ECC-401 Linear Integrated Circuits

UNIT-I: Introduction to Operational Amplifiers and Characteristics
Introduction, Block diagram, characteristics and equivalent circuits of an ideal op-amp, various types of Operational Amplifiers and their applications, Power supply configurations for OPAMP applications, inverting and non-inverting amplifier configurations.

UNIT-II: The Practical op-amp
Introduction, Input offset voltage, offset current, thermal drift,Effect of variation in power supply voltage, common-mode rejection ratio, Slew rate and its Effect, PSRR and gain –bandwidth product.

UNIT-III: Amplifiers and Oscillators
Summing amplifier, Integrators and differentiators, Instrumentation amplifier, Differential input and differential output amplifier, Voltage-series feedback amplifier, Voltage-shunt feedback amplifier, Log/ Antilog amplifier, Triangular/rectangular wave generator, phase-shift oscillators.

UNIT-IV: Active Filters
Characteristics of filters, Classification of filters, Magnitude and frequency response, Butterworth 1st and 2nd order Low pass, High pass and band pass filters, Chebyshev filter characteristics, Band reject filters.

UNIT-V: Comparators and Converters:
Comparator, Zero Crossing Detector, Monostable and Astable Multivibrator ,Schmitt Trigger, Voltage limiters, Clipper and clampers, Precision rectifiers, Voltage-to-current converter, Current-to-voltage converter.

UNIT-VI: Advanced applications
Applications as Frequency Divider, PLL, using op-AMP and analog multipliers,Amplitude modulation using analog multiplier, Frequency Shift Keying, simple OP-AMP
Voltage regulator.
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List of Experiments
Tools Required –Function Generator, Power Supply,
Oscilloscopes, Connecting wires.
1. Study the characteristics of negative feedback amplifier
2. Design of an instrumentation amplifier.
3. Study the characteristics of regenerative feedback system with extension to design an astable multivibrator.
4. Study the characteristics of integrator circuit.
5. Design of Analog filters – I.
6. Design of Analog filters – II.

ECC- 402- Microprocessor and Microcontrollers

Unit-I History of computers: Timing and control, memory devices: semiconductor memory organization, 8-bit microprocessor (8085): Architecture, types of instructions, instruction set, addressing modes, flag register of 8085, and memory segmentation.

Unit-II 16-bit Microprocessors (8086/8088): Architecture, physical address, flag registers, memory organization, bus cycle, addressing modes, instruction set difference between 8086 and 8088, introduction to 80186 and 80286, assembly language programming of 8086/8088

Unit –III Data Transfer Schemes: Introduction, types of transmission, 8257 (DMA), 8255 (PPI), serial data transfer (USART 8251), keyboard-display controller (8279), Programmable Priority Controller (8259)

Unit-IV Programmable Interval Timer/ Counter (8253/8254): Introduction, modes, interfacing of 8253, applications, ADC and DAC: Introduction, DAC converters, ADC converters, DAC and ADC interfacing and applications.

Unit -V Microcontroller (8051): Introduction, architecture, instruction set, addressing modes, registers, memory organization, timers/counters, interrupts, addressing modes, 8051 instruction set , applications of microcontrollers.

References:

Hall Douglas V.,Microprocessor and interfacing, Revised second edition 2006, Macmillan, McGraw Hill .

A.K. Ray &K.M.Bhurchandi, Advanced Microprocessors and peripherals- Architecture, Programming and Interfacing, Tata McGraw – Hill, 2009 TMH reprint.

Kenneth J. Ayala, The 8086 microprocessor: programming and interfacing the PC, Indian - edition, CENGAGE Learning.

Muhammad Ali Mazidi and Janice Gillespie Mazidi, The 8051 Microcontroller and Embedded

Systems, Pearson education, 2005.

Kenneth J. Ayala, The 8051 Microcontroller Architecture, III edition, CENGAGE Learning.

Microprocessor Architecture, Programming and Applications with the 8085 6/e

October 2013, Ramesh Gaonkar.

List of Experiment(Extendable):

To study 8085 based microprocessor system.

