JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

II Year B.Tech. ECE - II Sem | **L** 3 | **T/P/D** 1/-/- | **C** 3

(54019) PRINCIPLES OF ELECTRICAL ENGINEERING

Unit – I – Transient Analysis (First and Second Order Circuits)

Transient Response of RL , RC Series, RLC Circuits for DC excitations, Initial Conditions, Solution using Differential Equations approach and Laplace Transform Method.

Unit – II – Two Port Networks

Impedance Parameters, Admittance Parameters, Hybrid Parameters, Transmission (ABCD) Parameters, Conversion of one Parameter to another, Conditions for Reciprocity and Symmetry, Interconnection of Two Port networks in Series, Parallel and Cascaded configurations, Image Parameters, Illustrative problems.

Unit – III – Filters

Classification of Filters, Filter Networks, Classification of Pass band and Stop band, Characteristic Impedance in the Pass and Stop Bands, Constant-k Low Pass Filter, High Pass Filter, m-derived T-Section, Band Pass filter and Band Elimination filter, Illustrative Problems.

Unit – IV – Symmetrical Attenuators

Symmetrical Attenuators – T-Type Attenuator, ð–Type Attenuator, Bridged T type Attenuator, Lattice Attenuator.

Unit –V – DC Generators

Principle of Operation of DC Machines, EMF equation, Types of Generators, Magnetization and Load Characteristics of DC Generators.

Unit –VI – DC Motors

DC Motors, Types of DC Motors, Characteristics of DC Motors, Losses and Efficiency, Swinburne's Test, Speed Control of DC Shunt Motor, Flux and Armature Voltage control methods.

Unit –VII – Transformers and Their Performance

Principle of Operation of Single Phase transformer, Types, Constructional

Features, Phasor Diagram on No Load and Load, Equivalent Circuit, Losses and Efficiency of Transformer and Regulation, OC and SC Tests , Predetermination of Efficiency and Regulation (Simple Problems).

Unit – VIII – Single Phase Induction Motors

Principle of Operation, Shaded Pole motors, Capacitor motors, AC Servomotor, AC Tachometers, Synchros, Stepper Motors, Characteristics.

Text Books :

1. Fundamentals of Electric Circuits – Charles K. Alexander, Mathew N. O. Sadiku, 3 ed., 2008,TMH.
2. Network Analysis – A Sudhakar ,Shyammohan S.Palli, 3 ed., 2009, TMH.
3. Introduction to Electrical Engineering – M.S.Naidu and S. Kamakshaiah, 2008, TMH.

Reference Books :

1. Networks, Lines and Fields – John.D.Ryder, 2 ed.,, 2008 (Reprint), PHI.
2. Engineering Circuit Analysis - W.H.Hayt and J. E Kemmerly and S.M.Durbin, 6 ed., 2008, TMH.
3. Network analysis and Synthesis – C L Wadhwa, 3 ed., 2007, New Age International Publishers.
4. Network Analysis – N.C.Jagan and C.Lakshmi Narayana, BSP, 2006.
5. Electric Circuits – Nilsson, Riedel, 8 ed., PE.

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(54020) ELECTRONIC CIRCUIT ANALYSIS

Unit – I: Single Stage Amplifiers

Classification of Amplifiers – Distortion in Amplifiers, Analysis of CE, CC, and CB Configurations with simplified Hybrid Model, Analysis of CE amplifier with Emitter Resistance and Emitter follower, Miller's Theorem and its dual, Design of Single Stage RC Coupled Amplifier using BJT.

Unit – II: Multi Stage Amplifiers

Analysis of Cascaded RC Coupled BJT amplifiers, Cascode Amplifier, Darlington Pair, Different Coupling Schemes used in Amplifiers - RC Coupled Amplifier, Transformer Coupled Amplifier, Direct Coupled Amplifier.

