Scheme and Syllabus of Semesters III to VIII of B.E
(With effect from 2010-2011)

Information Science and Engineering

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELGAUM

ENGINEERING MATHEMATICS – III

CODE: 10 MAT 31   **IA Marks: 25**
Hrs/Week: 04   **Exam Hrs: 03**
Total Hrs: 52   **Exam**
Marks:100

PART-A

Unit-I: FOURIER SERIES

Convergence and divergence of infinite series of positive terms, definition and illustrative examples*
Periodic functions, Dirichlet's conditions, Fourier series of periodic functions of period 2π and arbitrary period, half range Fourier series. Complex form of Fourier Series. Practical harmonic analysis.   **[7 hours]**

Unit-II: FOURIER TRANSFORMS

Infinite Fourier transform, Fourier Sine and Cosine transforms, properties, Inverse transforms
       [6 hours]

Unit-III: APPLICATIONS OF PDE

Various possible solutions of one dimensional wave and heat equations, two dimensional Laplace's equation by the method of separation of variables, Solution of all these equations with specified boundary conditions. D'Alembert's solution of one dimensional wave equation.

       [6 hours]

Unit-IV: CURVE FITTING AND OPTIMIZATION

Curve fitting by the method of least squares- Fitting of curves of the form $y = ax + b$, $y = ax^2 + bx + c$, $y = ae^{bx}$, $y = ax^b$

Optimization: Linear programming, mathematical formulation of linear programming problem (LPP), Graphical method and simplex method.

[7 hours]

PART-B

Unit-V: NUMERICAL METHODS - 1

Numerical Solution of algebraic and transcendental equations: Regula-falsi method, Newton - Raphson method. Iterative methods of solution of a system of equations: Gauss-seidel and Relaxation methods. Largest eigen value and the corresponding eigen vector by Rayleigh's power method.

[6 hours]

Unit-VI: NUMERICAL METHODS – 2

Finite differences: Forward and backward differences, Newton's forward and backward interpolation formulae. Divided differences - Newton's divided difference formula, Lagrange's interpolation formula and inverse interpolation formula.

Numerical integration: Simpson's one-third, three-eighth and Weddle's rules (All formulae/rules without proof)

[7 hours]

Unit-VII: NUMERICAL METHODS – 3

Numerical solutions of PDE – finite difference approximation to derivatives, Numerical solution of two dimensional Laplace's

equation, one dimensional heat and wave equations
[7 hours]

Unit-VIII: DIFFERENCE EQUATIONS AND Z-TRANSFORMS

Difference equations: Basic definition; Z-transforms – definition, standard Z-transforms, damping rule, shifting rule, initial value and final value theorems. Inverse Z-transform. Application of Z-transforms to solve difference equations.

[6 hours]

Note: * In the case of illustrative examples, questions are not to be set.

Text Books:

1. B.S. Grewal, Higher Engineering Mathematics, Latest edition, Khanna Publishers
2. Erwin Kreyszig, Advanced Engineering Mathematics, Latest edition, Wiley Publications.

Reference Book:

1. B.V. Ramana, Higher Engineering Mathematics, Latest edition, Tata Mc. Graw Hill Publications.
2. Peter V. O'Neil, Engineering Mathematics, CENGAGE Learning India Pvt Ltd.Publishers

ELECTRONIC CIRCUITS
(Common to CSE & ISE)

Subject Code: 10CS32   I.A. Marks : 25
Hours/Week : 04   Exam Hours: 03

PART - A

UNIT - 1   **7 Hours**

Transistors, UJTs, and Thyristors: Operating Point, Common-Emitter Configuration, Thermal Runaway, Transistor Switch, Unijunction Transistors, SCR.

UNIT - 2   **6 Hours**

Field Effect Transistors: Bipolar Junction Transistors versus Field Effect Transistors, Junction Field Effect Transistors, Metal Oxide Field Effect Transistors, Differences between JFETs and MOSFETs, Handling MOSFETs, Biasing MOSFETs, FET Applications, CMOS Devices, Insulated Gate Bipolar Transistors (IGBTs)

UNIT - 3   **6 Hours**

Optoelectronic Devices: Introduction, Photosensors, Photoconductors, Photodiodes, Phototransistors, Light-Emitting Diodes, Liquid Crystal Displays, Cathode Ray Tube Displays, Emerging Display Technologies, Optocouplers

UNIT - 4   **7 Hours**

Small Signal Analysis of Amplifiers: Amplifier Bandwidth: General Frequency Considerations, Hybrid h-Parameter Model for an Amplifier, Transistor Hybrid Model, Analysis of a Transistor Amplifier using complete h-Parameter Model, Analysis of a Transistor Amplifier Configurations using Simplified h-Parameter Model (CE configuration only), Small-Signal Analysis of FET Amplifiers, Cascading Amplifiers, Darlington Amplifier, Low-Frequency Response of Amplifiers (BJT amplifiers only).

PART - B

UNIT - 5   **6 Hours**

Large Signal Amplifiers, Feedback Amplifier: Classification and characteristics of Large Signal Amplifiers, Feedback Amplifiers: Classification of Amplifiers, Amplifier with Negative Feedback, Advantages of Negative Feedback, Feedback Topologies, Voltage-Series (Series-Shunt) Feedback, Voltage-Shunt (Shunt-Shunt) Feedback, Current-Series (Series-Series) Feedback, Current-Shunt (Shunt-Series) Feedback.

UNIT - 6   **7 Hours**

Sinusoidal Oscillators, Wave-Shaping Circuits: Classification of Oscillators, Conditions for Oscillations: Barkhausen Criterion, Types of Oscillators, Crystal Oscillator, Voltage-Controlled Oscillators, Frequency Stability.