To study 8086 based microprocessor system.

Write an Assembly Language Program to add two 16 bit numbers.

Write an Assembly Language Program to subtract two 16 bit numbers.

To perform multiplication/division of given numbers.

To perform computation of square root of a given number.

To obtain interfacing of RAM chip to 8085/8086 based system

To develop and run a program for finding out the largest/smallest number from a given set ofnumbers.

ECC-403 Communication Network and Transmission Lines

Unit – I

Characteristic Parameters of symmetrical and asymmetrical two port networks and their design: image impedance, iterative impedance, characteristic impedance, propagation coefficient, image transfer coefficient ,iterative transfer coefficient, Lattice and Bridged-T networks, reactive matching networks, matching techniques, Insertion Loss, symmetrical and asymmetrical attenuators and their design.

Unit – II

Passive LC Filters: Analysis and design of Low pass, high pass, band pass and band elimination filters, m-derived filters, composite filters, Filter specifications, Butterworth approximation, Chebyshev approximation, elliptic function approximation, frequency transformation.

Unit – III

Positive real function, LC, RL, RC, and RLC network synthesis, Foster and Cauer network, minimum positive real function, Brune' s method, Bott-Duffin method, Synthesis-Coefficient.

Unit – IV

Transmission line fundamentals: Lumped parameter equivalent, voltage and current on a transmission line, infinite line, characteristic impedance and propagation constant, waveform distortion, attenuation and phase equalizers,distortion-less line, loading, liner reflection on a line, reflection coefficient, input and transfer impedances, open circuit and short circuit line, reflection factors, reflection loss, insertion loss, T and equivalents of a line, location of line fault.Construction and design of two wire line and coaxial cable.

Unit – V

Line at radio frequencies, parameters of line and coaxial cable at radio frequencies, dissipation-less line, voltage and current on a dissipation-less line, standing waves, standing wave ratio, input impedance of open circuit and short circuit, power and impedance measurement on lines, eighth-wave, quarter-wave and half wave line, circle diagram, Smith chart, solution of problems using Smith chart, single and double stub matching .introduction to micro-strip lines
and its analysis.

References:

1. J.D. Ryder: Networks and Transmission Lines, 2nd edition, PHI
2. M.E. Valkenberg: Introduction to Modern Network synthesis, Wiley Eastern Ltd.
3. G.K. Mithal: Network Analysis, Khanna Publishers.
4. Umesh Sinha: Networks and Transmission Lines, Satya Prakashan.
5. Suresh: Electric Circuits and Networks, Pearson Education.

List of Experiments:

Following illustrative practical should be simulated with the help of any RF simulation software e.g.

FEKO / HFSS / IE3D / Microwave Office / Microwave Studio or any other similar software:-

1. To set up Transmission Line Analyzer for measurements.
2. To set up the standing waves formation on a transmission line and observe their maxima and minima using
frequency domain method.
3. To measure the characteristic impedance of transmission lines using frequency domain method and to
differentiate between the matched and unmatched lines.
4. To measure the VSWR, reflection coefficient and return loss in a transmission line.
5. To measure the dielectric constant of insulator in the transmission line.
6. To measure the velocity of propagation and wavelength in the given transmission line.
7. To study the attenuation characteristics of signal along a transmission line and observe its variation with
frequency. Also calculate the phase constant and propagation constant.
8. To study the effect of reactive loads on transmission lines.
9. To study the difference between lossy and loss less line.

ECC - 404 Analog Communication

Unit-I

Different types of Signals (Continuous, Discrete, Periodic), Time Domain and Frequency Domain Representation, Introduction to basic Transform Techniques applicable to these Signals.

Spectral Analysis: Fourier Technique, Fourier Transform and their Properties, Transform of Gate Signal, Impulse Function and Unit Step Function, Fourier Transform Technique for Periodic Signal, Transform of Train of Pulses and Impulses, Sine and Cosine wave.

Signal Energy and Power, Spectral Density of various types of signals, Spectra (Parseval's Theorem), Density Spectra of Periodic Gate and Impulse train.