Unit – III: BJT Amplifiers - Frequency Response

Logarithms, Decibles, General frequency considerations, Frequency response of BJT Amplifier, Analysis at Low and High frequencies, Effect of coupling and bypass Capacitors, The Hybrid- pi (?) - Common Emitter Transistor Model, CE Short Circuit Current Gain, Current Gain with Resistive Load, Single Stage CE Transistor Amplifier Response, Gain-Bandwidth Product, Emitter follower at higher frequencies.

Unit –IV : MOS Amplifiers [3]

Basic concepts, MOS Small signal model, Common source amplifier with Resistive load, Diode connected Load and Current Source Load, Source follower, Common Gate stage Cascode and Folded Cascode Amplifier and their Frequency response.

Unit – V: Feedback Amplifiers

Concepts of Feedback, Classification of Feedback Amplifiers, General characteristics of Negative Feedback Amplifiers, Effect of Feedback on Amplifier Characteristics, Voltage Series, Voltage Shunt, Current Series and Current Shunt Feedback Configurations, Illustrative Problems.

Unit – VI: Oscillators

Classification of Oscillators, Conditions for Oscillations, RC Phase Shift

Oscillator, Generalized analysis of LC oscillators - Hartley, and Colpitts Oscillators, Wien-Bridge & Crystal Oscillators, Stability of Oscillators.

Unit – VII: Large Signal Amplifiers

Classification, Class A Large Signal Amplifiers, Transformer Coupled Class A Audio Power Amplifier, Efficiency of Class A Amplifier, Class B Amplifier, Efficiency of Class B Amplifier, Class-B Push-Pull Amplifier, Complementary Symmetry Class B Push-Pull Amplifier, Distortion in Power Amplifiers, Thermal Stability and Heat Sinks.

Unit – VIII: Tuned Amplifiers

Introduction, Q-Factor, Small Signal Tuned Amplifiers, Effect of Cascading Single Tuned Amplifiers on Bandwidth, Effect of Cascading Double Tuned Amplifiers on Bandwidth, Stagger Tuned Amplifiers, Stability of Tuned Amplifiers.

TEXT BOOKS:

1. Integrated Electronics - Jacob Millman and Christos C Halkias, 1991 ed., 2008, TMH.
2. Electronic Devices and Circuits - S. Salivahanan, N.Suresh Kumar, A Vallavaraj, 2 ed., 2009, TMH.
3. Design of Analog CMOS Integrated Circuits – Behzad Razavi, 2008, TMH.

REFERENCES:

1. Electronic Devices and Circuit Theory - Robert L.Boylestad, Louis Nashelsky, 9 ed., 2008 PE.
2. Introductory Electronic Devices and Circuits– Robert T. Paynter, 7 ed., 2009, PEI.
3. Electronic Circuit Analysis – K. Lal Kishore, 2004, BSP.
4. Electronic Devices and Circuits, David A. Bell – 5 ed., Oxford University Press.
5. Microelectric Circuits – Sedra and Smith – 5 ed., 2009, Oxford University Press.

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(54021) PULSE AND DIGITAL CIRCUITS

Unit-I

Linear Wave Shaping : High pass and low pass RC circuits and their response for Sinusoidal, Step, Pulse, Square, & Ramp inputs, High pass RC network as Differentiator, Low pass RC circuit as an Integrator, Attenuators and its application as a CRO Probe, RL and RLC Circuits and their response for Step Input, Ringing Circuit.

Unit- II

Non-Linear Wave Shaping: Diode clippers, Transistor clippers, Clipping at two independent levels, Comparators, Applications of Voltage comparators. Clamping Operation, Clamping circuit taking Source and Diode resistances into account, Clamping Circuit Theorem, Practical Clamping Circuits, Effect of Diode Characteristics on Clamping Voltage, Synchronized Clamping.

Unit-III

Switching Characteristics of Devices : Diode as a Switch, Piecewise Linear Diode Characteristics, Diode Switching times, Transistor as a Switch, Break down voltages, Transistor in Saturation, Temperature variation of Saturation Parameters, Transistor-switching times, Silicon-controlled-switch circuits.

