S.E. Sem. IV [ETRX]

Advanced Engineering Mathematics

SYLLABUS

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

1. **Random variables**
   1. Discrete and continuous random variable, Probability mass and density function for random variables.
   2. Expected value, Variance, Moments and moment generating functions.
   3. Relation between Raw and central moments.

2. **Probability distributions**
   1. Binomial, Poisson and Normal distribution.
   2. Introduction to distribution such as 't' and 'χ^{2}', central limit theorems and problems based on this theorem.

3. **Sampling theory**
   1. Large and small samples, Test of significance for both samples.
   2. Paired 't' test.
   3. Application for χ^2 distribution.

4. **Discrete structure**
   1. Relation and function (Equivalence relation, Injective, Surjective and Bijective functions)
   2. Poset, Lattice (Bounded, Complemented and Distributive lattice)
   3. Algebraic structure : Group, Ring, Field.

5. **Matrices**
   1. Cayley Hamilton theorem, eigen values and eigen vectors (without proof).
   2. Similar matrices, orthogonally similar matrices, reduction to the diagonal form.

6. **Complex Integration**
   1. Cauchy's theorem and Cauchy's integral formula.
   2. Taylor's and Laurent's formula, Singularities and poles.
   3. Residue theorem.

References :

1. Text book Applied Mathematics *(P.N. Wartikar/J.N. Wartikar)* Pune Vidyarthi Griha Prakashan
2. Theory of complex variable *(Shantinarayan)*
3. Engineering Mathematics *(S.S. Sastri)*
4. Fundamental of Mathematicals Statistics *(S.C. Gupta and V.K.Kapoor)*
5. Probability and Statistics, Schum Series)
6. Discrete Mathematics *(Kolman, Busby, Sharon Rus)*
7. Function of discrete Mathematics *(K.D.Joshi)*

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S.E. Sem. IV [ETRX]

Basic of Analog and Digital Communication System

SYLLABUS

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

Term Work : 25 Marks

Oral : 25 Marks

1. **Elements of Communication System :**
   Basic block diagram of communication system, Modulation and Demodulation concept, channels Noise in communication system, Signal-to-Noise ratio, noise factor and Noise Figure, equivalent Noise Temperature Electromagnetic Waves propagation : Propagation terms and Definitions.

2. **Amplitude Modulation ;**
   Principles of DSB full carrier AM, envelope detector, practical diode detector. Different types of AM : DSB-SC, SSB-SC, VSB, ISB.

3. **Angle modulation**
   Principles of Frequency Modulation and phase Modulation. FM Modulators, types of FM : NBFM and WBFM, FM Transmitter, noise triangle, pre-emphasis and de-emphasis circuits. FM Detection : frequency discriminator and phase discriminator.

4. **Radio Receivers**
   Receiver Characteristics, TRF Receivers, and Super heterodyne Receivers : choice of IF, AGC, AFC In AM and FM receivers.

5. **Analog Pulse Modulation**
   Sampling Theorem for Low pass signals, Aliasing error, Sampling techniques, Principles, generation, Demodulation and spectrum of PAM, PWM, PPM .

6. **Digital Pulse Modulation**
   Comparison of digital signal transmission over analog signal transmission, significance of regenerative repeaters.
   Pulse –coded modulation (PCM) : sampling, quantizing, encoding technique, PCM bandwidth,
   Necessity of companding, PCM waveform formats : Uni-polar and polar NRZ, RZ, AMI
   Delta modulation (DM), Adaptive Delta modulation (ADM).
   Multiplexing : TDM, FDM – Principles and applications.