Linear Time Invariant (LTI) Systems, Impulse Response, Convolution, Convolution with Impulse Function, Casual and Non Causal System, Distortion less System, Impulse Response of Distortion less System, Ideal Filter and Practical Filter.

Unit-II

Modulation Techniques: Need and types of modulation techniques, Amplitude Modulation, Frequency Spectrum, Power Distribution, Modulation by Complex Signal, Low Level and High Level AM Modulators, Linear Integrated Circuit AM Modulators, Suppressed Carrier Generation (Balance/Chopper and Square Law Modulation), SSB Generator (Phase and Frequency Discrimination Method), VSB Transmission and Application. Detection of AM signals: Envelope Detector Circuit, RC Time Constant, Synchronous Detection Technique, Error in Synchronous Detection, SSB signal detection, PLL and its use in demodulation.

Unit-III

Angle Modulation: Frequency and Phase Modulation Frequency spectrum, bandwidth requirement, Frequency and Phase Deviation, Modulation Index, NBFM and WBFM, Multiple frequencies FM. FM Modulators: Direct (Parameter Variation Method) and Indirect (Armstrong) Method of frequency modulation. FM Detector: Slope Detector, Foster Seely Discriminator, Ratio Detector and PLL detectors.

Unit-IV

Radio Transmitters: AM transmitter, block diagram and working of Low Level and High Level Transmitters, Trapezoidal Pattern and Carrier Shift, SSB Transmitters, FM transmitters Frequency Multiplication Applied to FM Signals, FM transmitters.

Radio Receivers: Block Diagram of Radio Receiver, Receiver Characteristics (Selectivity, Fidelity and Sensitivity), AM Receiver, RF Receiver, Super-heterodyne Receiver, RF Amplifier, Frequency Mixer, AVC and AFC, Image Signal, Intermediate Frequency Selection, Diversity Reception, FM Receiver.

Unit-V Noise :
Sources and types of noise and their power density, White Noise, Noise from Single and Multiple noise source for Linear Systems, Super Position of Power Spectrum, Equivalent Noise Bandwidth, Noise Figure, and Equivalent Noise Temperature, their Relationship, Calculation of Noise Figure and Noise Temperature for Cascade Systems, Noise Performance of Communication System, Band Pass Noise Representation in Terms of Low Pass, In-phase and Quadrature Phase Component and their Power Spectral Density, Figure of Merit, Calculation for AM, AM-SC and SSB System, Noise in Angle Modulated System, Figure of Merit for FM, Noise Density of Output of FM Detector, Pre-Emphasis and De-Emphasis, Phasor Representation of Noise, Capture Effect, Comparison of Noise Performance of AM and FM.

References:
1. B.P. Lathi : Modern Analog and Digital Communication System, Wiley Eastern limited
2. Taub and Schilling : Principles of communication Systems, TMH
3. Singh and Sapre : Communication Systems, TMH
4. S Haykin : Communication Systems, John Wiley and Sons Inc
5. S Ghose: Signals and Systems, Pearson Education.
6. A Bruce Carlson : Communication System, TMH
7. Steven : Communication Systems – Analysis and Design, Pearson Education

List of Experiments (Expandable):
All experiments (wherever applicable) should be performed through the following steps.
Step 1: Circuit should be designed/drafted on paper.
Step 2: The designed/drafted circuit should be simulated using simulation Software (TINAPRO/ PSPICE/ LABVIEW/ CIRCUIT MAKER).
Step 3: The designed/drafted circuit should be tested on the bread board and compare the results with the simulated results.
Step 4: The bread board circuit should be fabricated on PCB by one batch using PCB machine.
1. Analysis of AM Modulation and Demodulation Techniques (Transmitter and Receiver), Calculation of Parameters
2. Analysis of FM Modulation and Demodulation (Transmitter and Receiver) and Calculation of Parameters
3. To Construct and Verify Pre-emphasis and De-emphasis and Plot the Waveforms.
4. Study of Super-heterodyne Receiver and Characteristics of Radio Receiver.
5. To Construct Frequency Multiplier Circuit and to Observe the Waveform
6. Study of AVC and AFC.
7. Study of PLL chip (566) and its use in various systems

ECC- 405 Electromagnetic Theory

Unit I- Co-ordinate Systems: Co-ordinate systems, vector &scaler fields, gradient, divergence & curl, divergence theorem, Stokes's theorem, electrostatic fields, coulomb's law, electric field intensity due to different charge distribution ie.. line charge, sheet charge, volume charge, equipotential surfaces, line of force, Gauss law, applications of gauss law, gauss law in point form, method of images.