Unit-IV

Multivibrators: Analysis and Design of Bistable, Monostable, Astable Multivibrators and Schmitt trigger using Transistors.

Unit-V

Time Base Generators : General features of a Time base Signal, Methods of Generating Time Base Waveform, Miller and Bootstrap Time base Generators-Basic Principles, Transistor Miller Time Base generator, Transistor Bootstrap Time Base Generator, Transistor Current Time Base Generators, Methods of Linearity improvement.

Unit-VI

Sampling Gates : Basic operating principles of Sampling Gates, Unidirectional

and Bi-directional Sampling Gates, Four Diode Sampling Gate, Reduction of pedestal in Gate Circuits, Six Diode Gate, Application of Sampling Gates.

Unit-VII

Synchronization and Frequency Division: Pulse Synchronization of Relaxation Devices, Frequency division in Sweep Circuit, Stability of Relaxation Devices, Astable Relaxation Circuits, Monostable Relaxation Circuits, Synchronization of a Sweep Circuit with Symmetrical Signals, Sine wave frequency division with a Sweep Circuit, A Sinusoidal Divider using Regeneration and Modulation.

Unit-VIII

Realization of Logic Gates Using Diodes & Transistors: AND, OR and NOT Gates using Diodes and Transistors, DCTL, RTL, DTL, TTL and CML Logic Families and its Comparison.

Text Books:

1. Millman's Pulse, Digital and Switching Waveforms –J. Millman, H. Taub and Mothiki S. Prakash Rao, 2 ed., 2008, TMH.
2. Solid State Pulse circuits –David A. Bell, 4 ed., 2002 PHI.

References:

1. Pulse and Digital Circuits – A. Anand Kumar, 2005, PHI.
2. Fundamentals of Pulse and Digital Circuits- Ronald J. Tocci, 3 ed., 2008.
3. Pulse and Digital Circuits – Motheki S. Prakash Rao, 2006, TMH.
4. Wave Generation and Shaping - L. Strauss.

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(54010) SWITCHING THEORY AND LOGIC DESIGN

UNIT I

Number Systems & Codes : Philosophy of Number Systems, Complement Representation of Negative Numbers, Binary Arithmetic, Binary Codes, Error Detecting & Error Correcting Codes, Hamming codes.

UNIT II

Boolean Algebra and Switching Functions : Fundamental Postulates of Boolean Algebra, Basic theorems and Properties, Switching Functions, Canonical and Standard forms, Algebraic simplification Digital Logic Gates, Properties of XOR gates, Universal Gates, Multilevel NAND/NOR Realizations.

UNIT III

Minimization of Switching Functions : Map method, Prime implicants, Don't care combinations, Minimal SOP and POS forms, Tabular Method, Prime – Implicant chart, Simplification rules.

UNIT IV

Combinational Logic Design

Design using conventional logic gates, Encoder, Decoder, Multiplexer, De-Multiplexer, Modular design using IC chips, MUX Realization of switching functions Parity bit generator, Code-converters, Hazards and Hazard free Realizations.

UNIT V

Programmable Logic Devices & Threshold Logic : Basic PLD's-ROM, PROM, PLA, PAL, Realization of Switching functions using PLD's, Capabilities and Limitations of Threshold gate, Synthesis of Threshold functions, Multigate Synthesis.

UNIT VI

Sequential Circuits - I : Classification of sequential circuits (Synchronous, Asynchronous, Pulse mode, Level mode with examples), Basic Flip-Flops,

Triggering and Excitation tables, Steps in Synchronous Sequential Circuit Design, Design of modulo-N Ring & Shift counters, Serial binary adder, Sequence detector.

UNIT VII

Sequential Circuits - II : Finite State Machine-Capabilities and Limitations, Mealy and Moore models, Minimization of Completely Sspecified and Incompletely Specified Sequential Machines, Partition Techniques and Merger chart methods, Concept of Minimal cover table.

UNIT VIII

Algorithmic State Machines : Salient features of the ASM chart, Simple examples, System design using data path and control subsystems, Control implementations, Examples of Weighing Machine and Binary multiplier.

