCE BOOKS:
1. M.G. Say, Alternating Current Machines, (5th Ed.) ELBS,1986.
2. Electrical Machine by Dr. P.S. Bimbhara (Khanna Publication)
3. Electrical Machines by Nagrath and Kothari (TMH).
4. A.C. Machines by Langs Dorf (Tata McGraw-Hill)

LIST OF EXPERIMENTS :-
Experiment can cover any of the above topics , following is a suggestive list :
1. Parallel operation of two transformers.
2. To perform Sumpner 's (Back to Back) test on two identical transformers.
3. To perform open circuit test and short circuit test on single phase transformer.
4. To study the speed control of d.c. motor below the normal range by armature resistance control and to plot speed Vs armature voltage , characteristic.
5. To study speed control of d.c. motor above normal range by field control and to plot speed Vs field current , characteristic.
6. To perform load test on 3-phase induction motor.
7. Perform no load and block rotor test on 3 phase induction motor.
8. To perform no load and block rotor test on single phase induction motor.
9. To synchronise a 3-phase alternator with the bus-bar.

List of practical:
1. Study of D C Machine (Parts)
2. Open characteristics (ED/ If) of a D C generator (a) series (b) shunt (c) compound
3. External characteristics of D C Generator (V \ IL)
4. Control the speed of D C series motor.
5. Perform swinburn's test of D C machine
6. Perform O.C. & S.C. test of single phase transformer
7. Perform load test on single phase transformer
8. Operate two single phase transformer in parallel having
9. Perform Sumpner's test on single phase transformer
10. Perform heat run test of single phase transformer
11. Prepare a report on transformer accessories and cooling methods of a Substation

Diploma (Engg.)
Electrical Engineering
Semester-IV
INDUSTRIAL MANAGEMENT

RATIONALE: Diploma pass-outs are generally engaged in middle level management. It is found necessary to impart the diploma pass-outs at final year level certain concepts, principles, procedures and understanding of management techniques so that he is brought out to a fairly high level of competency in "supervisor-ship."

The course has two aspects - behavioral science and mathematical approach towards management. Behavioral science includes communication skills, grievance handling, motivation, morale and leadership. Mathematical approach includes PPC, CPM, PERT and Inventory management. It has been felt necessary to provide the students knowledge about newer trends in management like TQM, JIT, ISO and role of Computers. It is hoped that the course will help the students to be successful in middle management role.

UNIT-I

INTRODUCTION : Definition and functions of management. Management theories - Decision, Quantitative, Mathematical and Behavioral Science.

SYSTEM THINKING : System definition and parameters. Different production and nonproduction systems, system design, different types of models under system thinking.

MATERIALS MANAGEMENT : Introduction, function, purchase systems, stock turnover, ordered quantity. Inventory, need of inventory control, EOQ and simple numerical problems on EOQ. Safety stock, different techniques of inventory control, ABC analysis (simple treatment only). Stores management - storing procedure and store records.

UNIT-II

PRODUCTION PLANNING AND CONTROL : Production systems, characterstics of each type, production and consumption rate. PPC functions, Gantt chart, advantages and preparation of Gantt chart (simple cases only), Critical ratio scheduling.

VALUE ANALYSIS : Concept of cost and value, types of value, objectives and procedure of value analysis, VA test, DARSIRI method of VA.

PROJECT PLANNING BY NETWORK : Network definition, objectives. CPM and PERT, activity, event, network formation, Fulkerson's rule, dependency of activities, dummy activity, duration, EST, EFT, LST, LFT, EPO, LPO, Total float and Free float. Network analysis in tabular form.

UNIT-III

INDUSTRIAL RELATIONS : Need, objectives and functions of personnel management, job analysis and job description, recruitment procedure, selection, difference between recruitment and selection, training and its advantages.

Communication in industry - its need and importance, techniques and barriers of communication. Grievances - its meaning and factors responsible for grievances, procedure for handling grievances. Strikes and Lock-out. Motivation - meaning and its benefits, techniques of motivation. Morale - definition and importance, factors responsible for high morale. Job satisfaction - factors influencing job satisfaction

SUPERVISION AND LEADERSHIP : Meaning and role of Supervisor in an industry. Older workers and their supervision. Concept of Leadership, qualities of good leader, leadership styles.

