RELIABILITY AND SYSTEM ENGINEERING
(IC-402-E)

L	T	T
4	1	5

Theory: -100 marks
Sessional: -50 marks
Time : 3 H

UNIT-1

Importance of Reliability, reliability functions, causes of failure, Modes of failure rate, Mortality curve, MTTF, Repair rate, MTBF, Up time, Down time, failure frequency, failure distribution, Derivation of distribution, Exponential, Reliability model

UNIT-2

Morkov and fault tree. Reliability evaluation using various models. Redundancy techniques, Unit Redundancy, Composite Redundancy, Basic principles of Maintainability, Availability.

UNIT-3

Concept of system Engineering, Elements of Modeling.
Linear programming concept of convexity, Graphic solution, Simplex method, Duality in linear programming, Dual simplex and primary dual simplex.

UNIT-4

Critical path scheduling,, CPM ,PERT, Dynamic programming: Cost flow and routing problems.

NOTE: The question paper shall have eight questions in all organized into four sections, each section having two questions from each of the four units. The candidate shall have to attempt five questions in all , selecting at least one question from each unit

BOOKS FOR REFERENCE :

1. Optimization Research By Hira and Gupta
2. Optimization techniques by S.S. Rao New age International Edu.
3. Reliability Engg. By E. Balagurusamy.
4. Reliability Engg. By K.K. Aggarwal Kluwar Ed.
5. Concept in Reliability L.S. Srinath EWP Ed.

ROBOTICS ENGINEERING
(IC-404-E)

L	T	Total			
3	2	5	Theory	:	100 marks
			Sessional	:	50 marks
			Time	:	3H

UNIT-1

INTRODUCTION: Terminology, Elements/Components of Robotics system, Drives, Sensors, Manipulator and control, Classification of Robotic system.

KINEMATICS : Position and orientation representation, Co-ordinate frames, Translation and rotational Transformation, Homogeneous Transformation, link Parameters, examples of Manipulator Kinematics.

UNIT-2

INVERSE KINEMATICS : Solving the Arm equation, General properties of solution. Existence of solution, Uniqueness of solution, Example: velocity of link motion.

DYNAMICS : Lagrange's approach of Dynamics, Link inertia, Lagrange's simplified dynamic models.

UNIT-3

WORK SPACE ANALYSIS AND TRAJECTORY PLANNING : Path specification in Trajectory application, straight line motion, Cubic spline.

CONTROL : Linear model, Linear feed back control, Single Axis PID control, Computed Torque control and Multi-variable control.

UNIT-4

INSTRUMENTATION AND PROGRAMMING : Sensors, Tactile sensors, Microswitch, Piezoelectric, Strain Gauge, Non contact Sensor; Capacitive, Inductive, Ultrasonic, Light reflector, Laser sensor. End effectors. Introduction to Programming and Languages.

NOTE: The question paper shall have eight questions in all organized into four sections, each section having two questions from each of the four units. The candidate shall have to attempt five questions in all , selecting at least one question from each unit

BOOKS FOR REFERENCE :

1. Introduction to Robotics, Mechanics and Control by J.J. Craig, Addison Wesley Publication Co.
2. Robot Dynamics and control by W. Sponges, M. Vidyasagar, John Willy and Sons, New York.
3. Robotic Control sensory vision, Intelligence by K.S.Fu R.C. Gonzalez and S.S. G. Lee, McGraw Hill.
4. Robot Engineering an Integrated Approach by Richard D. Klafter Thomos Chmidewski, Michel Nigin by PHI.

ADVANCE CONTROL SYSTEM
(IC-406-E)

L	T	T
4	1	5

Theory : 100 marks
Sessional : 50 marks
Time: 3H

UNIT-1
Complex Control Systems :
Principles, Applications and examples of Cascade Control, Over-ride Control, Split Range Control, Feed-Forward Control, Ratio Control Adaptive, Self-Adaptive Control, Optimal Control, Direct –Digital Supervisory Control.

UNIT-2
Programmable Logic Controllers :
Principle, Relative Merit, Over hard- wired Logic and Relay and Programming Languages.

UNIT-3
Multivariable Control Systems :
Interaction in multiple loops, RGA method for minimizing interactions, Controllability, Observability, State Space Analysis.

UNIT-4
P-I Diagrams:
Standard Instrumentation Symbols for Devices, Signal Types, Representation of a Process Control Loop using PI diagram, Control Loops Architecture, Ergonomics.