TEXTBOOKS:

1. Switching & Finite Automata theory – Zvi Kohavi, 2 ed., TMH.
2. Digital Design – Morris Mano, 3 ed., 2006, PHI.
3. Switching Theory and Logic Design – A. Anand Kumar, 2008, PHI.

REFERENCES:

1. An Engineering Approach to Digital Design – Fletcher, PHI.
2. Fundamentals of Logic Design – Charles H. Roth, 5 ed., 2004, Thomson Publications.
3. Digital Logic Applications and Design – John M. Yarbrough, 2006, Thomson Publications.

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(54011) ELECTROMAGNETIC THEORY AND TRANSMISSION LINES

UNIT I

Electrostatics – I : Coulomb's Law, Electric Field Intensity – Fields due to Different Charge Distributions, Electric Flux Density, Gauss Law and Applications, Electric Potential, Relations Between E and V, Maxwell's Two Equations for Electrostatic Fields, Energy Density, Illustrative Problems.

UNIT II

Electrostatics - II : Convection and Conduction Currents, Dielectric Constant, Isotropic and Homogeneous Dielectrics, Continuity Equation, Relaxation Time, Poisson's and Laplace's Equations; Capacitance – Parallel Plate, Coaxial, Spherical Capacitors, Illustrative Problems.

UNIT III

Magnetostatics : Biot-Savart's Law, Ampere's Circuital Law and Applications, Magnetic Flux Density, Maxwell's Two Equations for Magnetostatic Fields, Magnetic Scalar and Vector Potentials, Forces due to Magnetic Fields, Ampere's Force Law, Inductances and Magnetic Energy, Illustrative Problems.

UNIT IV

Maxwell's Equations (Time Varying Fields): Faraday's Law and Transformer emf, Inconsistency of Ampere's Law and Displacement Current Density, Maxwell's Equations in Different Final Forms and Word Statements, Conditions at a Boundary Surface : Dielectric-Dielectric and Dielectric-Conductor Interfaces, Illustrative Problems .

UNIT V

EM Wave Characteristics - I: Wave Equations for Conducting and Perfect Dielectric Media, Uniform Plane Waves – Definition, All Relations Between E & H, Sinusoidal Variations, Wave Propagation in Lossless and Conducting Media, Conductors & Dielectrics – Characterization, Wave Propagation in

Good Conductors and Good Dielectrics, Polarization, Illustrative Problems.

UNIT VI

EM Wave Characteristics – II: Reflection and Refraction of Plane Waves – Normal and Oblique Incidences, for both Perfect Conductor and Perfect Dielectrics, Brewster Angle, Critical Angle and Total Internal Reflection, Surface Impedance, Poynting Vector and Poynting Theorem – Applications, Power Loss in a Plane Conductor, Illustrative Problems.

UNIT VII

Transmission Lines - I : Types, Parameters, Transmission Line Equations, Primary & Secondary Constants, Expressions for Characteristic Impedance, Propagation Constant, Phase and Group Velocities, Infinite Line Concepts, Losslessness/Low Loss Characterization, Distortion – Condition for Distortionlessness and Minimum Attenuation, Loading - Types of Loading, Illustrative Problems.

UNIT VIII

Transmission Lines – II : Input Impedance Relations, SC and OC Lines, Reflection Coefficient, VSWR,UHF Lines as Circuit Elements : λ/4, λ2, λ/8 Lines – Impedance Transformations, Significance of Z_{min} and Z_{max} Smith Chart – Configuration and Applications, Single and Double Stub Matching, Illustrative Problems.

TEXT BOOKS:

1. Elements of Electromagnetics – Matthew N.O. Sadiku, 4 ed., 2008, Oxford Univ.Press.
2. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, 2 ed., 2000, PHI.
3. Transmission Lines and Networks – Umesh Sinha, Satya Prakashan, 2001, (Tech. India Publications), New Delhi.

