MS Excel: Working with work books / work sheets.

- Data Entry techniques & defining datas etasa Table.
- Setting, Previewing, and Printing under MS-Excel.
- Performing Calculations, using Excel Formulas, Functions and Charts.
- Sorting / Filtering data in excel sheet.

Working with MS Power Point.

- Presentation Basics. Adding more components to the slides, printing the slides.
- Formatting Presentations, backgrounds and layout. Applying Themes. Using SlideMaster.
- Working with Graphics, Images and Clips. Multimedia. Inserting Sound and Narration
- Delivering Presentations. Animating Objects. Adding Action effects.
- Live Presentation. Using Custom Shows.
- Saving / Protecting the Presentation.

Web Page Development:

- Introduction to HTML, CSS, JAVA Scripting
- Development of Webpage.

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SEMESTER : VI [ELECTRICAL ENGINEERING]

6EE01 POWER ELECTRONICS

Course Outcomes

After completing this course student will be able to

1. Explain the concepts and techniques used in power electronics
2. Apply the knowledge of series and parallel connection of SCRs in power control applications
3. Analyze various power converter circuits
4. Analyze the single phase and three phase Inverter circuits
5. Explain the operation of DC/DC converter circuits
6. Demonstrate the applications of power electronic circuits.

Syllabus

Unit I:SCR, Triac, Diac ï Construction and Applications, two Transistor Analogy of SCR, SCR turnON mechanism, different methods for turning ON SCR, turn OFF mechanism, Thyristor firing circuits, introduction to Power MOSFET and IGBT their construction and characteristics.

Unit II: Series-Parallel operation of SCRs, firing circuits for series and parallel operations, static and dynamic equalizing circuit, equalization of current in parallel connected SCRs,string efficiency, de-rating factors, protections of SCRs against di/dt, dv/dt, over-voltage/ over-current protection.

Unit III: Principle of phase control, half-wave-controlled rectifier, half controlled bridge and fully controlled bridge rectifier for R, RL and RLE load, derivation for output voltage and current, effect of freewheeling diode, effect of source inductance.

Unit IV: Classification of circuit for forced commutation, series inverter, improved series inverter, parallel inverter, single phase PWM inverters, principle of operation of three phase bridge inverter in 120^0 and 180^0mode.

Unit V: Basic principle of Chopper, Time ratio control and current limit controlled technique, Voltage commutated Chopper circuit, Jones Chopper, Step up Chopper, Step down Chopper and AC Chopper.

Unit VI: Speed control of DC series motor using chopper, Speed control of DC shunt motor using phase controlled rectifier. Speed control of three phase Induction motor by stator voltage control method, V/f control.

Text Book: Rashid Muhammad, H., ñPower Electronics: Circuits, Devices and Applicationsò, 4^{th} Edn., Pearson Education.

Reference Books:

1. Mohan Ned, Undeland Tore, M. and Robbins William, P., ñPower Electronics: Converter, Applications and Designò, John Wiley & Sons, 1994.
2. LandevCyrill, W., ñPower Electronicsò, McGraw Hills, London, 1981.
3. Dewan, S.B. and Satrughan A., ñPower Semiconductor Circuitsò, John Wiley & Sons,
4. M.D. Singh & K.B. Khanchandani, ñPower Electronics ñTata Mc-Graw Hill, New Delhi

6EE02 POWER SYSTEMS -II

Course Outcomes:

At the end of the course, students will be able to:

1. Understand Power Factor improvement, Capacitor bank installation in distribution system, metering system in Industries and Residential area.
2. Understand Positive Sequence, Negative & zero sequence system and fault analysis.
3. Create computational models for analysis of both symmetrical and unsymmetrical conditions in power systems,
4. Analyse the system performance where there is an unbalanced fault, and also calculate the corresponding fault current.
5. Examine the need of various analysis like fault analysis, short circuit analysis stability analysis, steady state and transient analysis.

Syllabus :

Unit I : Symmetrical Components : Definition and choice, Alpha operator, transformation matrices, sequence components, power invariance, line and phase sequence quantities relations, three phase delta/star transformer bank-sequence voltages and currents relationship.