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Wave-Shaping Circuits: Basic RC Low-Pass Circuit, RC Low-Pass Circuit as Integrator, Basic RC High-Pass Circuit, RC High-Pass Circuit as Differentiator, Multivibrators, Integrated Circuit (IC) Multivibrators.

UNIT - 7   **7 Hours**
Linear Power Supplies, Switched mode Power Supplies: Linear Power Supplies: Constituents of a Linear Power Supply, Designing Mains Transformer; Linear IC Voltage Regulators, Regulated Power Supply Parameters.
Switched Mode Power Supplies: Switched Mode Power Supplies, Switching Regulators, Connecting Power Converters in Series, Connecting Power Converters in Parallel.

UNIT - 8   **6 Hours**
Operational Amplifiers: Ideal Opamp versus Practical Opamp, Performance Parameters, Some Applications: Peak Detector Circuit, Absolute Value Circuit, Comparator, Active Filters, Phase Shifters, Instrumentation Amplifier, Non-Linear Amplifier, Relaxation Oscillator, Current-To-Voltage Converter, Voltage-To-Current Converter, Sine Wave Oscillators.

Text Book:
1. Anil K Maini, Varsha Agarwal: Electronic Devices and Circuits, Wiley, 2009.
(4.1, 4.2, 4.7, 4.8, 5.1 to 5.3, 5.5, 5.6, 5.8, 5.9, 5.13, 5.14, 6.1, 6.3, 7.1 to 7.5, 7.10 to 7.14, Listed topics only from 8, 10.1, 11, 12.1, 12.2, 12.3, 12.5, 13.1 to 13.6, 13.9, 13.10, 14.1, 14.2, 14.6, 14.7, 15.1, 15.5 to 15.7. 16.3, 16.4, 17.12 to 17.22)

Reference Books:
1. Jacob Millman, Christos Halkias, Chetan D Parikh: Millman's Integrated Electronics – Analog and Digital Circuits and Systems, 2nd Edition, Tata McGraw Hill, 2010.
2. R. D. Sudhaker Samuel: Electronic Circuits, Sanguine-Pearson, 2010.

LOGIC DESIGN
(Common to CSE & ISE)

Subject Code: 10CS33	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART-A

UNIT – 1   **7 Hours**
Digital Principles, Digital Logic: Definitions for Digital Signals, Digital Waveforms, Digital Logic, 7400 TTL Series, TTL Parameters The Basic Gates: NOT, OR, AND, Universal Logic Gates: NOR, NAND, Positive and Negative Logic, Introduction to HDL.

UNIT – 2   **6 Hours**
Combinational Logic Circuits
Sum-of-Products Method, Truth Table to Karnaugh Map, Pairs Quads, and Octets, Karnaugh Simplifications, Don't-care Conditions, Product-of-sums Method, Product-of-sums simplifications, Simplification by Quine-McClusky Method, Hazards and Hazard Covers, HDL Implementation Models.

UNIT – 3   **6 Hours**
Data-Processing Circuits: Multiplexers, Demultiplexers, 1-of-16 Decoder, Encoders, Exclusive-or Gates, Parity Generators and Checkers, Magnitude Comparator, Programmable Array Logic, Programmable Logic Arrays, HDL Implementation of Data Processing Circuits

UNIT – 4   **7 Hours**
Clocks, Flip-Flops: Clock Waveforms, TTL Clock, Schmitt Trigger, Clocked D FLIP-FLOP, Edge-triggered D FLIP-FLOP, Edge-triggered JK FLIP-FLOP, FLIP-FLOP Timing, JK Master-slave FLIP-FLOP, Switch Contact Bounce Circuits, Various Representation of FLIP-FLOPs, Analysis of Sequential Circuits, HDL Implementation of FLIP-FLOP

PART-B

UNIT – 5   **6 Hours**
Registers: Types of Registers, Serial In - Serial Out, Serial In - Parallel out, Parallel In - Serial Out, Parallel In - Parallel Out, Universal Shift Register, Applications of Shift Registers, Register Implementation in HDL

UNIT – 6   **7 Hours**
Counters: Asynchronous Counters, Decoding Gates, Synchronous Counters, Changing the Counter Modulus, Decade Counters, Presettable Counters, Counter Design as a Synthesis problem, A Digital Clock, Counter Design using HDL

UNIT – 7   **7 Hours**
Design of Synchronous and Asynchronous Sequential Circuits: Design of Synchronous Sequential Circuit: Model Selection, State Transition Diagram, State Synthesis Table, Design Equations and Circuit Diagram,

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Implementation using Read Only Memory, Algorithmic State Machine, State Reduction Technique.

Asynchronous Sequential Circuit: Analysis of Asynchronous Sequential Circuit, Problems with Asynchronous Sequential Circuits, Design of Asynchronous Sequential Circuit, FSM Implementation in HDL

UNIT – 8   **6 Hours**
D/A Conversion and A/D Conversion: Variable, Resistor Networks, Binary Ladders, D/A Converters, D/A Accuracy and Resolution, A/D Converter-Simultaneous Conversion, A/D Converter-Counter Method, Continuous A/D Conversion, A/D Techniques, Dual-slope A/D Conversion, A/D Accuracy and Resolution

Text Book:
1. Donald P Leach, Albert Paul Malvino & Goutam Saha: Digital Principles and Applications, 7th Edition, Tata McGraw Hill, 2010.