UNIT-IV

ORGANISATIONAL DYNAMICS : Characteristics and principles of Organisation, Modern organisational approach, types of organisation, meaning and significance of various types of 24 organisation,
organisation, resistance to change, factors for reducing the resistance to change.

OPERATIONS RESEARCH : Definition and concept of OR, methods of OR, simple Linear Programming problem formulation and solution by Graphical method.

UNIT-V

NEW TRENDS IN MANAGEMENT : Role of computers in management, Introduction to Management Information System (MIS).

Total Quality Management (TQM) - Introduction, stages of development - Inspection, Quality Control, Quality Assurance, Total Quality Control, TQM. Introduction to ISO-9000. Deming's PDCA Cycle (Plan, Do, Check and Action). Japanese Quality Management, culture, Kaizen Strategy (continuous improvement), Quality Circle, Just In Time (JIT) - concept and application.

REFERENCE BOOKS

1. Learning Package on Industrial Management Publisher : TTTI, Bhopal.
2. CPM and PERT - Principles and Applications By L.S.Shrinath
3. Industrial Organisation and Management By K.K.Ahuja
4. Modern Production Operation Management By Buffa Willey Eastern Ltd. (latest edition)

TEXT BOOKS

1. Production Operation Management By Goel B.S. Pragati Prakashan.
2. Indutrial Engg. and Management By O.P.Khanna. Khanna Publisher.

Diploma (Electrical Engineering)
Semester-IV
FUNDAMENTAL OF ELECTRONICS

Unit I: HISTORY OF ELECTRONICS

a) Generation of electronics: First generation ; concept of emission of electrons, Second generation: semiconductor Third generation: SSI fourth generation: concept of LSI VLSI
b)Semi conductor Device: P-type and N-type semiconductor with energy level diagram PN junction Barrier voltage , Types of PN junction: Grown junction, alloy junction, Diffused junction, epitaxial junction Forward biased & reversed biased junction Diode symbol, circuit diagram for characteristics (forward & reversed) Characteristics, diode equation.

UNIT II: SEMICONDUCTOR DIODE

a) Types of Diode: Zener diode ,Tunnel diode, photo diode, varactor diode
b) Application of Diode: Single phase, half wave, full wave and bridge types of rectifiers, calculation of output voltage, average and RMS values, ripple factor and rectification efficiency ,Filter and types of filters.

UNIT III: TRANSISTOR

Types of Transistor, Formation of a transistor P-N-P & N-P-N transistor working, symbol, Leakage current in a transistor , Relationship between alpha & beta ,Common Base configuration , Common Emitter configuration, Transistor characteristics UJT,FET and MOSFET : symbol, construction and working

UNIT IV: AMPLIFIER

a)Transistor Biasing: D.C & A.C load line ,procedure for drawing load line, operating point Biasing of a transistor - need for biasing (give reason) -method of biasing ,fixed battery method, emitter resistances method, potential divider method Biasing techniques
b)Types of amplifier: Principal of amplification, types of transistor amplifiers, feedback amplifier, RC coupled, tuned amplifier, and direct coupled amplifiers, operational amplifier power amplifier and their types(Class A, class B, class AB and class C)

UNIT V : OSCILLATOR

Oscillator-block diagram treatment, definition ,applications ,classification, explain damped oscillation, positive feedback amplifier as an oscillator, baekhausen criterion for sustained oscillation, L-C Oscillators -Circuit diagram & working of-Hartelly & colpitt's oscillator, R-C oscillators, -R-C Phase shift oscillator, circuit, working, Wien bridge Oscillator-Block diagram Treatment Crystal oscillator -explain piezoelectric Non sinusoidal oscillators -circuit diagram, working.

List of practical:

1. Color coding and testing of electronic components
2. To plot Forward & Reverse biased characteristics of diode.
3. To plot Forward & Reverse biased characteristics of Zener diode.
4. To Study the Rectifiers a] Half wave b] Full wave & draw i/p & o/p wave forms.
5. To Study the filter circuits. a] Capacitor Filter b] Inductor filter & draw wave forms
6. To Plot Input & output characteristics of transistor in CE mode.
7. To Plot Input & output characteristics of transistor in CB mode.
8. To study the Zener Diode as Regulator& calculate load regulation.
9. To study Single stage common emitter amplifier & plot its frequency response.