Unit II: Power system elements ï sequence impedance and sequence networks ; Various three phase transformer connections ï zero sequence rules; Unbalanced load system - Power Factor improvement, Capacitor bank installation in distribution system, Metering system in Industries and Residential area

Unit III : Symmetrical Fault Analysis : Transmission line transients, three phase symmetrical short circuit at alternator terminals, Power system fault calculations, short circuit MVA, Current limiting reactors, ring system and tie bar system, Circuit breaker rating calculation.

Unit IV : Unsymmetrical Fault Analysis:L-G, L-L-G and L-L faults at unloaded generator terminals, Equivalent sequence network diagram, Fault impedance, Unsymmetrical faults through impedance, Power system faults- loaded and unloaded conditions.

Unit V : Over voltages : Causes ï internal and external; Voltage surge, Basic insulation level, Protection ï earthing screen, overhead ground wire, lightning arresters.

Unit VI : Corona Effect : Power loss due to corona, Practical importance of corona, use of bundled conductors in E.H.V transmission lines and its advantages, Overhead line insulators ,Voltage distribution in suspension type insulator, String efficiency , Grading . Sag and stress calculation of overhead conductance, Vibration dampers.

Text Book :- 1. Power System Analysis, N.V.Ramana, Pearson Education, 2010.

Reference Books:

1. Power System Analysis, Arthur R. Bergen, Vijay Vittal,2/e, PEARSON Education
2. I. J. Nagrath & D. P. Kothari ï ñModern Power System Analysisò, TMHPublishing.
3. Depriya Das, Electrical Power System

6EE03 COMPUTER AIDED ELECTRICAL MACHINE DESIGN

Course Outcome

After completing this course, student will be able to

1. Explain the Basics of Computer aided machine design & material selection.
2. Derive the design parameters of single & three phase transformer core.
3. Calculate the winding& cooling system parameters of the transformer
4. Develop the armature winding diagram for three phase Induction Motor
5. Determine the stator core dimensions of three phase Induction motor
6. Design the squirrel cage & wound type rotor for three phase Induction motor

Syllabus

Unit I: Introduction: Review of transformer & Induction motor constructional features, Major considerations in electrical machine design, optimization, electrical engineering materials: Conducting, Insulating & Magnetic Materials,Limitations of traditional design, need for CAD, analysis, synthesis and hybrid methods of CAD.

Unit II: Transformer Design -I: Transformer Core Design - Material selection, type of construction, Specific magnetic & electric loadings, output equation, core and yoke cross sections, window dimensions, overall core dimensions calculations, core loss estimation from design data. Optimum core design for Minimum cost, Minimum losses, Minimum weight & Minimum volume.

Unit III: Transformer Design – II: Transformer Winding - types, and design calculation, Layout, no-load current calculation, primary and secondary winding resistance and leakage reactance from design data, mechanical forces ï types & causes. Estimation of efficiency & regulation from design data. Cooling methods for a transformer, design of transformer tank. Calculation of cooling tubes.

Unit IV: AC Winding Design: Concentrated & distributed winding, Integral slot & fractional slot winding, Full pitch & short pitch windings, Single layer& double layer winding, distribution factor, coil pitch factor and winding factor, EMF equation, Development of winding diagrams.

Unit V: Induction Motor Stator design: Specific electric and magnetic loadings selection, output equation, main dimensions (D&L) calculation, stator slot- numbers, shape and dimensions, stator teeth dimension, stator core dimensions.Air gap length calculation.

Unit VI: Induction Motor Rotor design::Squirrel cage rotor design ï selecting number of rotor slots, design of rotor bars & slots, design of end rings. **Wound type rotor design** - rotor winding design, rotor slots design, and rotor core design. Bearings, shaft design. estimation of no-load current, stator and rotor winding resistances from design data, dispersion coefficient & its effect on performance of IM.