Reference Books:
1. Stephen Brown, Zvonko Vranesic: Fundamentals of Digital Logic Design with VHDL, 2nd Edition, Tata McGraw Hill, 2005.
2. R D Sudhaker Samuel: Illustrative Approach to Logic Design, Sanguine-Pearson, 2010.
3. Charles H. Roth: Fundamentals of Logic Design, Jr., 5th Edition, Cengage Learning, 2004.
4. Ronald J. Tocci, Neal S. Widmer, Gregory L. Moss: Digital Systems Principles and Applications, 10th Edition, Pearson Education, 2007.
5. M Morris Mano: Digital Logic and Computer Design, 10th Edition, Pearson Education, 2008.

DISCRETE MATHEMATICAL STRUCTURES
(Common to CSE & ISE)

Subject Code: 10CS34   **I.A. Marks : 25**
Hours/Week : 04   **Exam Hours: 03**
Total Hours : 52   **Exam Marks: 100**

PART – A

UNIT – 1   **6 Hours**
Set Theory: Sets and Subsets, Set Operations and the Laws of Set Theory, Counting and Venn Diagrams, A First Word on Probability, Countable and Uncountable Sets

UNIT – 2   **7 Hours**
Fundamentals of Logic: Basic Connectives and Truth Tables, Logic Equivalence – The Laws of Logic, Logical Implication – Rules of Inference

UNIT – 3   **6 Hours**
Fundamentals of Logic *contd*.: The Use of Quantifiers, Quantifiers, Definitions and the Proofs of Theorems

UNIT – 4   **7 Hours**
Properties of the Integers: Mathematical Induction, The Well Ordering Principle – Mathematical Induction, Recursive Definitions

PART – B

UNIT – 5   **7 Hours**
Relations and Functions: Cartesian Products and Relations, Functions – Plain and One-to-One, Onto Functions – Stirling Numbers of the Second Kind, Special Functions, The Pigeon-hole Principle, Function Composition and Inverse Functions

UNIT – 6   **7 Hours**
Relations *contd.*: Properties of Relations, Computer Recognition – Zero-One Matrices and Directed Graphs, Partial Orders – Hasse Diagrams, Equivalence Relations and Partitions

UNIT – 7   **6 Hours**
Groups: Definitions, Examples, and Elementary Properties, Homomorphisms, Isomorphisms, and Cyclic Groups, Cosets, and Lagrange's Theorem.

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Coding Theory and Rings: Elements of Coding Theory, The Hamming Metric, The Parity Check, and Generator Matrices

UNIT – 8   **6 Hours**
Group Codes: Decoding with Coset Leaders, Hamming Matrices
Rings and Modular Arithmetic: The Ring Structure – Definition and Examples, Ring Properties and Substructures, The Integers Modulo n

Text Book:
1. Ralph P. Grimaldi: Discrete and Combinatorial Mathematics, , 5th Edition, Pearson Education, 2004.
   (Chapter 3.1, 3.2, 3.3, 3.4, Appendix 3, Chapter 2, Chapter 4.1, 4.2, Chapter 5.1 to 5.6, Chapter 7.1 to 7.4, Chapter 16.1, 16.2, 16.3, 16.5 to 16.9, and Chapter 14.1, 14.2, 14.3).

Reference Books:
1. Kenneth H. Rosen: Discrete Mathematics and its Applications, 7th Edition, McGraw Hill, 2010.
2. Jayant Ganguly: A Treatise on Discrete Mathematical Structures, Sanguine-Pearson, 2010.
3. D.S. Malik and M.K. Sen: Discrete Mathematical Structures: Theory and Applications, Cengage Learning, 2004.
4. Thomas Koshy: Discrete Mathematics with Applications, Elsevier, 2005, Reprint 2008.

DATA STRUCTURES WITH C
(Common to CSE & ISE)

Subject Code: 10CS35	I.A. Marks : 25
Hours/Week : 04	Exam Hours: 03
Total Hours : 52	Exam Marks: 100

PART – A

UNIT - 1   **8 Hours**
BASIC CONCEPTS: Pointers and Dynamic Memory Allocation, Algorithm Specification, Data Abstraction, Performance Analysis, Performance Measurement

UNIT -2   **6 Hours**
ARRAYS and STRUCTURES: Arrays, Dynamically Allocated Arrays, Structures and Unions, Polynomials, Sparse Matrices, Representation of Multidimensional Arrays

UNIT - 3   **6 Hours**
STACKS AND QUEUES: Stacks, Stacks Using Dynamic Arrays, Queues, Circular Queues Using Dynamic Arrays, Evaluation of Expressions, Multiple Stacks and Queues.

UNIT - 4   **6 Hours**
LINKED LISTS: Singly Linked lists and Chains, Representing Chains in C, Linked Stacks and Queues, Polynomials, Additional List operations, Sparse Matrices, Doubly Linked Lists

PART - B

UNIT - 5   **6 Hours**
TREES – 1: Introduction, Binary Trees, Binary Tree Traversals, Threaded Binary Trees, Heaps.

UNIT – 6   **6 Hours**
TREES – 2, GRAPHS: Binary Search Trees, Selection Trees, Forests, Representation of Disjoint Sets, Counting Binary Trees, The Graph Abstract Data Type.

UNIT - 7   **6 Hours**
PRIORITY QUEUES Single- and Double-Ended Priority Queues, Leftist Trees, Binomial Heaps, Fibonacci Heaps, Pairing Heaps.

UNIT - 8   **8 Hours**
EFFICIENT BINARY SEARCH TREES: Optimal Binary Search Trees, AVL Trees, Red-Black Trees, Splay Trees.

