S.E. Sem. IV [EXTC]

Analog and Digital IC – Design and Applications

SYLLABUS

Time : 3 Hrs.

Theory : 100 Marks
Term Work : 25 Marks
Oral : 25 Marks

1. **Circuits with Resistive Feedback :**
   Basic Op-Amp Configurations, Ideal Op-Amp Circuits analysis, Negative Feedback, Current-to-voltage Converters, Voltage-to-Currents Converters, current Amplifiers, Difference Amplifier, Instrumentation Amplifier, Instrumentation Applications.

2. **Active Filters :**
   The Transfer function, First-Order Active Filters, Standard Second-Order Responses, KRC Filters, Multiple-Feedback Filters, State-Variable and Biquad Filters, Filter approximations, cascade design, generalized impedance converters, direct design, Switched capacitor filters.

3. **Analog IC's :**
   All Types of A/D Converter. Comparator Circuits and Their Applications, Sample and Hold Circuits, IC Power Amplifiers. Analog Multipliers (Logarithmic multipliers, Log and Antilog Amplifiers. 555 Timer. VCO ICs(566). PLL ICs(565, 4046B). Function Generator IC 8038, XR 2206.

4. **Sequential logic design :**
   Clocked synchronous state machine analysis, Clocked synchronous state machine design, designing state machines using state diagrams, state machine synthesis using transition lists, decomposing state machines, feedback sequential circuits, VHDL sequential circuit, VHDL sequential circuit design features.

5. **Synchronus logic Design practices.**
   Sequential circuits documentation standards, use of latches and flipflops like switch debouncing, counters-ripple, synchronus and MSI, decoding binary counter states, counter in VHDL. Shift Registers, ring counter Johnson counter, linear feedback shift register counter, Shift register in VHDL.

6. **Memory, CPLDs and FPGAs**
   Types of memory devices, Read-only memory (ROM), Read/write memory, static RAM, Dynamic RAM, Introduction to Xilinx XC9500, CPLD family and Xilinx XC 4000 FPGA family.

References :

1. Design with Operational Amplifiers and Analog Integrated Circuits (*Sergio Franco*) 3rd edition, McGraw Hill International edition, 2002.
2. Digital Logic Design Principles (*Norman Balabnian and Bradley Carlson*) John Wiley and Sons, 2004.
3. Fundamentals of Digital Logic with VHDL Design (*Stephen Brown & Zvonko Vranesic*) First Edition, McGraw Hill International edition, 2000.
4. Micro Electronic Circuits (*S. Sedra and K. C. Smith*) Saunders College Publishing, Third Edition, 1991.
5. Digital Integrated Electronics (*H. Taub and D. Schilling*) McGraw-Hill Publications, 1997.

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S.E. Sem. IV [EXTC]
Applied Mathematics - IV

SYLLABUS

Time : 3 Hrs. **Theory :** 100 Marks

1. Bessel Function
1. Relation between Laplace and Bessel's differential equation, its solution by series method, Bessel function of first and second kind, Recurrence relations for,
2. Generating function of, Orthogonality of Bessel-Fourier series of a function.

2. Matrices
1. Eigen Values and Eigen vectors, Cayley Hamilton theorem (without proof), Similar Matrices, Orthogonally Similar Matrices
2. Functions of square Matrix, Derogatory and Nonderogatory Matrices.

3. Matrices and Complex Variables
1. Quadratic forms over real field, Reduction of Quadratic form to a diagonal canonical form, Rank, Index and Signature of quadratic form, sylvester's law of Inertia
2. Value-class of a quadratic form-Definite, Semidefinite and indefinite.
3. Functions of a Complex variable, Analytic Functions, Cauchy-Riemann equations in Cartesian and polar co-ordinates. Harmonic functions, Analytical method and Milne Thomson method to find f(z).

4. Complex Variables
1. Conformal Mappings and Bilinear transformations, Cross-Ratios, Fixed points of Bilinear Transformations.
2. Complex Integration, Complex line integral, Cauchy's Integral theorem for simply connected regions (with proof) and Cauchy's Integral formula (with proof).