Text Books:

1. A. K. Sawhney, ñA Course in Electrical Machine Designò Dhanpat Rai & Co Ltd, 2016
2. R.K.Agrawal, ñPrinciples of Electrical Machine Designò, S.K.Kataria and Sons, Delhi

Reference Books:

1. K.G.Upadhyay,ñDesign of Electrical Machinesò, New Age international Publishers,1st Edition 2008
2. S.K.Sen,ñPrinciples of Electrical Machine Design with Computer Programsò, Oxford and I.B.H. Company Pvt. Ltd., New Delhi
3. IndrajitDasgupta, ñDesign of Transformersò, TMH 1st Edition 2002
4. Indian Standards for Transformer & Three phase IM design from BIS websites

6EE04 Professional Elective - II
ADVANCED CONTROL SYSTEMS

Course Outcomes:

After completing this course students will be able to:

1. Design compensator using time domain and frequency domain specifications
2. Represent system using state space model
3. Analyze controllability and observability for systems.
4. Design state feedback controller.
5. Analyze digital systems using Z Transform
6. Develop the describing function for the nonlinearity to assess the stability of the system.
7. Analyzethe Nonlinear system using Phase plane Analysis

Syllabus :

Unit I: Compensation Techniques :

Introduction, preliminary consideration of classical design. Lead compensator, Lag Compensator, Lead-Lag compensator, Feedback compensation in frequency domain.

Unit II: State Space Technique I: State, state space and state variables ,SISO /MIMO linear systems state Variable models- differential equations, transfer functions, block diagrams And state diagrams. Transfer function decomposition ï Phase variable Forms, canonical forms and Jordan canonical forms, STM computation, L.T, Canonical transformation, and Cayley Hamilton theorem. Time Response ï SISO systems.

Unit III: State Space Technique II:

Concept-controllability and observability, SISO/ MIMO linear Systems Gilbertôs method and Kalmanôs test; SISO controllable Systems design ï state feedback.

Unit IV: Sampled Data Control Systems:

Representation, Z transform, Sampler and hold, ZOH, Open loop and closed loop SDCS, Z transfer Function, difference equation, solution, Pulse transfer function, Stability Analysis, S and Z domain relationship, Juryôs test, and bilinear Transformation. Root locus method.

Unit V: Non-Linear System Analysis I:

Non linear system behaviour, types and characteristics, Describing function Stability analysis limit cycles, Limitation of Describing function.

Unit VI: **Non-Linear System Analysis II**:
Linearization, Singular points, Classification and nature, Phase plane method, non linear system analysis, Phase trajectories, construction ï analytical and graphical method by isoclines, stability analysis, limit cycles, limitations ï phase plane method.

Text Books:

1. Nagrath and Gopal,ò Control system Engineeringò Wiley Eastern Ltd , New Delhi
2. K.Ogata,ò Modern Control Theory ñPrentice Hall Of India Pvt Ltd , New Delhi.

Reference Books:

1. Naresh Sinha. ñControl system Engineeringò Wiley Eastern Pvt. Ltd., New Delhi.
2. B.C. Kuo. ñAutomatic Control systemò Prentice Hall Of India Pvt Ltd Delhi.
3. D Roy Choudhury, ñModern Control EngineeringòPublisher: PHI Learning.

6EE04 Professional Elective – II:
DIGITAL COMMUNICATION SYSTEMS

Course Outcomes:

After Completing this course student will be able to:

1. To study basic building blocks of digital communication system.
2. To learn information theory and theoretical bounds on the data rates of digital communication.
3. To understand and analyze communication channel.
4. To study and analyze different digital modulation techniques.
5. To study baseband transmission of the signal.
6. To understand importance of channel encoding and decoding in digital communication.
7. To study multiple access schemes and spread spectrum communication.

Unit-I: Introduction to Digital Communication SYstem: Functional Blocks of Digital Communication System; Source Encoder and Decoder, Channel Encoder and Decoder, Modulator and Demodulator. Line Coding: Need for Line coding, Properties of Line Coding, Unipolar RZ and NRZ, Polar RZ and NRZ, Bipolar NRZ (AMI), Split Phase Manchester Coding, Polar Quaternary NRZ Coding, HDB3 Coding, Scrambler and Unscrambler.

Unit-2: Information Theory:
Measure of Information, Entropy and Information Rate of Long Independent and Dependent Sequences. Source Encoding: Huffman Encoding, Shannonôs Encoding Algorithm, Shannon- Fano Algorithm. Discrete Communication Channel: Noiseless Channel, Deterministic Channel, Binary Symmetric Channel, Rate of Information Transfer over Discrete Channel, Capacity of Discrete Memoryless Channel.Continuous Channel: Shannon Hartley Theorem for channel capacity, Signal to Noise Ratio ï Bandwidth Tradeoff.