10. To study Two stage RC coupled amplifier & plot its Frequency response.

Text Books:

1. Grob Bernard, Basic Electronics, Tata McGraw Hill
2. V.K Mehta, ELECTRONIC PRINCIPLES, S Chand
3. SANJEEV GUPTA, ELECTRONICS DEVICES & CIRCUITS

Diploma (Engg.)
Electrical Engineering
Semester-V

ELECTRICAL ESTIMATING AND COSTING

Unit-I

Principles of estimating, purchase procedure, cost of materials, various charges like labour, stores, overhead tools, contingency etc.

Unit-II

Various types of wiring systems including P.V.C. pipe, their merits and demerits. Calculation of total load & selection of wire, preparation of estimates for a small residential building, big institution or office building. Estimate for single store yard, multistory building. Estimate for a small workshop and industrial installation, agricultural pump, domestic pump, floor mills etc. Estimation of total cost.

Unit-III

Service connections For a single storey and multistoried building, single phase and three phase service connections, various methods of service connections. Distribution of circuits for light and power load. (Guidance may be taken by the M.P. Electricity Boards estimates).

Unit-IV

Preparation of estimate and costing of 11KV or 33KV line. Selection of routes. Estimates for distribution lines- Location of poles for a given situation or locality. Providing street lights, necessary hardware, stay arrangements, underground cables, providing services lines using underground cables.

Substations :-Various types of sub-stations, pole-mounted in-door and out-door substations. Estimating quantity and cost for a substation of a given specification.

Unit-V

Estimating and costing for repair/maintenance of electrical devices/equipments. Estimates for repairing electrical equipment e.g. Rewinding, assembling and testing of polyphase induction motor. Repairing of 3 phase starters. Repairing of single phase transformers.Repairing of devices like hot plate, press, mixer fan etc.

Diploma (Electrical Engg.)
Semester-V
ELECTRIC TRACTION

UNIT-I

Requirements of an Ideal traction system. Traction Systems: Non-electric traction systems. Electric traction systems: Straight electric traction, its advantages and disadvantages. Diesel electric traction, its advantages and disadvantages. Systems of track electrification: DC System, composite system –single phase to three phase system and single phase AC to DC system (Kando system). Advantages and disadvantages of single phase 25 Kv AC system over DC system.

UNIT-II

Traction Mechanics: - Units used in traction mechanics. Types of services , speed time curve. Average speed and schedule speed. Factors affecting the schedule speed. Tractive effort, specific energy consumption , factors affecting specific energy consumption. Coefficient of adhesion. (Simple numerical on simplified speed time curves and specific energy consumption).

UNIT-III

Traction Motors: desirable characteristics of traction motors, special features of traction motor. Suitability of DC series motor for traction. Suitability of three phase Induction motor for traction. Traction motor Control: Traction control of DC locomotives and EMUs, series parallel control combined with rheostatic control, transition from series to parallel combination (open circuit transition, shunt transition and bridge transition), energy efficiency and limitations of series parallel cum rheostatic control, chopper control of motors in DC traction systems. Traction control system of AC locomotives: Tap changer, step less voltage control through use of thyristors.

UNIT-IV

Braking: Requirement of a braking system. Mechanical braking: vacuum braking, compressed air braking, hand brake for parking. Electric braking: Rheostatic braking and regenerative braking. (no derivation and no numerical).

UNIT-V

Application of computers in management of electric traction: introduction. Computer capability relevant to electric traction. Advantages of use of computers for management of electric traction.

Reference books:

1. J. Upadhyay S. N. Mahendra Electric Traction Allied Publishers Ltd.
2. G. C. Garg Utilisation of Electric Power & Electric Traction, Khanna Publishers.

Text books:

1. Om Prakash Kesari Vidyut Engine Parichay (In Hindi) S. P. Graphics, Nashik.
2. J. B. Gupta Utilisation of Electric Power & Electric Traction, S. K. Kataria & Sons.

