EX- 501 - Utilisation of Electrical Energy

Unit-I

Illumination Engineering

Nature of light, units, sensitivity of the eye, luminous efficiency, glare. Production of Light; Incandescent lamps, arc lamps gas discharge lamps- fluorescent lampspolar curves, effect of voltage variation on efficiency and life of lamps, Distribution and control of light, lighting calculations, solid angle, inverse square and cosine laws, methods of calculations, factory lighting, flood lighting and street lighting, Direct diffused and mixed reflection & transmission factor, refractors, light fittings.

Unit-II

Heating, Welding And Electrolysis

Electrical heating-advantages, methods and applications, resistance heating, design of heating elements, efficiency and losses control. Induction heating: core type furnaces, core less furnaces and high frequency eddy current heating, dielectric heating: principle and special applications, arc furnaces: direct arc furnaces, Indirect arc furnaces, electrodes, design of heating elements, power supply and control. Different methods of electrical welding, resistance welding, arc welding, energy storage welding, laser welding, electro beam welding, and electrical equipment for them. Arc furnaces transformer and welding transformers. Review of electrolytic principles, laws of electrolysis, electroplating, anodizing-electro-cleaning, extraction of refinery metals, power supply for electrolytic process, current and energy efficiency.

Unit-III

Traction

Special features of Traction motors, selection of Traction Motor, Different system of electric traction and their Advantages and disadvantages, Mechanics of train movement: simplified speed time curves for different services, average and schedule speed, tractive effort, specific energy consumption, factors affecting specific energy consumption, acceleration and braking retardation, adhesive weight and coefficient of adhesion,

Unit-IV

Electric Drives

Individual and collective drives- electrical braking, plugging, rheostatic and regenerative braking load equalization use of fly wheel criteria for selection of motors for various industrial drives, calculation of electrical loads for refrigeration and air-conditioning, intermittent loading and temperature rise curve.

Unit-V

Introduction to Electric and Hybrid Vehicles

Configuration and performance of electrical vehicles, traction motor haracteristics, tractive effort, transmission requirement, vehicle performance and energy consumption.

References:

- Open Shaw ,Taylor, .Utilization of electrical energy., Orient Longmans, 1962.
- H. Pratap, Art and Science of Utilization of Electrical Energy.
- Gupta, J.B., Utilization of Elect. Energy ,Katariya and sons, New Delhi.
- Garg, G.C., Utilization of Elect. Power and Elect. Traction.
- N V Suryanarayan, Utilization of Elect. Power including Electric Drives and Elect.

Traction, New Age International.
 Hancok N N, Electric Power Utilisation, Wheeler Pub.
 Mehrdad,Ehsani,Yimin Gao,Sabastien.E. Gay,Ali Emadi, “Modern electric, hybrid electric and fuel cell vehicles”, CRC Press.

EX- 502 – Microprocessors and Microcontrollers

UNIT 1:

Microprocessor 8086

Introduction to 16-bit 8086 microprocessors, architecture of 8086, Pin Configuration, interrupts, minimum mode and maximum mode, timing diagram, Memory interfacing, Comparative study of Salient features of 8086, 80286 and 80386.

UNIT 2:

Microprocessor 8086 programming

Instruction set of 8086, Addressing mode, Assembler directives & operations, assembly and machine language programming, subroutine call and returns, Concept of stack, Stack structure of 8086, timings and delays,

UNIT 3:

Input-Output interfacing: Memory Mapped I/O and Peripherals I/O. PPI 8255 Architecture and modes of operation, Interfacing to 16-bit microprocessor and programming, DMA controller (8257) Architecture, Programmable interval timer 8254, USART 8251, 8 bit ADC/DAC interfacing and programming.

UNIT 4:

Microcontroller 8051

Intel family of 8 bit microcontrollers, Architecture of 8051, Pin description, I/O configuration, interrupts; Interrupt structure and interrupt priorities, Port structure and operation, Accessing internal & external memories and different mode of operations, Memory organization, Addressing mode, instruction set of 8051 and programming.

UNIT 5:

8051 Interfacing, Applications and serial communication

8051 interfacing to ADC and DAC, Stepper motor interfacing, Timer/ counter functions, 8051 based thyristor firing circuit, 8051 connections to RS-232, 8051 Serial communication , Serial communication modes, Serial communication programming, Serial port programming in C.

List of Experiment

A. Introduction

1. Introduction to 8086 & 8051 kit, hardware features & modes of operation.

2. Technique of programming & basic commands of kit.

3. Instruction set of 8086 & 8051.

B. Assembly language programming of 8086 & 8051.

1. Write a program to add two 8-bit numbers.

2. Write a program to add two 16-bit numbers.

3. Write a program for 8-bit decimal subtraction.

4. Write a program to find 1’s complement and then 2’s complement of a 16-bit numbers.

5 .Write a program to find larger of two numbers.