Unit-3 : Bandpass Modulation and Demodulation techniques:
BPSK, BFSK, ASK and DPSK generation and reception, Signal space diagram, PSD and Bandwidth of BPSK and BFSK systems, QPSK. Transmitter and Receiver, Signal space diagram, PSD and Bandwidth of QPSK, Probability of Error of ASK, BPSK and BFSK systems, Comparison of Digital modulation systems. Coherent Detection: Matched Filter (Impulse response and Probability of Error).

Unit-4: Base Band Transmission:
Base Band Binary PAM systems, Inter Symbol Interference, Base Band Pulse Shaping and Nyquist Criterion, Eye Diagram, Correlative Coding: Duobinary Encoder with Pre-coder, Modified Duobinary Encoder, Modified Duobinary Encoder with Pre-coder. Equaliation: Need for equalization, Transversal Equalizer (Problems Expected), Preset Equalizer, Adaptive Equalizer, Clock and Carrier Synchronization.

Unit 5: Error Control Coding:
Introduction to Error Control Coding, Types of Errors, Methods of Controlling Errors, Linear Bloc Codes:Matrix Description of Linear Block codes, Hamming Distance, Hamming Weight, Minimum Hamming Distance, Hamming Codes, Encoder for Linear Block code, Syndrome Decoding, Syndrome Decoder for (n, k) Linear Block Code, Error Detection and Correction capability of Linear Block Codes (Derivation expected). Cclic Codes: Properties of Cyclic Codes, Systematic and Non-Systematic generator Matrix, Parity Check Matrices for Cyclic Codes, Encoders for Cyclic Codes, Syndrome Decoding for Cyclic Codes. Convolution Codes:Time Domain Approach and Transform domain approach for convolution code generation, Code Tree and Code Trellis for Convolution code.

Unit 6: Multiple Access Schemes and Spread Spectrum Communication:
Multiple Access schemes: Time Division Multiple Access, Frequency Division Multiple Access, Code Division Multiple Access, Space Division Multiple Access. Spread Spectrum Sytems: Notion of Spread Spectrum, PN Sequence Generation (Problems Expected), Direct Sequence Spread Spectrum (DSSS), Jamming Margin, Processing Gain, Eb/No Ratio, Frequency Hopped Spread Spectrum, Slow and Fast frequency Hopping

Text Book: Proakis J. K., ñDigital Communicationò, Mc-Graw Hill Book Co., London (Second Edition)

.**Reference Books:**

1. Shanmugam K.S., ñDigital & Analog Communication Systemsò, John Wiley & Sons, New York, 1996
.2. Taub, Herbert, Schilling D. L., ñPrinciples of Communication Systemsò, Mc-Graw Hill International Book Co., Tokyo.
3. W.C.Y. Lee, ñMobile Cellular Telecommunications Systemsò, Mc-Graw Hill International Editions, 1990.
4. Glover and Grant, ñDigital Communicationò, Prentice Hall Publication.

6EE04 Professional Elective – II
INDUSTRIAL ELECTRICAL SYSTEMS

Course Outcomes:

At the end of this course, students will demonstrate the ability to

1. Understand the electrical wiring systems for residential, commercial and industrial consumers.
2. representing the systems with standard symbols and drawings, SLD.
3. Understand various components of industrial electrical systems.
4. Analyze and select the proper size of various electrical system components.

Unit I: Electrical System Components:

LT system wiring components, selection of cables, wires, switches, distribution box, meteringsystem, Tariff structure, protection components- Fuse, MCB, MCCB, ELCB, inverse currentcharacteristics, symbols, single line diagram (SLD) of a wiring system, Contactor, Isolator,Relays, MPCB, Electric shock and Electrical safety practices

Unit 2: Residential and Commercial Electrical Systems:

Types of residential and commercial wiring systems, general rules and guidelines forinstallation, load calculation and sizing of wire, rating of main switch, distribution board andprotection devices, earthing system calculations, requirements of commercial installation, deciding lighting scheme and number of lamps, earthing of commercial installation, selection and sizing of components.