REFERENCES:

1. Engineering Electromagnetics – Nathan Ida, 2 ed., 2005, Springer (India) Pvt. Ltd., New Delhi.
2. Engineering Electromagnetics – William H. Hayt Jr. and John A. Buck, 7 ed., 2006, TMH.
3. Networks, Lines and Fields – John D. Ryder, 2 ed., 1999, PHI.

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(54606) ELECTRICAL ENGINEERING LAB

PART – A

1. Verification of KVL and KCL.
2. Serial and Parallel Resonance – Timing, Resonant frequency, Bandwidth and Q-factor determination for RLC network.
2. Time response of first order RC/RL network for periodic non-sinusoidal inputs – time constant and steady state error determination.
3. Two port network parameters – Z-Y Parameters, chain matrix and analytical verification.
4. Two port network parameters – ABCD and h- Parameters
5. Verification of Superposition and Reciprocity theorems.
6. Verification of maximum power transfer theorem. Verification on DC, and AC Excitation with Resistive and Reactive loads.
7. Experimental determination of Thevenin's and Norton's equivalent circuits and verification by direct test.
8. Constant – k Low Pass Filter and High Pass Filter – Design and Test.

PART – B

1. Magnetization characteristics of D.C. Shunt generator. Determination of critical field resistance.
2. Swinburne's Test on DC shunt machine (Predetermination of efficiency of a given DC Shunt machine working as motor and generator).
3. Brake test on DC shunt motor. Determination of performance characteristics.
4. OC & SC tests on Single-phase transformer (Predetermination of efficiency and regulation at given power factors and determination of equivalent circuit).
5. Load Test on Single Phase Transformer.

Note: Any **12** of the above experiments are to be conducted

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(54607) ELECTRONIC CIRCUIT ANALYSIS LAB

List of Experiments (12 experiments to be done) :

I) Design and Simulation in Simulation Laboratory using any Simulation Software. (Any 6 Experiments):

1. Common Emitter Amplifier
2. Common Source Amplifier
3. Two Stage RC Coupled Amplifier
4. Current shunt and Voltage Series Feedback Amplifier
5. Cascode Amplifier
6. Wien Bridge Oscillator using Transistors
7. RC Phase Shift Oscillator using Transistors
7. Class A Power Amplifier (Transformer less)
9. Class B Complementary Symmetry Amplifier
10. Common Base (BJT) / Common Gate (JFET) Amplifier.

II) Testing in the Hardware Laboratory (6 Experiments)

A) Any Three circuits simulated in Simulation laboratory

B) Any Three of the following

1. Class A Power Amplifier (with transformer load)
2. Class C Power Amplifier
3. Single Tuned Voltage Amplifier
4. Hartley & Colpitt's Oscillators
5. Darlington Pair
6. MOS Amplifier

Equipments required for Laboratories:

1. For software simulation of Electronic circuits

i) Computer Systems with latest specifications

ii) Connected in LAN (Optional)

iii) Operating system (Windows XP)

iv) Suitable Simulations software

2. For Hardware simulations of Electronic Circuits

i) Regulated Power Supply (0-30V)

ii) CRO's

iii) Functions Generators

iv) Multimeters

v) Components

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(54608) PULSE AND DIGITAL CIRCUITS LAB

Minimum Twelve experiments to be conducted:

1. Linear wave shaping.
2. Non Linear wave shaping – Clippers.
3. Non Linear wave shaping – Clampers.
4. Transistor as a switch.
5. Study of Logic Gates & some applications.
6. Study of Flip-Flops & some applications.
7. Sampling Gates.
8. Astable Multivibrator.
9. Monostable Multivibrator.
10. Bistable Multivibrator.
11. Schmitt Trigger.
12. UJT Relaxation Oscillator.
13. Bootstrap Sweep Circuit.

Equipment required for Laboratories:

1. Regulated Power Supply - 0 – 30 V
2. CRO - 0 - 20 M Hz.
3. Function Generators - 0 – 1 M Hz
4. Components
5. Multi Meters