Unit II -Laplace's & Poisson's equations: Laplace's & Poisson's equations, electric dipole, dipole moment, potential & electric field intensity due to dipole, conductor & insulator, polarization, boundary value conditions for electric field, capacitances of various types of capacitors, energy stored and energy density in static electric field, current density, conduction & convection current density ohms law in point form, equation of continuity.

Unit III- Magnetic Fields: Magnetic Fields, Biot-Savart's law, magnetic field intensity due to straight current carrying filament, circular, square and solenoid current carrying wire, magnetic flux, flux density & magnetic field intensity, magnetic boundary conditions, ampere's circuital law and its applications, magnetic force, lorentz force on straight and long current carrying conductors in magnetic field, force between two long & parallel current carrying conductors. magnetic dipole & dipole moment, torque on a current carrying loop in magnetic field.

Unit IV - Magnetic Potential: Scalar magnetic potential and its limitations, vector magnetic potential and its properties, self and mutual inductances, self inductance of solenoid, toroid coils, mutual inductance between a straight long wire & a square loop, energy stored in magnetic field & energy density, faraday's law, displacement current, maxwell's equations for different types- free space, harmonically varying field, static and steady fields, differential & integral form.

Unit V - Electro Magnetic Waves : Electro magnetic waves, uniform plane wave in time domain in free space, sinusoidally time varying uniform plane wave in free space, wave equation and solution for material medium, uniform plane wave in dielectrics and conductors, pointing vector theorem, instantaneous, average and complex poynting vector, power loss in a plane conductor, , polarization of waves, reflection by conductors and dielectric – normal & oblique incidence, reflection at surface of a conducting medium, transmission line analogy.

References:

P.V. Gupta; Electromagnetic Fields; DhanpatRai
Mathew N.O Sadiku; Elements of Electromagnetic; Oxford
S.P. Seth; Electromagnetic Field ;DhanpaRai& Son
Sandeepwali ; Elements of Electromagnetic; Oxford
N.N. Rao; Element of Engineering Electromagnetic; PHI.
John D. Kraus; Electromagnetic; TMH.

ECC-406 DATA STRUCTURES

UNIT I

Introduction: Data structures, Type of Data structure, ordered lists, operations in ordered list, sparse matrices, , arrays multi - dimensional arrays, linked lists, operations on linked list, doubly linked list and its operations, storage pools, garbage collection.

UNIT II

Stack: Stacks and Its Operations, applications of Stacks and queues and operation of queues, difference between Stacks and queues, Circular queues, Mazing problem, Prefix, postfix, infix notations

UNIT III

Trees: Concept of Trees, Type of Trees, applications of Trees , AVL Trees, B -Trees, binary tree, operations on binary tree , Spanning tree, cut sets, graphs, properties of graph, Planner graphs and its applications, Hamiltonian path and circuits Eularian paths and circuits.

UNIT IV

Sorting & Searching : Sorting, Insertion Sort, Bubble Sort, selection sort Quick Sort, Merge Sort, Heap Sort, Radix sort, Searching & Hashing: Hash Table, Hash Functions, Collision Resolution Strategies, Hash Table Implementation. Symbol Table, Static tree table, Dynamic Tree table.

UNIT V

Sorting & Searching Technique: Sequential Search, Binary Search, Other search techniques, Time complexity & memory requirements, Bubble Sort, Insertion sort, Quick sort, Selection sort, Merge sort, Heap sort, maxima and minima heap.

References:

1. Data Structure by Tanenbaum
2. Data Structure by Horowitz & Sahan