Unit 3: Illumination Systems: Understanding various terms regarding light, lumen, intensity, candle power, lamp efficiency,specific consumption, glare, space to height ratio, waste light factor, depreciation factor,various illumination schemes, Incandescent lamps and modern luminaries like CFL, LED andtheir operation, energy saving in illumination systems, design of a lighting scheme for aresidential and commercial premises, flood lighting.

Unit 4: Industrial Electrical Systems – I:

HT connection, industrial substation, Transformer selection, Industrial loads, motors, startingof motors, SLD, Cable and Switchgear selection, Lightning Protection, Earthing design,Power factor correction ï kVAR calculations, type of compensation, Introduction to PCC,MCC panels.Specifications of LT Breakers, MCB and other LT panel components.

Unit 5: Industrial Electrical Systems – II:

DG Systems, UPS System, Electrical Systems for the elevators, Battery banks, Sizing theDG, UPS and Battery Banks, Selection of UPS and Battery Banks.

Unit 6: Industrial Electrical System Automation:

Study of basic PLC, Role of in automation, advantages of process automation, PLC basedcontrol system design, Panel Metering and Introduction to SCADA system for distributionautomation.

Text Book: S. L. Uppal and G. C. Garg, "Electrical Wiring, Estimating & Costing", Khanna Publishers.

Reference Books:

1. K. B. Raina, ñElectrical Design, Estimating & Costingò, New age International, 2007.
2. S. Singh and R. D. Singh, ñElectrical estimating and costingò, Dhanpat Rai and Co.,
3. Web site for IS Standards.
4. H. Joshi, ñResidential Commercial and Industrial Systemsò, McGraw Hill Education, 2008.

6EE05 OPEN ELECTIVE – II
ENERGY AUDIT AND MANAGEMENT

Course Outcomes:

After completing this course student will be able to:

1. Discuss energy scenario and itôs management.
2. Conduct the energy audit of different systems.
3. Determine the economics of energy conservation
4. Discussvarious energy Conservation methods & their case studies
5. Explain fundamentals of Harmonics.

Syllabus:

Unit I : Energy Scenario & Management:

Indian energy scenario, Energy needs of growing economy, Energy pricing in India Energy sector reforms, various forms of energy, Primary and secondary energy, commercial and non-commercial energy, Global primary energy reserves, Energy and environment, Necessity of conserving energy, Energy strategy for the future, Electrical energy management, Concept of supply side management and demand side management, Methods of implementing Demand side management and advantages to consumer, utility and society.

Unit II: Energy Audit:

Definition, Need of energy audit, Preliminary and detailed energy audit. Procedure for carrying out energy audit, Instruments used for energy audit, Data Analysis-Energyð production relationship, specific energy consumption, Sankey diagram, CUSUM Technique, Bench marking energy performance, Recommendations for energy conservation, Action plan, Executive Summary.

Unit III: Economics of energy conservation:

Cost factors, Budgeting, Standard costing and Sources of capital, Cash flow diagram and activity chart, Simple Payback period analysis, Time value of money, Net present value method, internal rate of return method, Profitability index for benefit cost ratio

Unit IV: Energy Conservation:

Energy conservation in motive power, Illumination, Heating & cooling systems, Pumping systems, thermal power stations and Transmission & Distribution Sector. Cogeneration &Waste heat recovery systems.

Unit V: Energy Audit Case Studies:

Energy Intensive Industries, Commercial, Industrial, Municipal and Agriculture Sector, IT industries, Hospitals.

Unit VI: Fundamentals of Harmonics:

Harmonic distortion, voltage versus current distortion, Power systems quantities under non sinusoidal conditions- active reactive and apparent power, displacement and true power factor, harmonic phase sequences, triplen harmonics, harmonic indices- Total harmonic distortion (THD), Total demand distortion (TDD) , Harmonic sources from commercial and industrial load.