Text Book:
1. Horowitz, Sahni, Anderson-Freed: Fundamentals of Data Structures in C, 2nd Edition, Universities Press, 2007.
   (Chapters 1, 2.1 to 2.6, 3, 4, 5.1 to 5.3, 5.5 to 5.11, 6.1, 9.1 to 9.5, 10)

Reference Books:
1. Yedidyah, Augenstein, Tannenbaum: Data Structures Using C and C++, 2nd Edition, Pearson Education, 2003.
2. Debasis Samanta: Classic Data Structures, 2nd Edition, PHI, 2009.
3. Richard F. Gilberg and Behrouz A. Forouzan: Data Structures A Pseudocode Approach with C, Cengage Learning, 2005.
4. Robert Kruse & Bruce Leung: Data Structures & Program Design in C, Pearson Education, 2007.

OBJECT ORIENTED PROGRAMMING WITH C++
(Common to CSE & ISE)

Subject Code: 10CS36	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART – A

UNIT 1   6 Hours
Introduction: Overview of C++, Sample C++ program, Different data types, operators, expressions, and statements, arrays and strings, pointers & user-defined types
Function Components, argument passing, inline functions, function overloading, recursive functions

UNIT 2   7 Hours
Classes & Objects – I: Class Specification, Class Objects, Scope resolution operator, Access members, Defining member functions, Data hiding, Constructors, Destructors, Parameterized constructors, Static data members, Functions

UNIT 3   7 Hours
Classes & Objects –II: Friend functions, Passing objects as arguments, Returning objects, Arrays of objects, Dynamic objects, Pointers to objects, Copy constructors, Generic functions and classes, Applications
Operator overloading using friend functions such as +, - , pre-increment, post-increment, [ ] etc., overloading <<, >>.

UNIT 4   6 Hours
Inheritance – I: Base Class, Inheritance and protected members, Protected base class inheritance, Inheriting multiple base classes

PART – B

UNIT 5   6 Hours
Inheritance – II: Constructors, Destructors and Inheritance, Passing parameters to base class constructors, Granting access, Virtual base classes

UNIT 6   7 Hours
Virtual functions, Polymorphism: Virtual function, Calling a Virtual function through a base class reference, Virtual attribute is inherited, Virtual functions are hierarchical, Pure virtual functions, Abstract classes, Using virtual functions, Early and late binding.

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UNIT 7   **6 Hours**
I/O System Basics, File I/0: C++ stream classes, Formatted I/O, I/O manipulators, fstream and the File classes, File operations

UNIT 8   **7 Hours**
Exception Handling, STL: Exception handling fundamentals, Exception handling options
STL: An overview, containers, vectors, lists, maps.

Text Books:
1. Herbert Schildt: The Complete Reference C++, 4th Edition, Tata McGraw Hill, 2003.

Reference Books:
1. Stanley B.Lippmann, Josee Lajore: C++ Primer, 4th Edition, Pearson Education, 2005.
2. Paul J Deitel, Harvey M Deitel: C++ for Programmers, Pearson Education, 2009.
3. K R Venugopal, Rajkumar Buyya, T Ravi Shankar: Mastering C++, Tata McGraw Hill, 1999.

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DATA STRUCTURES WITH C/C++ LABORATORY
(Common to CSE & ISE)

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Subject Code: 10CSL37   **I.A. Marks : 25**
Hours/Week : 03   **Exam Hours: 03**
Total Hours : 42   **Exam Marks: 50**

1. Using circular representation for a polynomial, design, develop, and execute a program in C to accept two polynomials, add them, and then print the resulting polynomial.

2. Design, develop, and execute a program in C to convert a given valid parenthesized infix arithmetic expression to postfix expression and then to print both the expressions. The expression consists of single character operands and the binary operators + (plus), - (minus), * (multiply) and / (divide).

3. Design, develop, and execute a program in C to evaluate a valid postfix expression using stack. Assume that the postfix expression is read as a single line consisting of non-negative single digit operands

and binary arithmetic operators. The arithmetic operators are + (add), - (subtract), * (multiply) and / (divide).

4. Design, develop, and execute a program in C to simulate the working of a queue of integers using an array. Provide the following operations:

a. Insert   b. Delete   c. Display

5. Design, develop, and execute a program in C++ based on the following requirements:

An EMPLOYEE class is to contain the following data members and member functions:

Data members: Employee_Number (an integer), Employee_Name (a string of characters), Basic_Salary (an integer) , All_Allowances (an integer), IT (an integer), Net_Salary (an integer).

Member functions: to read the data of an employee, to calculate Net_Salary and to print the values of all the data members.

(All_Allowances = 123% of Basic; Income Tax (IT) = 30% of the gross salary (= basic_Salary _ All_Allowance); Net_Salary = Basic_Salary + All_Allowances – IT)

6. Design, develop, and execute a program in C++ to create a class called STRING and implement the following operations. Display the results after every operation by overloading the operator <<.

       i.   STRING s1 = "VTU"
       ii.   STRING s2 = "BELGAUM"
       iii.   STIRNG s3 = s1 + s2; (Use copy constructor)

7. Design, develop, and execute a program in C++ to create a class called STACK using an array of integers and to implement the following operations by overloading the operators + and - :

       i.   s1=s1 + element; where s1 is an object of the class STACK and element is an integer to be pushed on to top of the stack.
       ii.   s1=s1- ; where s1 is an object of the class STACK and – operator pops off the top element.

Handle the STACK Empty and STACK Full conditions. Also display the contents of the stack after each operation, by overloading the operator <<.

8. Design, develop, and execute a program in C++ to create a class called LIST (linked list) with member functions to insert an element at the front of the list as well as to delete an element from the front of the list. Demonstrate all the functions after creating a list object.

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9. Design, develop, and execute a program in C to read a sparse matrix of integer values and to search the sparse matrix for an element specified by the user. Print the result of the search appropriately. Use the triple <row, column, value> to represent an element in the sparse matrix.

10. Design, develop, and execute a program in C to create a max heap of integers by accepting one element at a time and by inserting it immediately in to the heap. Use the array representation for the heap. Display the array at the end of insertion phase.