NOTE: The question paper shall have eight questions in all organized into four sections, each section having two questions from each of the four units. The candidate shall have to attempt five questions in all, selecting at least one question from each unit

BOOKS RECOMMENDED:

(1) Kane-Handbook of Advanced Process Control System
(2) Warnock-Programmable Controllers; Operation and Application
(3) Johnson-Process Control: Instrumentation Technology
(4) Harriott-Process Control

GENETIC ALGORITHM
IC-422-E

L	T	Total		
4	1	5	Theory	: 100 marks
			Sessional	: 50 marks
			Time :	3H

UNIT-1

INTRODUCTION : Introduction to GA Terminology, Architecture of GA, steady –state Algorithm operators, GA for VLSI design, lay out and test Automation, Partitioning Algorithm, circuit partitioning by GA, Hybrid Genetic Algorithm.

CELL PLACENT & ROUTING : Standard cell placement, Macro cell placements, Steiner problem in graph, Macro cell Routing, Routing phase 1 & 2,Results of Experiments.

UNIT-2

FPGA TECHNOLOGY MAPPING : Circuit Description, circuit segmentation and FPGA mapping, Circuit Segmentation for Pseudo –Exhaustive Testing, Experimental Results of Mapping segmentation.

AUTOMATIC TEST GENERATION : Test Generation in GA framework, Test Generation for test Application Time reduction, GA-HITEC Hybrid, ALT- TEST Hybrid, Use of finite stale Machine sequences, Dynamic Test sequence compaction.

UNIT-3

PEAK POWER ESTIMATION : Effect of adding delay Models, Application of GA to peak Power Estimation, Estimation of peak single –cycle and N – cycle Power, Peak sustained power Estimation.

UNIT-4

PARALLEL IMPLIMENTATION : Wolverines, Standard cell placement using GA, Distributed Placement Algorithm, Parallel Genetic Algorithm for Automatic test Generation Sequential GA –Based ATG, Parallel GA –Based ATG.

NOTE: The question paper shall have eight questions in all organized into four sections, each section having two questions from each of the four units. The candidate shall have to attempt five questions in all , selecting at least one question from each unit

Books Recommended :

1. Genetic Algorithm by K.F. Man, K.S. Kang
2. Industrial Applications of GA by Charles L.karr and L. Michael Freeman
3. GA in Search, optimization and Machine Learning by D.E. Goldberg, Addison –Wesley
4. GA for VLSI and Test Automation by Pinki muzumderand Elizabeth M. Rudnick, Pearson Education.

ULTRASONIC INSTRUMENTS & MEASUREMENTS
IC-420-E

L	T	T		
4	1	5	Theory	: 100
			Sessional	: 50
			Time :	3H

UNIT-1

Introduction: Ultrasonic Engineering, Types of sound waves, Wave motion, velocity of propagation, characteristic impedance, reflection, attenuation and transmission through layers, Particle and radiation pressure, block diagram of Ultrasonic Instruments, Health Hazards of Ultrasonic.

UNIT-2

Generation of Ultrasonic: Ultrasonic transducers Piezoelectric and magnetostrictive transducers, Ultrasonic Transducers for Industrial Processing –Siren, whistles, liquid, ultrasonic Generators, Depletion Layer transducers, Coupling of transducers to the load.

UNIT-3

Ultrasonic Measurements: Ultrasonic flow meters, liquid level sensing and control, signaling, density measurement, viscosity measurement, measurement of small particle contaminants in hydraulic systems, Measurement of temperature in hot gases, Ultrasonic flaw detection, scanning and imaging.

UNIT-4

Instrumentation and applications: Ultrasonic sensing using Pulse echo and Doppler techniques, Industrial processing units: Mechanism involved in cavitations, cleaning process, ultrasonic impact grinding, welding, Ultrasonic instrumentation in Bio-Medical Engineering.

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Books Suggested:

1. Ultrasonic Engineering: J.R. Fredrick.
2. Physics Principal of Ultrasonic Diagnosis : P.N.T. Wells

INFORMATION THEORY & CODING
(IC-424-E)

L	T	Total			
4	1	5	Theory	:	100 marks
			Sessional	:	50 marks
			Time	:	3H

UNIT 1 Elements of information theory

Source coding theorem, Huffman coding, Channel coding theorem, channel capacity theorem, Shannon fano theorem, entropy, Base band and band pass sampling theorems reconstruction from samples, Practical aspects of sampling and signal recovery TDM

UNIT 2 Waveform Coding Techniques

PCM Channel noise and error probability DPCM and DM Coding speech at low bit rates Prediction and adaptive filters. Base band shaping for data transmission, PAM signals and their power spectra Nyquist criterion ISI and eye pattern Equalization.