List of Experiment:

1. Study of electric AC locomotives.
2. Study of relays, contactors
3. Study overload protection, earth fault protection of power.
4. Study Differential current protection of traction circuits
5. Study of computer aided locomotive designs.
6. Study of monitoring execution of trip inspection
7. Study the use of computers for management of electric traction system.

Diploma (Engg.)
Electrical Engineering
Semester-V
POWER ELECTRONICS

Unit-I

SCR - Structure, Two transistor model, characteristics, turn-on methods, factor responsible for temperature rise, circuit for over voltage, over current, voltage surge & high dv/dt, Gate production. Modes of heat transfer.

Triggering circuits - Resistance phase shift, UJT, Schmitt trigger. Turn-off types of commutation, methods of commutation. SCR rating, series and parallel connection. Thyristor family and other devices, DIAC, TRIAC, SCS, SUS, LASCR, MOSFET, IGRT, GTO, MCT.

Unit-II

Rectification- Single phase HW and FW converters. Mathematical relations of Idc and Irms. Applications Advantages of polyphase rectification.

Unit-III

Inverter- Series and parallel inverter, current and voltage source inverter, emergency tube light, comparison of inverters using different types of (transistor, MOSFET, IGRT) devices, block diagram of UPS (on load / off load). Applications of Inverter

Unit-IV

Converter- Block diagram of DC to DC converter. Converter duty cycle, variable and constant frequency control method,1-quardant 2-quardant 4-quadrant operation of choppers, applications of choppers. Working of single phase cyclo-converter, basic concept of three phase cycloconverter, application of cyclo-converters.

Unit-V

Speed control of Motors- Advantages of electronic speed control, 4-quadrant operation of DC motors, constant torque and constant horse power operation, speed control of separately excited DC motor, single and 3 phase controlled rectifiers, field failure protection and armature current limiter, speed control using chopper, dual converter. Speed control of induction motor using rectifier, inverter and cyclo-convector (block diagram only). Speed control of slip ring induction motor using SCRS in rotor circuit.

List of Practical:

1. Characteristics of thyristor family devices.
2. Study of single phase controlled rectifiers.
3. Study of emergency tube light
4. Study of SCR triggering circuits
5. Study of commutation circuits
6. Electronic speed control of d.c.motor
7. Electronic speed control of induction motor
8. Study of UPS
9. Study of chopper

Reference:

1. Power electrics : Circuits, devices & applications, M. H. Rashid, PHI
2. Power Electronics, P.C. Jain, TMH

Textbooks:

1. P.C. Sen, Power Electonics, TMH
2. Dr. P.S. Bhimbhra, Power Electonics, Khanna Pub.

Diploma (Engg.)
Electrical Engineering
Semester-V
SWITCHGEAR OPERATION AND CONTROL

Unit-I

Introduction to power system- Growth of power system in India, future schemes, various elements of power system. Interconnection, its necessity and advantages, planning, operation and improvement of power system. Load study, type of faults.

Representation of power system- Single line diagram, use of standard symbol.

Per unit quantity - definition and advantages, base impedance conversion of per unit values from one base values to other base values. Generalized ABCD constants, their values in terms of circuit parameters. To prove AD-BC=1 characteristics of ABCD constants.

Unit-II

Fault analysis - Type of faults- symmetrical and unsymmetrical. Phase sequence impedance, phase sequence networks, analysis of symmetrical faults. Analysis of L-G, L-L and L-L-G fault by symmetrical components, simple numerical problems**.**

Unit-III

Introduction to protection- Purpose of protective system, requirement and selection. Abnormalities in a power system and their effects. Reasons for failure. Self and non self clearing faults. Use of CT/PT in protective scheme. Definition of terms regarding CT/PT. Advantages of CT/PT. Neutral earthing, their methods and advantages.

Unit-IV

Protective relay - Type of relays- induction, electromagnetic, thermal. Primary and back up relaying. Types of back up relays, causes of failure of primary relaying. Explanation of terms used in relaying. Principle and working of different types of relays- electromagnetic and induction type. Induction type over current relay, reverse power relay, time and current settings. Differential relays., distance relays, thermal relays, inverse current characteristics.