6. Write a program to shift an 8-bit number left by 2-bits.

7. Write a program to multiply two 16-bit numbers .

8. Write a program for factorial of given number by recursion.

9. Write a program to square of an 8-bit number.

10. Write a program to generate a square wave of 2 KHz Frequency on input pin.

BOOKS:

1. Hall Douglas V.,Microprocessor and interfacing, Revised second edition 2006, Macmillan, McGraw Hill .
2. A.K. Ray & K.M.Bhurchandi, Advanced Microprocessors and peripherals- Architecture, Programming and Interfacing, Tata McGraw – Hill, 2009 TMH reprint..
3. Kenneth J. Ayala**,** The 8086 microprocessor: programming and interfacing the PC, Indian -edition , CENGAGE Learning.
4. Muhammad Ali Mazidi and Janice Gillespie Mazidi, The 8051 Microcontroller and Embedded Systems, Pearson education, 2005.
5. Kenneth J. Ayala**,** The 8051 Microcontroller Architecture, III edition, CENGAGE Learning.
6. V.Udayashankara and M.S.Mallikarjunaswamy, 8051 Microcontroller: Hardware, Software & Applications, Tata McGraw – Hill, 2009.
7. McKinlay, The 8051 Microcontroller and Embedded Systems – using assembly and C, PHI, 2006 / Pearson, 2006.
8. Microprocessor and Interfacing, I edition 2012, oxford press setnil kumar, Saravam Jeevanathan shah.

EX-503 ELECTRICAL MACHINE-II

Unit-I

D.C. Machine-I

Basic construction of DC machines; types of DC machines and method of excitation; lap and wave windings; Emf equation; armature reaction and methods of limiting armature reaction; Commutation process and methods for improving commutation; Basic performance of DC generators and their performance characteristics; Metadyne and Amplidyne; permanent magnet DC motors; Brush less dc motors,

Unit-II

D.C. Machine-II

Basic operation of DC motors; Torque equation; Operating characteristics of DC motors, Starting of DC motors- 2point, 3 point and 4 point starters; speed control of DC motors; losses and efficiency of DC machines; testing of DC machines, direct testing, Swinburne's test and Hopkinson's test. Application of DC machines

Unit-III

Synchronous Machine-I

Construction; types of prime movers; excitation system including brushless excitation; poly-phase distributive winding, integral slot and fractional slot windings; emf equation, generation of harmonics and their elimination; armature reaction; synchronous reactance and impedance, equivalent circuit of alternator, relation between generated voltage and terminal voltage, voltage regulation of alternators using synchronous impedance, mmf, zpf and new A.S.A method.

Unit-IV

Synchronous Machine-II

Salient pole machines; two reaction theory equivalent circuit model and phasor diagram; determination of X_d and X_q by slip test; SCR and its significance; regulation of salient pole alternator, power angle equation and characteristics; synchronizing of alternator with infinite busbar,; parallel operation and load sharing; synchronizing current, synchronizing power and synchronising torque coefficient; synchroscopes and phase sequence indicator; effect of varying excitation and mechanical torque,.

Unit-V

Synchronous machine-III

Synchronous motor operation, starting and stopping of synchronous motor, pull in torque, motor under load power and torque, reluctance torque, effect of excitation, effect of armature reaction, power factor adjustment, V curves, inverted V curves, synchronous motors as power factor correcting device, super synchronous and sub synchronous motors, hunting and damper winding efficiency and losses.

Analysis of short circuit oscillogram, determination of various transient, sub transient and steady reactances and time constants, expression of transient and sub transient reactances in terms of self and mutual inductances of various winding, short circuit current, equivalent circuit. Single phase synchronous motors- hysteresis motor, reluctance motor.

Repulsion motor, stepper motor, switched reluctance

List of Experiments (expandable)

Experiments can cover any of the above topics, following is a suggestive list:

i. To plot magnetisation characteristic of a separately excited DC generator

ii. To perform load test on DC generators.

iii. To perform load test on DC series and shunt motor

iv. To perform Swinburn's test on a DC machine and find out its efficiency under full load condition.

v. To conduct Hopkinson's test on a pair of DC shunt machine.

vi. To perform OCC and SCC test on an alternator and determine its regulation.

vii. To determine regulation of alternator using mmf and zpf methods.

viii. To synchronise alternator with infinite bus bar.

ix. To plot V and inverted V curves for a synchronous motor

x. To find X_d and X_q of salient pole synchronous machine by slip test.

xi. To Determine negative sequence and zero sequence reactance of an alternator.

xii. To determine subtransient direct axis and quadrature axis synchronous reactances of salient pole machine.