UNIT 3 Digital Modulation Techniques

Binary and M-ary modulation techniques, Coherent and non-coherent detection, Bit vs symbol error probability and bandwidth efficiency. Bit error analysis using orthogonal Signaling

UNIT 4 Error Control Coding

Rationale for coding Linear block codes, cyclic codes and convolution codes Viterbi decoding algorithm and trellis codes.

NOTE: The question paper shall have eight questions in all organized into four sections, each section having two questions from each of the four units. The candidate shall have to attempt five questions in all , selecting at least one question from each unit

Books Recommended :

1. Principles of digital communication: J. Dass. , S.K. Malik & P.K. Chatterjee, 1991.
2. Introduction to the theory of Error correcting codes: Vera Press, 1992
3. Information Theory and Reliable Communication: Robert G. Gallanger Mc Graw Hill, 1992
4. Related IEEE/IEE publications

DIGITAL SYSTEM DESIGN
IC-418-E

L	T	Total	Theory : 100 marks
4	1	5	Sessional : 50 marks
			Time : 3H

UNIT 1 INTRODUCTION : Introduction to Computer-aided design tools for digital systems. Hardware description languages: introduction to VHDL, data objects, classes and data types, Operators, Overloading, logical operators. Types of delays Entity and Architecture declaration. Introduction to behavioral, data flow and structural models.

UNIT 2 : VHDL STATEMENTS : Assignment statements, sequential statements and process, conditional statements, case statement Array and loops, resolution functions, Packages and Libraries, Concurrent statements.
Subprograms: Application of functions and Procedures, Structural Modeling, component declaration, structural layout and generics.

UNIT 3 : COMBINATIONAL CIRCUIT DESIGN:VHDL Models and Simulation of combinational circuits such as Multiplexers, Demultiplexers, encoders, decoders, code converters, comparators, implementation of Boolean functions etc.

UNIT 4 : SEQUENTIAL CIRCUITS DESIGN:VHDL Models and Simulation of Sequential Circuits. Shift Registers, Counters etc.

NOTE: The question paper shall have eight questions in all organized into four sections, each section having two questions from each of the four units. The candidate shall have to attempt five questions in all, selecting at least one question from each unit

REFERENCE BOOKS :

1. IEEE Standard VHDL Language Reference Manual (1993)
2. Digital Design and Modeling with VHDL and Synthesis: KC Chang; IEEE Computer Society Press.
3. "A VHDL Primer": Bhaskar; Prentice Hall1995.
4. "Digital System Design using VHDL": Charles. H. Roth; PWS (1998).
5. "VHDL – Analysis & Modeling of Digital Systems": Navabi Z; McGraw Hill.
6. VHDL – IV Edition: Perry; TMH (2002).
7. "Introduction to Digital Systems": Ercegovac. Lang & Moreno; John Wiley (1999).
8. Fundamentals of Digital Logic with VHDL Design: Brown and Vranesic; TMH (2000).
9. Modern Digital Electronics- III Edition: R.P. Jain; TMH (2003).

DIGITAL SIGNAL PROCESSING LAB
(VIII Sem) IC-426-E

L	T	P	Total
0	0	2	2

Sessional : 25 Marks
Practical : 25 Marks
Total : 50 Marks
Duration : 3 Hrs

Perform the Experiments using MATLAB :

1. To develop a program for computing Z- transform in factored form, Plot its poles and zeros , and then determine its ROCs.
2. To develop a program for computing Inverse Z-transform of a rational transfer function.
3. To develop a program for linear convolution and circular convolution .
4. To develop a Program for computing discrete fourier transform .
5. To develop a Program for computing the convolution by overlap-add method and overlap save-method.
6. To develop Program for realization of IIR Digital Filters (Direct, Cascade, Parallel).
7. To develop a program for sampling theorem.
8. To design FIR filters using windows technique.
9. To design analog filter (Low pass, High pass).
10. To design analog filter (Band pass, Band stop)
11. To design IIR filters using (Impulse Invariant method).
12. To design IIR filters using (bilinear transformation).