11. Design, develop, and execute a program in C to implement a doubly linked list where each node consists of integers. The program should support the following operations:
    i. Create a doubly linked list by adding each node at the front.
    ii. Insert a new node to the left of the node whose key value is read as an input.
    iii. Delete the node of a given data if it is found, otherwise display appropriate message.
    iv. Display the contents of the list.
(Note: Only either (a,b and d) or (a, c and d) may be asked in the examination)

12. Design, develop, and execute a program in C++ to create a class called DATE with methods to accept two valid dates in the form dd/mm/yy and to implement the following operations by overloading the operators + and -. After every operation the results are to be displayed by overloading the operator <<.
    i. no_of_days = d1 – d2; where d1 and d2 are DATE objects, d1 >=d2 and no_of_days is an integer.
    ii. d2 = d1 + no_of_days; where d1 is a DATE object and no_of_days is an integer.

13. Design, develop, and execute a program in C++ to create a class called OCTAL, which has the characteristics of an octal number. Implement the following operations by writing an appropriate constructor and an overloaded operator +.
    i. OCTAL h = x ; where x is an integer
    ii. int y = h + k ; where h is an OCTAL object and k is an integer.
Display the OCTAL result by overloading the operator <<. Also display the values of h and y.

14. Design, develop, and execute a program in C++ to create a class called BIN_TREE that represents a Binary Tree, with member functions to perform inorder, preorder and postorder traversals. Create a BIN_TREE object and demonstrate the traversals.

Note: In the examination each student picks one question from a lot of *all* the 14 questions.

ELECTRONIC CIRCUITS & LOGIC DESIGN LABORATORY
(Common to CSE & ISE)

Subject Code: **10CSL38**   **I.A. Marks   : 25**
Hours/Week : 03   **Exam Hours: 03**
Total Hours : 42   **Exam Marks : 50**
PART-A

1. a) Design and construct a suitable circuit and demonstrate the working of positive clipper, double-ended clipper and positive clamper using diodes.
   b) Demonstrate the working of the above circuits using a simulation package.

2. a) Design and construct a suitable circuit and determine the frequency response, input impedance, output impedance, and bandwidth of a CE amplifier.
   b) Design and build the CE amplifier circuit using a simulation package and determine the voltage gain for two different values of supply voltage and for two different values of emitter resistance.

3. a) Design and construct a suitable circuit and determine the drain characteristics and transconductance characteristics of an enhancement-mode MOSFET.
   b) Design and build CMOS inverter using a simulation package and verify its truth table.

4. a) Design and construct a Schmitt trigger using Op-Amp for given UTP and LTP values and demonstrate its working.
   b) Design and implement a Schmitt trigger using Op-Amp using a simulation package for two sets of UTP and LTP values and demonstrate its working.

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5. a) Design and construct a rectangular waveform generator (Op-Amp relaxation oscillator) for given frequency and demonstrate its working.

   b) Design and implement a rectangular waveform generator (Op-Amp relaxation oscillator) using a simulation package and demonstrate the change in frequency when all resistor values are doubled.

6. Design and implement an astable multivibrator circuit using 555 timer for a given frequency and duty cycle.

PART – B

7. a) Given a 4-variable logic expression, simplify it using Entered Variable Map and realize the simplified logic expression using 8:1 multiplexer IC.

   b) Design and develop the Verilog /VHDL code for an 8:1 multiplexer. Simulate and verify its working.

8. a) Realize a J-K Master / Slave Flip-Flop using NAND gates and verify its truth table.

   b) Design and develop the Verilog / VHDL code for D Flip-Flop with positive-edge triggering. Simulate and verify its working.

9. a) Design and implement a mod-n (n<8) synchronous up counter using J-K Flip-Flop ICs and demonstrate its working.

   b) Design and develop the Verilog / VHDL code for mod-8 up counter. Simulate and verify its working.

10. a) Design and implement a ring counter using 4-bit shift register and demonstrate its working.

    b) Design and develop the Verilog / VHDL code for switched tail counter. Simulate and verify its   working.

11. Design and implement an asynchronous counter using decade counter IC to count up from 0 to n (n<=9) and demonstrate its working.

12. Design and construct a 4-bit R-2R ladder D/A converter using Op-Amp. Determine its accuracy and resolution.

IV SEMESTER

ENGINEERING MATHEMATICS – IV

CODE: 10 MAT 41   **IA Marks: 25**
Hrs/Week: 04   **Exam Hrs: 03**
Total Hrs: 52   **Exam**
Marks:100

PART-A

Unit-I: NUMERICAL METHODS - 1

Numerical solution of ordinary differential equations of first order and first degree; Picard's method, Taylor's series method, modified Euler's method, Runge-kutta method of fourth-order. Milne's and Adams - Bashforth predictor and corrector methods (No derivations of formulae).

[6 hours]

Unit-II: NUMERICAL METHODS – 2

Numerical solution of simultaneous first order ordinary differential equations: Picard's method, Runge-Kutta method of fourth-order.

Numerical solution of second order ordinary differential equations: Picard's method, Runge-Kutta method and Milne's method.

[6 hours]

Unit-III: Complex variables – 1

Function of a complex variable, Analytic functions-Cauchy-Riemann equations in cartesian and polar forms. Properties of analytic functions.
Application to flow problems- complex potential, velocity potential, equipotential lines, stream functions, stream lines.

[7 hours]

Unit-IV: Complex variables – 2

Conformal Transformations: Bilinear Transformations. Discussion of Transformations: $w = z^2$, $w = e^z$, $w = z + (a^2 / z)$. Complex line integrals-Cauchy's theorem and Cauchy's integral formula.