Circuit interruption devices - Function of fuse. fusing factor, fusing characteristic. Application of isolator and circuit breakers. Circuit breaker capacities. Arc formation in C.B. and methods of arc extinction. Definition of various terms with reference to circuit interruption wave form. working principle and operation of Bulk Oil/Minimum oil/air blast/SF CB. Merits and Demerits of different types of C.B.

Unit-V

Protection against over voltages - Causes and effects of over voltage. Traveling wave. Overvoltage protection, earth wire, lighting arresters- Multiple gap type, horn gap type, line type,
station type and distribution type. Surge absorber.

Protective schemes- Protection of alternator- various abnormalities, Merz price differential protection, over current and earth fault protection. Protection of transformer- various abnormalities, differential protection, Buchholz relay. Feeder and transmission line protection - time graded and over current protection, current graded system, differential protection. Protection of Induction motors, use of thermal relays and under voltage protection

List of Practicals:

1. Study of a HVDC system.
2. Study and use of CT/PT employed for protection and determine their ratio error.
3. Study of an Induction type O/C relay and plot the inverse characteristic
4. To study the differential protection of transformer/alternator.
5. Visit to power station
6. Study of different protective elements/schemes- ground wire Lightening arrestors, fuse, circuit breaker.
7. Study of Min. Oil Circuit breaker.

References:

1. Sunil S. Rao , Switchgear and protection.
2. Badriram & Vishwakarma, Power System Protection

Textbooks:

1. IJ Nagrath and DP Kothari,"Power System Engineering" Tata McGraw-Hill.
2. CL Wadhwa, "Electric Power Systems", Wiley Eastern Limited.

Diploma (Engg.)
Electrical Engineering
Semester-V
UTILISATION OF ELECTRICAL POWER

Unit-I Electric Drives

Merits and demerits oof electric drives, factors governing selection of motors, drive requirements. Group and individual drive, starting and running characteristics of various motors. Selection of starters, hand operated and contractor type starters, liquid resistor type starter. Speed control of motors, load equalization, use of fly wheel. Motor enclosures, selection of motors for particular service, size and rating of motors.

Unit-II

Advantages and disadvantages of electric heating, methods of electric heating. principle of electric heating. Resistance heating elements and alloys. Causes of failures of heating elements. Arc furnaces, principle, construction, working and uses.
Induction heating principle, construction and use of Ajax Wyatt(core type) and coreless type.
L.F. and H.F. Induction Furnaces. Dielectric Heating Principles and uses.(Numerical)
Electrical welding: Definition, classification of electrical welding, principle of arc welding. Qualities of a good weld. Welding defects. Resistance welding, advantages, classification, principle and working, comparision of resistance and arc welding process A.C & D.C. arc welding

Unit-III Illumination

Electromagnetic wave spectrum, solid and plane angle, definition of electrical term in use like MSEP,MHSCP etc. sensitivity of human eye. Luminous efficiency, horizontal and vertical laws of illumination, Inverse square law & lambert's cosine law. Defination of terms used in lighting, lighting scheme, various types of lamps their uses and fittings. Numericals problems on laws of illumination.

UNIT-IV Power factor Improvement

Causes of low power factor, Disadvantages of Low power factor, power factor improvement by using static capacitors, Location of capacitors for power factor improvement, most economical power factor.

Unit-V Electro-chemical processes and storage batteries

Electro deposition and faraday's laws of electrolysis(numerical).various electro-chemical processes like electroplating, electro-extraction, regions Storage batteries, classification, construction. Battery maintenance. Battery charning, circuit diagram. Application of storage batteries

List of Practicals:

1. Speed control of slip ring induction motor by variation of rotor resistance.
2. To verify the change in power factor by changing load parameters and its improvement using capacitance.
3. To draw 'V' curves of synchronous motor.
4. Study and operation of resistance oven and to control its temperature.
5. Study of dielectric / induction heating.
6. Measurement of luminous efficiency of lamps by lux meter.
7. Study and operation of various types of lamps.
8. Study of arc welding

Diploma (Electrical Engg.)