Text Book: Guide books for National Certification Examination for Energy Manager / Energy Auditors Book-1, Book-2, Book-3, Book-4 (available online BEE website)

Reference: Books:

1. S. C. Tripathy, ñUtilization of Electrical Energy and Conservationò, McGraw Hill, 1991.
2. Success stories of Energy Conservation by BEE, New Delhi (www.bee-india.org)
3. Energy Conservation and Audit ByThumman, Fairmont Press
4. Energy Audit and Conservation TERI.

6EE05 Open Elective – II

ELECTRICAL ESTIMATING & COSTING

Course Outcomes:

After completion of the course students will be able to

1. Understand methods of installation and estimation of service connection
2. Decide type of wiring, its estimation and costing for residential building
3. Carry out electrification of commercial complex, factory unit installations
4. Design & estimate for feeders & distributors
5. Understand contract, tendering and work execution process.

Syllabus:

Unit I: Electrical Installation:

Classification of Electrical Installation, General requirement of Electrical Installation. Important definitions related to Installation.

Service Connection: Concept of service connection, Types of service connection & their features. Methods of Installation of service connection.Estimation of service connection.

Unit II : Residential Building Electrification :

Procedures for designing the circuits and deciding the number of circuits.Selection of type of wiring and rating of wires &cables..Earthing of Residential Installation. Estimate and cost Preparation of Residential Installation.

Unit III:Electrification of commercial Installation:

Concept of commercial Installation. Differentiate between electrification of Residential and commercial Installation Deciding the size of cables, busbar and busbar chambers. Earthing of the electrical Installation Selection of type wire, wiring system.Preparation of detailed estimate and costing of commercial Installation.

Unit IV: Electrification of factory unit Installation:

Concept of Industrial load. concept of Motor wiring circuit.Important guidelines about power wiring and Motor wiring.Selection and rating of wire, cable size.Sequence to be followed to prepare estimate.Preparations of detailed estimate and costing of small factory unit/ workshop.

Unit V: Design & estimate for feeders &distributors:
Different schemes for feeders & distributors, estimates for different feeders & distributors, Distribution transformer, Deciding Size & location, Estimate for outdoor & indoor type distribution substation.

Unit VI:Contracts, Tenders and Execution:
Tender and tender notices. Procedure for submission and opening tenders. Comparative statements, criteria for selecting contractors, General conditions in order form. Principles of Execution of works administrative approval, technicalsanctions.Billing of executed work.

Text Book: Electrical Design; Estimating and costing by K.B. Raina, S.K.Bhattacharya New Age International (p) Limited, New Delhi.

Reference Books:

1. Electrical Estimating and costing by Surjit Singh Dhanpat Rai and company, New Delhi.
2. Electrical Estimating and costing by N. Alagappan S. Ekambaram, Tata Mc Graw Hill Publication New Delhi

6EE06 POWER ELECTRONICS - LAB.

List of Experiments:

1. To verify the V-I characteristics of SCR
2. To verify forward and reverse characteristics of DIAC
3. To verify forward and reverse characteristics of TRIAC
4. To study UJT as relaxation oscillator
5. AC voltage control using triac - diac combination
6. To verify the operation of half and full controlled converter
7. To verify the operation of SCR commutation circuits
8. To design & simulate dc-dc buck converter
9. To design & simulate dc-dc boost converter
10. Construct and test the dc chopper control circuit using thyristor
11. Study of PWM based step down dc chopper using MOSFET/IGBT
12. To verify the operation of Single phase single pulse / sinusoidal PWM inverter using MOSFET/IGBT
13. To verify the operation of Single phase parallel inverter using MOSFET/IGBT
14. To verify the operation of Single phase to single phase cycloconverter
15. To verify the operation of Single phase dual converter With R - RL loads
16. To verify the operation of Single phase ac voltage controller

6EE07 POWER SYSTEMS - II LAB

List of Experiments:

1. Determination of negative sequence reactance of a synchronous generator
2. Determination of zero sequence reactance of a synchronous generator
3. To study various types of current limiting reactors
4. To study the mechanism of lightning arrester
5. Introduction to use of Simulation package (Power World Simulator) for power systems
6. To study substation layout and its components
7. To study HVDC Transmission System
8. To simulate three phase fault for a given power system using MATLAB Simulink
9. To find the direct axis synchronous reactance, X_d& quadrature axis synchronous reactance, X_q of a salient pole synchronous machine by slip test
10. To find the direct axis subtransient reactance, X_dò & quadrature axis sub ï transient reactance, X_qò of a salient pole synchronous machine by conducting static test
11. TO study of corona on EHV lines.
12. To study of faults at overhead line insulators
13. To study of sag and stress on overhead conductors