5. Complex Variables
1. Taylor's and Laurent's development (without proof), Zeros, Singularities and poles of function, Residue theorem (with proof).
2. Real definite Integrals of the form.

6. Vector Integration
1. Line Integral, properties of Line Integrals, Conservative fields, Scalar potentials.
2. Green's theorem in a plane (Statement only), Surface Integrals. Divergence Theorem (statement only). Stoke's Theorem (statement only).

References :

1. Vector Analysis (*Murray R. Spiegel*) Schaum's Outline Series – McGraw Hill Publications
2. Complex Variables (*Murray R. Spiegel*) Schaum's Outline Series – McGraw Hill Publications.
3. Higher Engineering Mathematics (*Dr. B. S. Grewal*) Khanna Publications.
4. Mathematical Methods (*J. N. Sharma and R. K. Gupta*) Krishna Prakashan Mandir (P) Ltd.
5. Calculas (*Thomas, Finney*) 9th Edition, Pearson Education.
6. Linear Algebra and Applications (*Gilbert Strang*) 4th Edition, Thompson Books/Cole.
7. Matrices (*Shantinarayan*) S.Chand Publications
8. A text book of Applied Mathematics Vol. I & II (*P. N. Wartikar & J. N. Wartikar*) Pune VIdyarthi Griha Prakashan.

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S.E. Sem. IV [EXTC]

Electromagnetic Wave Theory

SYLLABUS

Time : 3 Hrs.

Theory : 100 Marks
Term Work : 25 Marks
Oral : 25 Marks

1. **Coulomb's law and electric field intensity :**
   Coulomb's law, electric field intensity, calculation of electric field intensity for various charge distributions, streamlines and sketches of field.

   Electric flux density and Gauss's law :
   Electric flux density, Gauss's law, vector operator and divergence theorem.

2. **Energy and potential :**
   Energy expended in moving a point charge in an electric field, line integral, potential and potential difference, calculations of electric field of both point charge and system of charges, potential gradient, dipole, energy density

3. **Conductors, Dielectrics, capacitance :**
   Current and current density continuity of current, conductor properties, dielectric material and properties, capacitance, calculation of capacitance of various configurations method of images.

   Poisson and Laplace's equations :
   Poisson and Laplace's equation and its application, uniqueness theorem, product solution of Laplace's equation.

4. **Steady magnetic field :**
   Biot-Savart law, Ampere's circuital law, curl of H. Stroke's theorem, magnetic flux and flux density, scalar and vector magnetic potentials of steady magnetic field lines.

5. **Time varying fields and Maxwell's equations :**
   Faraday's law concept of displacement currents, Maxwell's equations in point form, Maxwell's equations in integral form, boundary conditions and significance of Maxwell's equations.

6. **Uniform Plane waves :**
   Uniform plane waves in time domain in free space, sinusoidally time varying uniform plane waves in free space, wave equation, wave equation and solution for material uniform plane. Waves in dielectrics and conductors, reflection of uniform plane waves, significance of plane waves, polarization of waves.

   Poynting vector and flow of power :
   Poynting vector and flow of power: Poynting theorem, power flow for a plane wave, power flow in a concentric cable, pointing vector about R-C lines, heterogeneous average and complex Poynting vector, Poynting loss in a plane conductor.

References :

1. Engineering Electromagnetics (*William H. Hayt*) Tata Mc Graw Hill publication.
2. Elements of Electromagnetics (*Sadiku*) Oxford
3. Engineering Electromagnetics (*Ida, Nathan*) 2nd edition, Springer.
4. Elements of Engineering Electromagnetics (*Nannapaneni Narayana Rao*) Prentice Hall of India Publication.
5. Electromagnetic Waves and Radiating Systems (*Edward C. Jordan, Keith G. Balmann*) Pearson.

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S.E. Sem. IV [EXTC]

Electronic Devices & Circuits - II

SYLLABUS

Time : 3 Hrs.