[7 hours]

PART-B

Unit-V: SPECIAL FUNCTIONS

Solution of Laplace equation in cylindrical and spherical systems leading Bessel's and Legendre's differential equations, Series solution of Bessel's differential equation leading to Bessel function of first kind. Orthogonal property of Bessel functions. Series solution of Legendre's differential equation leading to Legendre polynomials, Rodrigue's formula.

[7 hours]

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Unit-VI: PROBABILITY THEORY - 1

Probability of an event, empherical and axiomatic definition, probability associated with set theory, addition law, conditional probability, multiplication law, Baye's theorem.

[6 hours]

Unit-VII: PROBABILITY THEORY- 2

Random variables (discrete and continuous), probability density function, cumulative density function. Probability distributions – Binomial and Poisson distributions; Exponential and normal distributions.

[7 hours]

Unit-VIII: SAMPLING THEORY

Sampling, Sampling distributions, standard error, test of hypothesis for means, confidence limits for means, student's t-distribution. Chi -Square distribution as a test of goodness of fit

[6 hours]

Text Books:

1. B.S. Grewal, Higher Engineering Mathematics, Latest edition, Khanna Publishers
2. Erwin Kreyszig, Advanced Engineering Mathematics, Latest edition, Wiley Publications.

Reference Book:

1. B.V. Ramana, Higher Engineering Mathematics, Latest edition, Tata Mc. Graw Hill Publications.
2. Peter V. O'Neil, Engineering Mathematics, CENGAGE Learning India Pvt Ltd.Publishers

GRAPH THEORY AND COMBINATORICS
(Common to CSE & ISE)

Subject Code: 10CS42	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART – A

UNIT -   **7 Hours**
Introduction to Graph Theory: Definitions and Examples, Subgraphs, Complements, and Graph Isomorphism, Vertex Degree, Euler Trails and Circuits

UNIT - 2   **6 Hours**
Introduction to Graph Theory *contd*.: Planar Graphs, Hamilton Paths and Cycles, Graph Colouring, and Chromatic Polynomials

UNIT - 3   **6 Hours**
Trees: Definitions, Properties, and Examples, Routed Trees, Trees and Sorting, Weighted Trees and Prefix Codes

UNIT - 4   **7 Hours**
Optimization and Matching: Dijkstra's Shortest Path Algorithm, Minimal Spanning Trees – The algorithms of Kruskal and Prim, Transport Networks – Max-flow, Min-cut Theorem, Matching Theory

PART – B

UNIT - 5   **6 Hours**
Fundamental Principles of Counting: The Rules of Sum and Product, Permutations, Combinations – The Binomial Theorem, Combinations with Repetition, The Catalon Numbers

UNIT - 6   **6 Hours**
The Principle of Inclusion and Exclusion: The Principle of Inclusion and Exclusion, Generalizations of the Principle, Derangements – Nothing is in its Right Place, Rook Polynomials

UNIT - 7   **7 Hours**
Generating Functions: Introductory Examples, Definition and Examples – Calculational Techniques, Partitions of Integers, the Exponential Generating Function, the Summation Operator

UNIT - 8   **7 Hours**
Recurrence Relations: First Order Linear Recurrence Relation, The Second Order Linear Homogeneous Recurrence Relation with Constant Coefficients, The Non-homogeneous Recurrence Relation, The Method of Generating Functions

Text Book:
1. Ralph P. Grimaldi: Discrete and Combinatorial Mathematics, 5th Edition, Pearson Education, 2004.
   (Chapter 11, Chapter 12.1 to 12.4, Chapter 13, Chapter 1, Chapter 8.1 to 8.4, Chapter 9 Chapter 10.1 to 10.4).

Reference Books:
1. D.S. Chandrasekharaiah: Graph Theory and Combinatorics, Prism, 2005.
2. Chartrand Zhang: Introduction to Graph Theory, TMH, 2006.
3. Richard A. Brualdi: Introductory Combinatorics, 4th Edition, Pearson Education, 2004.
4. Geir Agnarsson & Raymond Geenlaw: Graph Theory, Pearson Education, 2007.

DESIGN AND ANALYSIS OF ALGORITHMS
(Common to CSE & ISE)

Subject Code: 10CS43   **I.A. Marks : 25**
Hours/Week : 04   **Exam Hours: 03**

Total Hours : 52   **Exam Marks: 100**

PART – A

UNIT – 1   **7 Hours**
INTRODUCTION: Notion of Algorithm, Review of Asymptotic Notations, Mathematical Analysis of Non-Recursive and Recursive Algorithms
Brute Force Approaches: Introduction, Selection Sort and Bubble Sort, Sequential Search and Brute Force String Matching.

UNIT - 2   **6 Hours**
DIVIDE AND CONQUER: Divide and Conquer: General Method, Defective Chess Board, Binary Search, Merge Sort, Quick Sort and its performance.

UNIT - 3   **7 Hours**
THE GREEDY METHOD: The General Method, Knapsack Problem, Job Sequencing with Deadlines, Minimum-Cost Spanning Trees: Prim's Algorithm, Kruskal's Algorithm; Single Source Shortest Paths.

UNIT - 4   **6 Hours**
DYNAMIC PROGRAMMING: The General Method, Warshall's Algorithm, Floyd's Algorithm for the All-Pairs Shortest Paths Problem, Single-Source Shortest Paths: General Weights, 0/1 Knapsack, The Traveling Salesperson problem.

PART – B

UNIT - 5   **7 Hours**
DECREASE-AND-CONQUER APPROACHES, SPACE-TIME TRADEOFFS: Decrease-and-Conquer Approaches: Introduction, Insertion Sort, Depth First Search and Breadth First Search, Topological Sorting
Space-Time Tradeoffs: Introduction, Sorting by Counting, Input Enhancement in String Matching.