6EE08 COMPUTER AIDED ELECTRICAL MACHINE DESIGN - LAB

Develop Minimum Eight (8) Computer programme:

List of Computer Programms:

1. Develop a computer programme for core design of a single-phase core type transformer
2. Develop a computer programme for core design of a single-phase shell type transformer
3. Develop a computer programme for core design of a three-phase core type transformer
4. Develop a computer programme for optimum core design of a three-phase core type transformer for minimum cost or maximum efficiency.

5. Develop a computer programme for Estimation of Iron losses in a three-phase core type transformer.
6. Develop a computer programme for windings design of a single-phase transformer
7. Develop a computer programme for windings design of a three-phase transformer
8. Develop a computer programme for calculating the No load current of a single-phase transformer.
9. Develop a computer programme for calculating the No load current of a three-phase transformer.
10. Develop a computer programme for tank design and calculating the number of cooling tubes required for three phase core type transformer.
11. Develop a computer programme to calculate Main dimensions (D & L) of a three phase Induction motor.
12. Develop a computer programme for stator core design of three phase induction motor.
13. Develop a computer programme for squirrel cage rotor design of three phase induction motor.
14. Develop a computer programme for wound type rotor design of three phase induction motor.
15. Develop a computer programme for estimating magnetizing current of a squirrel cage type three phase induction motor.

6EE09 COMPUTER TECHNOLOGY - LAB

Student needs to complete minimum eight assignments based on the following

- Computer Network: Basic Hardware and Terminology in networks, Classifications, The Internet, The Intranet and Extranet.
- Installation of Operating systems, Application software in Personnel Computer or laptop.
- Study of PLCs usedforIndustrial automation, developing the ladder diagram for given task in automation using PLC.
- Basics of IoT, IoT based Monitoring & Controlling of various Electrical Equipment.
- Develop the simulation models for various tasks in electrical engineering using Simulation software.
- Develop the computer programme for various tasks in electrical engineering using software.

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B.E. (ELECTRICAL & ELECTRONICS ENGG.) SEMESTER - V

5EX01/4EP03 CONTROL SYSTEMS

Course Outcomes:

After completing this course, student will be able to:

1. Demonstrate the fundamental concepts of automatic Control and mathematical modeling ofthe Systems.
2. Determine the transfer function of control system components.
3. Analyze the time response of various systems and performance of controllers.
4. Evaluate the stability of linear systems using various methods.

Unit I : Introduction to automatic control: Open loop and closed loop system, servo-mechanisms, mathematical modeling of physical systems, transfer functions, block diagrams and signal flow graphs. Effect of feedback on sensitivity to parameter variation and reduction of the noise.

Unit II : Control System Components: Electrical / Electro-mechanical components such as A.C./D.C. servomotors, stepper motors, synchros, potentiometers, tacho-generators, encoders, their functional analysis and operating characteristics and their application.

Unit III: Time response analysis: Time response of first and second order systems to standard inputs. Time response specifications, types of system, error analysis, error coefficients, steady state errors, dynamic error series. Approximate methods for higher order system, proportional, derivative and integral control.

Unit IV: Stability: Stability of control systems, characteristics equation, impulse response, Routh-Hurwitz stability criterion, relative stability. Root Locus: construction of root locus, determination of roots from root locus conditions on variable parameter for stability, effect of addition of poles and zeros.

Unit V: Frequency response methods: Frequency response of linear system, specification, Logarithmic frequency response (Bode) plots from transfer function for various systems. Polar plots for various systems. Estimation of approximate transfer functions from the frequency response.

Unit VI: Stability analysis from frequency response: Gain margin and Phase margin; Stability analysis from Bode plots. Nyquist criterion, Nyquist plots and stability analysis.

BOOKS RECOMMENDED:

Text Book: Nagrath I.J., Gopal M.: Control System Engineering, Wiley Eastern.