Books:

1. M.G. Say,Performance & design of AC machines, CBS publishers & distributors, Delhi, 3rd edition

2. A.E. Clayton & N.N. Nancock, The Performance & design of DC machines CBS publications & distributors, Delhi, 3rd edition

3. P.S. Bhimbra, Electrical Machinery, Khanna Pub.

4. P.S. Bhimbra, Generalized theory of Electrical Machines, Khanna publishers, Delhi,

5. Ashfaq Husain, Electric Machines, Dhanpat Rai, New Delhi

5. I.J. Nagrath & D.P. Kothari, Electric Machines, Tata McGraw Hill , New Delhi,

6. Syed A. Nasar,Electric Machines & Power Systems, Volume I , Tata McGraw Hill, New Delhi

7. A. E. Fitzerald, C. Kingsley & S.D. Umans , Electric Machinery Tata McGraw Hill ,New Delhi ,5th edition

EX- 504 – Power Electronics Devices & Circuits

Unit-I

Advantages and application of power electronic devices characteristics, Symbol & application of power diodes, power transistors, GTO, Triac, Diac, Power MOSFET, IGBT, LASCR, Fast recovery diode, schottey diode MCTs. Principle of operation of SCR, Two transistor analogy, brief idea of construction of SCR, Static characteristics of SCR, Condition of turn on & off of SCR Gate characteristics, Method for turning on of SCR, Turnoff methods, different commutation echniques (Class A,B,C,D,E, & F Commutation) firing of SCR, Use of pubic transformer and opto isolator in firing, Resistance firing Ckt, Resistance capacitance firing circuit, UJT firing cut, and ramp triggering, firing for 3-Φ circuit. SCR rating & protection of SCR over voltage, Over current, Suprior firing, Design of snubber circuit and protection of gate of SCR, heating, cooling & mounting of SCR series and parallel operation of SCR, String efficiency & problem associated with series and parallel operation of SCR

Unit-II

Operation and analysis of single phase (Half wave & Full Wave) and multiphase (Three Phase) uncontrolled and controlled rectifier circuit with resistive, resistive & inductive load (continuous & non continuous conduction, Fw small & very large inductive loads) and RLE loads. Estimation of average load voltage and load current for above rectifier cirucits active and reactive power input. Effect of free wheeling diode and source inductance on performance of these rectifier circuits . Comparison of mid point & Bridge rectifier circuits.

Unit-III

Series and parallel inverter, Voltage source & current source inverter, Single phase and three phase bridge inverter, Self cumulated inverters,, Mc- murray & MC murray bed ford inverters, Voltage control of single phase and three phase bridge inverter, Harmonics & their reduction techniques.

Unit-IV

Principle of chopper operation, Various control strategies in chopper, Step up & step-up/step down choppers, chopper configuration (Type A,B, C,D, & E), Steady state analysis of chopper circuits, Current & voltage commutation of chopper circuits Jones & Morgens chopper

Unit-V

Single phase (mid point & bridge configuration) and three phase cyclo convertor configuration and operating principles. AC voltage controllers (using SCRs & Traics) single phase full wave controller with R and RL load, Estimation of RMS load voltage, RMS load current and input power factor, three phase AC voltage controller (Without analysis) Dual converter Switched mode voltage regulator buck, Boost, Buch & Boost, Ck regulators.

LIST OF EXPERIMENTS

- 1- VI CHARACTERISTICS OF SCR
- 2- VI CHARACTERISTICS OF DIAC
- 3- VI CHARACTERISTICS OF BJT
- 4- CHARACTERISTICS OF TRIAC
- 5- VI CHARACTERISTICS OF MOSFET

- 6- TRANSFER CHARACTERISTICS OF MOSFET
- 7- OUTPUT CHARACTERISTICS OF IGBT
- 8- TRANSFER CHARACTERISTICS OF IGBT
- 9 - SINGLE PHASE SCR HALF CONTROLLED CONVERTER WITH R LOAD
- 10- 1Φ SCR FULLY CONTROLLED CONVERTER WITH R-LOAD
- 11 - STUDY OF 3Φ SCR HALF CONTROLLED CONVERTER
- 12- STUDY OF 3Φ SCR FULLY CONTROLLED CONVERTER
- 13- STUDY OF CLASSES OF COMMUTATION A,B,C,D,E,F.