UNIT – 6   **7 Hours**
LIMITATIONS OF ALGORITHMIC POWER AND COPING WITH THEM: Lower-Bound Arguments, Decision Trees, P, NP, and NP-Complete Problems, Challenges of Numerical Algorithms.

UNIT - 7   **6 Hours**
COPING WITH LIMITATIONS OF ALGORITHMIC POWER: Backtracking: n - Queens problem, Hamiltonian Circuit Problem, Subset – Sum Problem.

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Branch-and-Bound: Assignment Problem, Knapsack Problem, Traveling Salesperson Problem.
Approximation Algorithms for NP-Hard Problems – Traveling Salesperson Problem, Knapsack Problem

UNIT – 8   **6 Hours**
PRAM ALGORITHMS: Introduction, Computational Model, Parallel Algorithms for Prefix Computation, List Ranking, and Graph Problems,

Text Books:
1. Anany Levitin: Introduction to The Design & Analysis of Algorithms, 2nd Edition, Pearson Education, 2007.
   (Listed topics only from the Chapters 1, 2, 3, 5, 7, 8, 10, 11).
2. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran: Fundamentals of Computer Algorithms, 2nd Edition, Universities Press, 2007.
   (Listed topics only from the Chapters 3, 4, 5, 13)

Reference Books:
1. Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein: Introduction to Algorithms, 3rd Edition, PHI, 2010.
2. R.C.T. Lee, S.S. Tseng, R.C. Chang & Y.T.Tsai: Introduction to the Design and Analysis of Algorithms A Strategic Approach, Tata McGraw Hill, 2005.

UNIX AND SHELL PROGRAMMING
(Common to CSE & ISE)

Subject Code: 10CS44   **I.A. Marks : 25**
Hours/Week : 04   **Exam Hours: 03**
Total Hours : 52   **Exam Marks: 100**

PART – A

UNIT – 1   **6 Hours**
The Unix Operating System, The UNIX architecture and Command Usage, The File System

UNIT - 2   **6 Hours**
Basic File Attributes, the vi Editor

UNIT - 3   **7 Hours**
The Shell, The Process, Customizing the environment

UNIT - 4   **7 Hours**
More file attributes, Simple filters

PART – B
UNIT - 5   **6 Hours**
Filters using regular expressions,

UNIT - 6   **6 Hours**
Essential Shell Programming

UNIT - 7   **7 Hours**
awk – An Advanced Filter

UNIT - 8   **7 Hours**
perl - The Master Manipulator

Text Book:
1. Sumitabha Das: UNIX – Concepts and Applications, 4th Edition, Tata McGraw Hill, 2006.
   (Chapters 1.2, 2, 4, 6, 7, 8, 9, 10, 11, 12, 13, 14, 18, 19)

Reference Books:
1. Behrouz A. Forouzan and Richard F. Gilberg: UNIX and Shell Programming**,** Cengage Learning, 2005.
2. M.G. Venkateshmurthy: UNIX & Shell Programming**,** Pearson Education, 2005.

MICROPROCESSORS
(**Common to CSE & ISE**)

Subject Code: 10CS45	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART A
UNIT – 1   **7 Hours**
Introduction, Microprocessor Architecture – 1: A Historical Background, The Microprocessor-Based Personal Computer Systems.
The Microprocessor and its Architecture: Internal Microprocessor Architecture, Real Mode Memory Addressing.

UNIT – 2   **7 Hours**

Microprocessor Architecture – 2, Addressing Modes: Introduction to Protected Mode Memory Addressing, Memory Paging, Flat Mode Memory Addressing Modes: Data Addressing Modes, Program Memory Addressing Modes, Stack Memory Addressing Modes

UNIT – 3   **6 Hours**
Programming – 1: Data Movement Instructions: MOV Revisited, PUSH/POP, Load-Effective Address, String Data Transfers, Miscellaneous Data Transfer Instructions, Segment Override Prefix, Assembler Details.
Arithmetic and Logic Instructions: Addition, Subtraction and Comparison, Multiplication and Division.

UNIT - 4   **6 Hours**
Programming – 2: Arithmetic and Logic Instructions (continued): BCD and ASCII Arithmetic, Basic Logic Instructions, Shift and Rotate, String Comparisons.
Program Control Instructions: The Jump Group, Controlling the Flow of the Program, Procedures, Introduction to Interrupts, Machine Control and Miscellaneous Instructions.

PART B
UNIT - 5   **6 Hours**
Programming – 3: Combining Assembly Language with C/C++: Using Assembly Language with C/C++ for 16-Bit DOS Applications and 32-Bit Applications
Modular Programming, Using the Keyboard and Video Display, Data Conversions, Example Programs

UNIT - 6   **7 Hours**

Hardware Specifications, Memory Interface – 1: Pin-Outs and the Pin Functions, Clock Generator, Bus Buffering and Latching, Bus Timings, Ready and Wait State, Minimum versus Maximum Mode.
Memory Interfacing: Memory Devices

UNIT – 7   **6 Hours**
Memory Interface – 2, I/O Interface – 1: Memory Interfacing (continued): Address Decoding, 8088 Memory Interface, 8086 Memory Interface.
Basic I/O Interface: Introduction to I/O Interface, I/O Port Address Decoding.

UNIT 8   **7 Hours**

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I/O Interface – 2, Interrupts, and DMA: I/O Interface (continued): The Programmable Peripheral Interface 82C55, Programmable Interval Timer 8254.

Interrupts: Basic Interrupt Processing, Hardware Interrupts: INTR and INTA/; Direct Memory Access: Basic DMA Operation and Definition.