Semester-VI

ENERGY CONSERVATION AND MANAGEMENT

UNIT-I

Energy Conservation: Lighting energy: methods of efficient lighting. Heating: methods of energy Saving in Furnaces, Ovens and Boilers. Cooling: methods of energy saving in ventilating systems and air conditioners,energy efficient motors, automatic star/ delta converters. Power factor improvement devices and soft starters/variable frequency drives. Amorphous core transformers cogeneration – its advantages.

UNIT-II

Tariff and Energy Conservation in Industries: Energy cost and recent MSEB tariffs, application of tariff system to reduce energy bill, energy conservation by improving load factor and power factor.

UNIT-III

Energy conservation in transmission and distribution systems: reactive power compensation, demand side management, system voltage optimization and phase current balancing, losses in transmission and distribution system and its minimization.

UNIT-IV

Energy and the environment: Environment and social concerns related to energy utilization, The green house effect, global warming and its effect, acid rains, global energy and environment management.

UNIT-V

Energy Audit: Procedure of energy audit, energy flow diagram and its importance, measurements in energy audit and various measuring instruments, questionnaires for the energy audit, equipment used for energy conservation. IE rules and regulations for energy audit, Electricity act 2003.

Reference books:

1.Giovanni Petrecca Industrial Energy Management: Principles and applications Kluwer Academic Publisher.
2.Steven R. Patrick, Dale R. Patric Stephen W. FardoEnergy conservation Guide book Fairmont Press.

Text books:

1.M.J. Steinburg and T.H. Smith Economy Loading of Power plant and Electric system John Willey and sons
2. C.L. Wadhawa Generation Distribution and Utilization of Electrical Energy New Age.

Diploma (Electrical Engg.)
Semester-VI
TESTING AND MAINTENANCE OF ELECTRICAL MACHINES

UNIT-I
Electrical Accidents and Safety Measures - Electrical accidents, Safety regulations, treatment of shock, fire extinguishers.

UNIT-II
Testing and maintenance of Relays and Circuit Breakers - Testing of Relays Factory test, commissioning test and preventive periodic maintenance test. Testing of circuit breakers, voltage test, type test, preventive maintenance of circuit breaker. Hot Line Maintenance - Meaning and advantages, special types of non- conducting materials used for tools for hot line maintenance.

UNIT-III
Installation - Types of heavy Electrical equipment, unloading accessories precautions for unloading, installation of small and large machines of both static and rotating type. Installation of pole mounted transformer.

UNIT-IV
Earthing-Reasons of earthing, earthing system, earth lead and its size, permissible earth resistance for different installations, improvement of earth resistance, double earthing, earth resistance measurement, rules for earthing.

UNIT-V
Trouble Shooting -Normal performance of equipment, trouble shooting internal and external faults, instruments and accessories for trouble shooting, trouble shooting charts.

Reference books:
1. B. V. S. Rao Operation & Maintenance of Electrical Machines Vol.-II Media Promoters & Publisher Ltd. Mumbai.
2. C.J. Hubert Preventive Maintenance Hand Books & Journals.

Text book:
1. B. L. Theraja Electrical Technology Vol I To IV S. Chand & Co., New Delhi.
2. B. V. S. Rao Operation & Maintenance Of Electrical Machines Vol –I .

List of Experiments:
1. Draw circuit diagram select appropriate meters, connect it to perform routine test on 1 ØI.M.
2. To perform routine test on three phase Induction motor, & calculate the different parameters.
3. Select two single phase transformers and to perform polarity test.
4. To perform back to back test.
5. To perform parallel operation of transformer as per I.S.
6. To perform parallel operation of alternator as per I.S.
7. To perform open circuit test on induction motor, plot circle diagram & calculate parameters.
8. To perform short circuit test on induction motor, plot circle diagram & calculate parameters.
9. To perform brake test on DC series motor & plot characteristic of output against torque, speed, load current as per I. S.

Diploma (Electrical Engg.)
Semester-VI
Elective-1
EXTRA HIGH VOLTAGE AC/DC

UNIT-I
Introduction : Need of EHV transmission, comparison of EHV AC & HVDC transmission, mechanical considerations of transmission line.

