

Research Entrance Test(RET)

Syllabus

For

ELECTRONICS

Under

Faculty of Science

SECTION A: RESEARCH METHODOLOGY

VHDL and ASIC Design: ASIC Design flow, Design Methodologies, Introduction to Hardware Description Language (VHDL): Structural, Behavioral, Data flow modeling, Concurrent and sequential VHDL, RAM and ROM, Test Benches, Finite State Machines, RTL Synthesis Test Methodology, Programmable Logic Design, Basics of Programmable logic devices, CPLD, Architecture and its building blocks, FPGA Architectures and its building blocks, Technology mapping for FPGAs, Design implementation using CPLD and FPGA, Floor planning and Placement.

MATLAB Environment: MATLAB as a calculator – variables – Functions – Displayformats – Complex numbers – Matrices and Vectors – Strings – Input and Output statements – Simple plotting in MATLAB – MATLAB package environments.

MATLAB operators and Control flow: Relation operations – Logical operations – Elementary math functions – Matrix functions - Characters and strings – IF-END, IF-ELSEEND, ELSE-IF, SWITCHCASE, FOR Loops, WHILE Loops

Interactive Computations: Matrices and Vectors, Matrices and Array operations, Vectorization, Command line functions, Using Built – in functions.

Plotting in MATLAB: Line styles, Markers and colors, Important plotting commands, Obtaining Numerical values from graphs, Different plot types, Three dimension plots, HandleGraphics, Saving plotting graphs. MATLAB Numerical methods: Linear algebra, Curve fitting, Data analysis and Statistics, Numerical Integration, Numerical Differentiation, Ordinary differential equations, Nonlinear algebraic equations, Eigen vectors and Eigen values.

MATLAB Electronic applications: Fourier analysis, Fourier transforms and applications.

Research Methodology: Research and Types of research, Meaning of Research- Objectives of Research- Motivation in Research. Research methods vs Methodology. Types of research – Descriptive vs. Analytical, Applied vs. Fundamental, Quantitative vs. Qualitative, Conceptual vs. Empirical. Research Process. Criteria of good Research.

Research Formulation: Defining and formulating the research problem - Selecting the problem - Necessity of defining the problem - Importance of literature review in defining a problem – Literature review – Primary and secondary sources – reviews, treatise, monographs-patents – web as a source – searching the web - Critical literature review – Identifying gap areas from literature review - Development of working hypothesis.

Data Collection and analysis: Execution of the research - Observation and Collection of data - Methods of data collection – Modeling, Mathematical Models for research, Sampling Methods- Data Processing and Analysis strategies. Data Analysis with Statistical Packages – Hypothesis-testing, Generalization-and-Interpretation.

References:

1. VHDL Primer ,J. Bhasker, , Pearson Education Asia, Low Price Edition
2. Digital Systems Design Using VHDL, Charles H Roth, Jr., Brooks/Cole ,Thompson Learning.
3. VHDL: Analysis and Modeling of Digital Systems, Z. Navabi, McGraw Hill International Editions.
4. Programming in MATLAB by Marc E. Hermitter, Thomson Brooks.
5. MATLAB programming by Rudrapratap.
6. An introduction to ResearchMethodology ,Garg, B.L., Karadia, R., Agarwal, F. and Agarwal, U.K., 2002., RBSA Publishers.
7. Research Methodology: Methods and Techniques Kothari, C.R., 1990.. New Age International.
8. Research Methodology, Sinha, S.C. and Dhiman, A.K., 2002., Ess Publications. Vol2 .
9. Research Methods: the concise knowledge base Trochim, W.M.K., 2005., Atomic Dog Publishing.

SECTION B: Electronics

Basic Circuit Theory: Network Analysis, Network Theorem, Two-port Networks, Frequency Domain Analysis, Network Synthesis.

Devices and Linear Integrated Circuits: Semiconductor Physics, Semiconductor Devices, Operational Amplifier, Logarithmic Amplifiers and IC OTA.

Digital Electronics: Combinatorial logic circuits, Sequential Circuits, Finite state machines, Control Unit design, Digital System design concepts, approaches, programmable logic devices PLAs ,PALs, CPLD, FPGA Architectures, Hazards.

Introduction to Programming: Introduction to Computer based problem solving, Programs and Algorithms. Functions: Scope rules, Parameters passing techniques, function returning pointers, recursion, pointer to function. The Preprocessors: # define, # error, # include, Conditional compilation directives. Memory Management in C: Static and dynamic allocation system, Concept of heap, NULL pointers, void pointers, dynamic memory allocation function.

Interrupts and Interrupts service routines: Introductions to interrupts, CPU registers, working of interrupts, ROM BIOS services and functions. Files: Stream and files, File handling functions, files and structures string and files, Random access files, Buffered file processing file service.

Control System and Data Acquisition System: Input/ Output Relationship, Time Domain Analysis, Frequency Domain Analysis, PID System, Operation and application of sensors.

Electromagnetic Theory: Electromagnetics, Transmission Line, Wave Guide, EM Wave Propagation, Antenna.

Microprocessor and Microcontroller: Overview of 8085, architecture of 8086 microprocessor, registers, addressing modes, instructions, directives, procedures and macro, Assembly language programming, Interfacing devices 8237/8257, 8253/8254, 8255, 8259, 8251, 8279 RS 232, 8051 MICROCONTROLLER, Interfacing, interrupts.

Communication: Probability and Stochastic Processes, Signal Representation, Noise, Digital Modulation, Digital Multiplexing, Information Theory and coding.

IC Technology and VLSI Design: Process in Device Fabrication, MOS Technology, CMOS Digital Circuit Modeling, CMOS Amplifiers.

Opto-Electronics: Optical Sources and Detectors, Optical Fibers, Fiber Joints and Couplers, Integrated Optics.

Digital Signal Processing and Applications: Discrete Time Signals and Systems, Z- Transform, Frequency analysis of Discrete time Systems, Design of Digital Filters

Advanced Test & Measurement Instruments: Digital Storage Oscilloscopes, mixed signal oscilloscopes, Arbitrary waveform generators, RF generators, RF power meter, DC electronic load, Electrometer, Current Source, EMI/EMC Tester, Spectrum analyzers, Impedance analyzer, Vector signal analyzer, Network analyzers, Lock-in-Amplifier, Automatic test equipment, Semiconductor parameter analyzer.

REFERENCES

All standard books in respective domains