References:

1 M.H. Rashid, Power Electronics Circuits, Devices and Applications, Pearson
2 Education, Singapore, 1993.
3 M Ramsmoorthy, An Introduction to transistor and their application, Affiliated East-West Press.
4 P.C. Sen, Power Electonics, TMH.
5 M.D. Singh, K.B. Khanchandani, Power Electronics, TMH, Delhi, 2001.
6 Chakravarti A., Fundamental of Power Electronics and Drives, Dhanpat Ray & Co.,
7 Dr. P.S. Bhimbhra, Power Electonics, Khanna Pub.
8 Vedam Subramanyam, Power Electronics New Age International Revised II ed. 2006.
9 Randall Shaffer, Fundaments of Power Electronics With MATLAB Cengage Leaening 2008.

EX- 505 – Power System – I

Unit-I

An overview of Electrical Energy Generation General background, structure and components of power network. Power generation – Introduction to conventional, non-conventional & distributed generation, Effect of transmission voltage on power system economy. Selection of size of feeder. Comparison of isolated versus interconnected power system. Problems associated with modern large interconnected power system. Power Plant Economics - Load curves, base load, peak load, load factor, demand factor, diversity factor, capacity factor, utilization factor, cost of electricity, capital cost, fuel and operation cost.

UNIT-II

Transmission Line Components & Under Ground Cabling

Inductance resistance and capacitance of transmission line, Calculation of inductance for 1-Φ and 3-Φ, Single and double circuit line, Concept of GMR and GMD, Symmetrical & asymmetrical conduction configuration, Calculation of capacitance for 2 wire and 3 wire systems, Effect of ground or capacitance, Capacitance calculation for symmetrical and asymmetrical 1-phase and three phase, Single and double circuit line, Charging current, Transposition of line, Composite conductor, Skin and proximity effect, bundle conductor. Underground Cable Comparison of cables and overhead transmission lines, Classification of cables, requirement of cable construction, capacitance of single and multi-core cable, economic core diameter, dielectric stress in cable, Grading of cables, ionisation of Heating of cables, Phenomena of dielectric losses and sheath loss in cables, Thermal resistance of cables.

UNIT-III

Transmission systems & performance of transmission line

Various systems of transmission, effect of system voltage, comparison of conductor materials required for various overhead systems. Short, Medium & long transmission line and their representation, Nominal T, Nominal Л, Equivalent T and equivalent Л, network models, ABCD constants for symmetrical & asymmetrical network, Mathematical solution to estimate regulation & efficiency of all types of lines. Surge Impedance, loading, Interpretation of long line equation and its equivalent equation. Tuned power lines. Power flow through transmission line, Circle diagram, Method of voltage control, Static & rotating VAR generator, transformer control.

UNIT-IV

Insulator & Mechanical design Mechanical DesignTypes of conductors used in overhead transmission line, Types of line supports and towers, Distribution of conductors over transmission towers, Spacing between conductors, Length of span and sag- tension calculation for transmission line, Wind & ice loading, support of line at two different levels, string chart, Sag template, Stringing of conductor, Vibration and Vibration dampers.InsulatorMaterials used for transmission line insulations, Types of insulator for overhead transmission line failure of insulator, Voltage distribution of suspension insulator, String efficiency, Shielding and grading.

Unit-V

Voltage control & Distribution system

Ac single phase, 3 phase, 3wire & 4 wire distribution, Kelvin's law for most economical size of conductor Substation layout showing substation equipment, bus bar single bus bar and sectionalized bus bar, main and transfer for bus bar system, sectionalized double bus bar system, ring mains.

References:

1. William Stevenson, Elements of Power System Analysis, McGraw Hill.
2. C.L. Wadhwa, Electrical Power System Analysis, New Age International.
3. D.P. Kothari, I.J. Nagrath, Modern Power System Analysis TMH, III Ed. Reprint 2008.
4. D.P. Kothari, I.J. Nagrath, Power System Engineering TMH II Ed. Reprint 2009.
5. John Grainger and William Stevenson, Power system Analysis, McGraw Hill.
6. Ashfaq Husain, Electrical Power Systems, Vikas Publishing House.
7. T. Wildi, Electrical Machines, Drives and Power Systems, Pearson Education.
8. C.L. Wadhwa, Generation, Distribution and Utilization of Electrical Energy", New Age International.
9. Turar Goren, Electrical power Transmission system Engineering, John Wiley & Sons.
10. Power Systems Design- M.V. Deshpandey

List of Experiment

Subject- Power System I

1. To study the Thermal Power Station.
2. To study the Hydro Power Station.
3. To study the Nuclear Power Station.
4. To study & draw Towers used in Transmission lines.
5. To study & draw the different types of insulator.
6. To study & design Electrical Power Transmission line.
7. Determination of Transmission Parameters of a transmission line.