References :

1. "Electronics communication system" *(WayneTomasi)* Pearson education, Third edition 2001.
2. "Electronics communication system" *(Kennedy and Davis)* Tata Mcgraw Hill
3. "Communication systems Analog and Digital", *(R.P. Sing and S.D. Sapre)* Tata Mcgraw Hill
4. "Principles of communication sytems", *(Taub and Schilling)* Tata Mcgraw Hill
5. "Electronics communication system", *(Roy Black)*, Cengage learning, second edition.
6. "Modern Digital and analog Communication system" Third Edition *(B.P. Lathi)* OXFORD
7. "Electronics communications modulation and transmission", *(Robert J. Schoenbeck)*
8. "Digital and Analog communication system", *(Lean W couch)* Pearson education, Sixth edition.

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S.E. Sem. IV [ETRX]

Digital Systems Design II

SYLLABUS

Time : 3 Hrs.

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

1. **Hardware Description Languages :**
   Introduction to Hardware description Language. Core features of VHDL, Data types, concurrent and sequential statements, data flow, behavioral, structural architectures, Subprograms, modularity, design reuse concepts.

2. **Application of HDL in Combinational Circuits :**
   Implementation of Combinational Circuits in VHDL, Use of Component Instantiation and Structural Architecture using VHDL and PLDs Combinational circuit design examples – barrel shifter, simple floating – point encoder, cascading comparator.

3. **Sequential Logic Design :**
   Synchronous State Machines : Mealy and Moore Machines. Clocked synchronous state machine analysis, Clocked synchronous state machine design, designing state machines using state diagrams, State Reduction techniques, State Assignment Rules, State machine synthesis using transition list.

4. **Applications of Sequential Circuits**
   MSI counters and applications, MSI shift registers and their applications. Implementation of Counters and Shift registers in VHDL, VHDL sequential circuit design features. Implementation of FSM in VHDL.

5. **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.

6. **Introduction to Asynchronous Design :**
   Fundamental and pulse mode Asynchronous sequential machine, Analysis of Asynchronous Sequential Circuits : Transition Table, Flow Table, Race Conditions Stability Considerations, Analysis of Simple circuits like latches is expected.

References :

1. VHDL Programming by Examples, (*Douglas L. Perry)* Fourth Edition, Tata McGraw hill Publications, 2002
2. Digital Design *(Morris Mano)* Pearson Education, Asia 2002
3. Digital Logic : Applications and Design *(John M. Yarbrough)* Thomson Brooks/Cole, 2004
4. Digital Design Principles and Practices *(John F. Wakerley)* third edition updated, Pearson Education, Singapore, 2002.
5. Fundamentals of Digital Logic with VHDL Design *(Stephen Brown & Zvonko Vranesic)* First edition, McGraw Hill International edition, 2000.

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S.E. Sem. IV [ETRX]

Electronic and Electrical Measuring Instruments and Machine

SYLLABUS

Time : 3 Hrs.

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

1. **Electronic and Digital Voltmeters :**
   Principles of operation, advantages over conventional type analog voltmeters, basic voltmeter, peak reading, average reading true RMS reading, sampling type, FET voltmeters, sensitivity considerations & calculations.
   Methods of analog–to–digital and digital–to–analog conversion, principles of operation and typical specifications of a digital voltmeter, description of various types of DVMs with block diagrams, Resolution and Sensitivity of a digital meter, digital displays for meters.

2. **Frequency meters, phase meters and signal generators ;**
   Analog–schematic & operational details, limitations. Digital Frequency meters, Phase measurement by voltage addition method, balanced modulation type, phase meters using flip–flops, digital meters, advantages & limitations of each type. Requirement of a good laboratory type signal generator, A.F. signal generators, Beat frequency oscillator & its advantages.

3. **Oscilloscopes :**
   Block diagram study of C.R.O., Description of panel layout & implementation of controls. Requirement of time base, triggered time base, delayed time base, external triggering etc. Lissajous patterns, use of these in phase & frequency measurements. Frequency time base, Wobbler scope & its applications, Dual trace, multi trace, Double beam, Sampling; Storage, Digital read–out oscilloscopes. Use of CRO in square wave testing of amplifiers, tracing of diode & transistor characteristics.