UNIT-II
EHV AC Transmission Parameters of EHV lines, Voltage gradient in bundle conductors lines, conductor sizing, over-voltages due to switching, ferro resonance. Insulation coordination line insulators and clearances, Corona & its effects, power loss, audible noise and radio-interference, long distance transmission with series and shunt compensations, principle of half wave transmission, flexible ac transmission

UNIT-III
HVDC Transmission :Types of dc links, terminal equipments & their operations, HVDC control system, reactive power control, harmonics and filters, multiterminal dc (MTDC) system, ac/dc system analysis, protection of terminal equipments. HVDC transmission based on voltage source-converters.

UNIT-IV
Constitution of EHV a.c. and d.c. links, Kind of d.c. links, Limitations and Advantages of a.c. and d.c. transmission, Principal application of a.c. and d.c. transmission, Trends in EHV a.c. and d.c. transmission, Power handling capacity. Parallel operation of HVAC & DC system. Problems & advantages.

UNIT-V
FACTS devices, basic types of controller, series controller, static synchronous series compensator(SSSC), thyristor-controlled series capacitor(TCSC), thyristor controlled series reactor(TCSR), shunt controller (STATCOM), static VAR compensator(SVC), series-series controller, combined series-shunt controller, unified power flow controller(UPFC), thyristor controlled phase shifting transformer(TCPST).

References :
1. Rakosh Das Begamudre, “Extra High Voltage AC Transmission Engineering” Revised Second Edition, John Wiley.
2. K.R. Padiyar, “HVDC Power Transmission System”, Second revised Edition, New Age Int. 2012
3. S. Rao, “EHV-AC and HV DC Transmission Engineering Practice”, Khanna Publishers.

Diploma (Electrical Engg.)
Semester-VI
Elective-2

MICROPROCESSOR AND CONTROL SYSTEM COMPONENT

UNIT-I

CONTROL SYSTEMS IN INSTRUMENTATION: Introduction. role of control system in instrumentation. Open loop and close loop control system, block diagram of open loop control system, types of open loop control system . block diagram of close loop control system , types of close loop control system , comparison between open loop and close loop control system, servomechanism and regulators with suitable examples.

UNIT-II

BASIC CONTROL ACTION AND CONTROLLER CHARACTERISTICS: On-off type control, proportional control, derivative control, Integral control, Proportional-derivative control, Proportional integral control (PID control).

UNIT-III

CONTROL SYSTEM COMPONENTS: Importance of control components. Construction, working principle, torque-speed characteristic, merits and demerits and applications of AC/ DC Servo motor , construction, working principle of synchro, synchro as transmitterreceiver and control transformer, application in position control system , construction, working principle AC/ DC Techo generator, Application of position control and speed control with feedback through Techo-generator , classification of stepper motor, construction, working, principle of stepper motor , solenoid valve, control valve , servo voltage stabilizer.

UNIT-IV

MICROPROCESSOR INTRODUCTION ARCHITECTURE: Introduction to microprocessor. Advantages and disadvantages of micro processor control over traditional control. Structure of microprocessor , generalized architecture of microprocessor, functions of each block. Lumped and distributed digital control and their block diagram. Different types of memories (ROM, RAM, PROM, EPROM,EEPROM), Functional block diagram of 8085 micro processor with pin diagram, logical block diagram of 8085 microprocessor- Registers, ALU, Decoder, Serial control action, Interrupt section, timing and control section.

UNIT-V

APPLICATIONS OF MICROPROCESSOR IN INSTRUMENTATION SYSTEM: Schematic diagram of memory chips decoder, memory interphasing. Traffic light control. SCR firing angle control. Data acquisition system

Text books:

1. Automatic Control System by S.Hasan Saeed-Katson
2. Microprocessor & its application by B.Ram
3. Control System Engineering H. M. Rai.

Reference books:

1. Microprocessor Architecture, Programming and Applications with the 8085- Ramesh aonkar
2. Control System Components B. Chattergee

List of Experiment:

1. Control of angular displacement using Synchro.
2. Study of AC and DC servo motor.
3. Use techogenerator for automatic speed control of D.C. motor
4. Study of basic control action and controller.
5. Various servo stabiliser for automatic voltage control and study/ trace its control circuit.
6. Study of stepper motor.
7. Use microprocessor for temperature control.
8. Use microprocessor for S.C.R. firing control .
9. Study of architecture of 8085.
10. Study of data acquisition system.