Theory : 100 Marks
Term Work : 25 Marks
Practical : 50 Marks
Oral : 25 Marks

1. **Frequency response :**
   General concepts, decibels, low frequency response characteristic, Gain Bandwidth product, high frequency response, frequency response of cascade amplifiers, effect of low frequency and high frequency on coupling and bypass capacitors.

2. **Multistage amplifiers :**
   RC coupled transformer coupled, direct coupled, Low and high frequency considerations, cascade amplifier, darlington pair, their performance, Analysis and design considerations of multistage amplifiers, effect of source and load resistance, Differential amplifiers, their types, small signal analysis, differential stage, level shifter.

3. **Large Signal Amplifiers :**
   Harmonic distortion and power efficiency of Class A, B, AB and C amplifiers, Thermal considerations and design, selection of heat sinks.

4. **Feedback amplifiers :**
   Feedback concept, ideal feedback amplifier, classification of feedback's, Topology, analysis and design of different types of negative feedback, General analysis of multistage feedback and multiloop feedback amplifiers.

5. **Oscillators :**
   Principle of oscillation, RC oscillator, Wein bridge oscillator, twin T oscillator with LC feedback, Colpitt oscillator, clap oscillator, Armstrong oscillator, Crystal controlled oscillator.

6. **Multivibrator Circuits :**
   Bistable Multivibrators, Schmitt trigger, Monostable multivibrator, Retriggerable Monostable Multivibrator, Astable Multivibrator.

References :

1. Foundations of Electronics : circuits and devices (*Russell L. Meade*) Cengage (Thomson)
2. Microelectronic Circuits Analysis and Design (*Rashid*) PWS Publishing.
3. Electronic Circuit Analysis and Design (*Donald*) A Neamen, TMH.
4. Electronic Devices and Circuit Theory (*Boylestad, Nashelsky*) Pearson Education.
5. Electronic Devices and Circuits (*A. K. Maini*) Wiley.
6. Electronic Devices (*Floyd*) Pearson Education Asia Publication.
7. Microelectronics (*Jacob Millman & Arcin Grabel*) Mc-Graw Hill publication.

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S.E. Sem. IV [EXTC]

Principles of Communication Engineering

SYLLABUS

Time : 3 Hrs.

Theory : 100 Marks
Term Work : 25 Marks
Practical : 50 Marks
Oral : 25 Marks

1. **Introduction :**
   Elements of a communication system, modulation and demodulation. Noise in communication systems, signal-to-noise ratio, noise factor and noise figure, equivalent noise temperature.

2. **Amplitude Modulation :**
   DSB full carrier AM-principles, modulator circuits, transmitters. Different types of AM, suppressed carrier AM, SSB, ISB-principles, transmitters.

3. **Angle modulation :**
   Frequency modulation, phase modulation, effect of noise, FM modulators, transmitters.

4. **Radio receivers :**
   Receiver characteristics, TRF and Super heterodyne receivers, AM detectors, FM detectors, receiver circuits

5. **Analog Pulse modulation :**
   Sampling theorem for low –pass and band-pass signals-proof with spectrum, aliasing Sampling techniques-principle, generation, demodulation, spectrum. PAM, PWM, PPM – generation and detection.

6. **Digital transmission :**
   Quantization, quantization error, non-uniform quantizing, encoding, PCM, DPCM, Delta modulation. Adaptive delta modulation-transmission system, and width.

References :

1. Electronics Communication Systems (*Wayne Tomasi*) Pearson Education 3rd edition, 2001.
2. Electronics Communication Systems (*Roy Blake*) Thomson Asia pvt. Ltd. Singapore, 2nd edition, 2002.
3. Digital and Analog Communication Systems (*Leon W. Couch*) Pearson education, 6th edition.
4. Communication Systems (*Haykin*) Wiley.
5. Electronic Communication : Principles and Systems (*William Stanley*) Cengage (Thomson)
6. Communication systems (*Alencar*) Springer
7. Principles of Communication Systems (*Herbert Taub and Donald Schilling*) Tata McGraw Hill, 2nd edition.

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