4. **Basic measuring instruments :**
   Essentials of indicating instruments – deflecting, controlling and damping torque. Construction and working principles of moving iron and moving coil ammeters and voltmeters, electrodynamometer watt–meters, induction type energy meters, power factor meters, instrument transformers.

5. **Measurement of R, L and C :**
   Measurement of low, medium, high resistances: Ohmmeter, Kelvin's double bridge, Wheatstone's bridge, Megger. Measurement of inductance: Maxwell's, Hay's and Anderson's bridge. Measurement of capacitance: Schering bridge.

6. 6.1. DC Motors :
   Back e.m.f., voltage equation, characteristics of series, shunt and compound motors, torque equations, speed control of dc shunt/series motors, three point and four point starter and applications of dc motors.
   6.2. Three phase induction motors :
   Construction and principle of operation, slip, rotor frequency, torque equation, torque–speed characteristics, starting methods of induction motors.
   6.3. Stepper motors :
   Construction, working principle and applications of variable reluctance, permanent magnet and hybrid stepper motors.

References :

1. Electronics Instrumentation & Measurement Techniques, third edition *(Cooper W.D. & Helfrick A.D.)* Prentice Hall of India, 1985.
2. Electronic Instrumentation, first edition, *(Kalsi H.S.,)* Tata McGraw Hill, 1997.
3. Electrical and electronic measuring instruments *(A.K. Sawhney)*
4. Electrical Measurements and measuring instruments, *(Golding and Widdis)*
5. Electric Machines, *(Nagrath and Kothari)*

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S.E. Sem. IV [ETRX]

Electronic Circuits Analysis and Design

SYLLABUS

Time : 3 Hrs.

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

1. **Frequency Response of Amplifiers :**
   High frequency parameters of BJT, Amplifier Frequency Response, System Transfer Functions, S–Domain Analysis, First – Order Functions, Bode Plots, Short–Circuit and Open–Circuit Time Constants, high Frequency Response of BJT, FET and MOSFET amplifier analysis.

2. **Oscillators :**
   Analysis and Design of phase shift, Quadrature, Wien bridge, Hartley, Colpitt and Crystal oscillator.

3. **Power Amplifiers :**
   Power amplifiers, Power transistors–power BJTs, power MOSFETs, design of class–A, class–AB, push pull class–B Transformer Coupled push pull Amplifier, complementary class B Power Amplifier. Heat sinks, design of heat sinks, for power amplifier devices.

4. **Differential Amplifiers :**
   BJT, FET and MOSFET differential amplifier analysis and design, design of CMOS, Differential Amplifier with Active Load.

5. **Multistage Amplifiers :**
   Design two stage BJT, JFET and MOSFET amplifiers and design of CASCODE amplifiers. Design of BJT-JFET hybrid amplifier.

6. **Feedback and Stability :**
   Introduction to basic feedback concepts, Ideal close-loop gain, Gain sensitivity bandwidth extension, Noise sensitivity, Reduction of Non-linear Distortion, Ideal Feedback Topologies, Analysis of Series-Shunt, Series-Series, Shunt-Shunt, Shunt-Series amplifiers, Loop gain, stability of the feedback circuit, The stability problem, Bode plots of one – pole, two – pole and three–pole amplifiers, Nyquist stability criterion, Phase and gain margins, Frequency compensation basic theory, Closed loop frequency response, Miller compensation.

References :

1. Microelectronics Circuits (Analysis and Design) *(Mohammad Rashid, Cengage Learning)*
2. Electronic Circuit Analysis and Design, Second edition *(Donald A. neamen)* McGraw Hill International edition 2001
3. Electronic Design, Fourth Edition *(Martin Roden, Gordon Carpenter, William Wieserman)*Shroff Publishers, 2002
4. Electronic Circuits Discrete and Integrated, Third Edition *(Donald Schilling & Charles Belove)* McGraw Hill International edition, 1989
5. Microelectronic Circuits, Fourth edition *(Adel Sedra & Kenneth Smith)* Oxford University Press, 1998

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