Text Book:

1. Barry B Brey: The Intel Microprocessors, 8th Edition, Pearson Education, 2009.
   (Listed topics only from the Chapters 1 to 13)

Reference Books:

1. Douglas V. Hall: Microprocessors and Interfacing, Revised 2nd Edition, TMH, 2006.
2. K. Udaya Kumar & B.S. Umashankar : Advanced Microprocessors & IBM-PC Assembly Language Programming, TMH 2003.
3. James L. Antonakos: The Intel Microprocessor Family: Hardware and Software Principles and Applications, Cengage Learning, 2007.

COMPUTER ORGANIZATION
(Common to CSE & ISE)

Subject Code: 10CS46	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART – A

UNIT - 1   **6 Hours**
Basic Structure of Computers: Computer Types, Functional Units, Basic Operational Concepts, Bus Structures, Performance – Processor Clock, Basic Performance Equation, Clock Rate, Performance Measurement, Historical Perspective
Machine Instructions and Programs: Numbers, Arithmetic Operations and Characters, Memory Location and Addresses, Memory Operations, Instructions and Instruction Sequencing,

UNIT - 2   **7 Hours**
Machine Instructions and Programs *contd*.**:** Addressing Modes, Assembly Language, Basic Input and Output Operations, Stacks and Queues, Subroutines, Additional Instructions, Encoding of Machine Instructions

UNIT - 3   **6 Hours**

Input/Output Organization: Accessing I/O Devices, Interrupts – Interrupt Hardware, Enabling and Disabling Interrupts, Handling Multiple Devices, Controlling Device Requests, Exceptions, Direct Memory Access, Buses

UNIT - 4   **7 Hours**
Input/Output Organization *contd*.: Interface Circuits, Standard I/O Interfaces – PCI Bus, SCSI Bus, USB

PART – B
UNIT - 5   **7 Hours**
Memory System: Basic Concepts, Semiconductor RAM Memories, Read Only Memories, Speed, Size, and Cost, Cache Memories – Mapping Functions, Replacement Algorithms, Performance Considerations, Virtual Memories, Secondary Storage

UNIT - 6   **7 Hours**
Arithmetic: Addition and Subtraction of Signed Numbers, Design of Fast Adders, Multiplication of Positive Numbers, Signed Operand Multiplication, Fast Multiplication, Integer Division, Floating-point Numbers and Operations

UNIT - 7   **6 Hours**
Basic Processing Unit: Some Fundamental Concepts, Execution of a Complete Instruction, Multiple Bus Organization, Hard-wired Control, Microprogrammed Control

UNIT - 8   **6 Hours**
Multicores, Multiprocessors, and Clusters: Performance, The Power Wall, The Switch from Uniprocessors to Multiprocessors, Amdahl's Law, Shared Memory Multiprocessors, Clusters and other Message Passing Multiprocessors, Hardware Multithreading, SISD, IMD, SIMD, SPMD, and Vector.

Text Books:
1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky: Computer Organization, 5th Edition, Tata McGraw Hill, 2002.
   (Listed topics only from Chapters 1, 2, 4, 5, 6, 7)
2. David A. Patterson, John L. Hennessy: Computer Organization and Design – The Hardware / Software Interface ARM Edition, 4th Edition, Elsevier, 2009.
3. (Listed topics only)

Reference Books:
1. William Stallings: Computer Organization & Architecture, 7th Edition, PHI, 2006.

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2. Vincent P. Heuring & Harry F. Jordan: Computer Systems Design and Architecture, 2nd Edition, Pearson Education, 2004.

DESIGN AND ANALYSIS OF ALGORITHMS LABORATORY
(Common to CSE & ISE)

Subject Code: 10CSL47   I.A. Marks : 25
Hours/Week : 03   Exam Hours: 03
Total Hours : 42   Exam Marks: 50

Design, develop and implement the specified algorithms for the following problems using C/C++ Language in LINUX / Windows environment.

1. Sort a given set of elements using the Quicksort method and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n.
   The elements can be read from a file or can be generated using the random number generator.

2. Using OpenMP, implement a parallelized Merge Sort algorithm to sort a given set of elements and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator.

3. a. Obtain the Topological ordering of vertices in a given digraph.
   b. Compute the transitive closure of a given directed graph using Warshall's algorithm.

4. Implement 0/1 Knapsack problem using Dynamic Programming.

5. From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm.

6. Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm.

7. a. Print all the nodes reachable from a given starting node in a digraph using BFS method.
   b. Check whether a given graph is connected or not using DFS method.

8. Find a subset of a given set S = {sl,s2,.....,sn} of n positive integers whose sum is equal to a given positive integer d. For example, if S= {1, 2, 5, 6, 8} and d = 9 there are two solutions{1,2,6}and{1,8}.A suitable message is to be displayed if the given problem instance doesn't have a solution.

9. Implement any scheme to find the optimal solution for the Traveling Salesperson problem and then solve the same problem instance using any approximation algorithm and determine the error in the approximation.

10. Find Minimum Cost Spanning Tree of a given undirected graph using Prim's algorithm.

11. Implement All-Pairs Shortest Paths Problem using Floyd's algorithm. Parallelize this algorithm, implement it using OpenMP and determine the speed-up achieved.

12. Implement N Queen's problem using Back Tracking.

Note: In the examination *each* student picks one question from the lot of *all* 12 questions.

MICROPROCESSORS LABORATORY
(Common to CSE & ISE)

Subject Code : 10CSL48   **I.A. Marks   : 25**
Hours/Week : 03   **Exam Hours: 03**
Total Hours : 42   **Exam Marks: 50**

Notes:

- **Develop and execute the following programs using 8086 Assembly Language. Any suitable assembler like MASM, TASM etc may be used.**
- **Program should have suitable comments.**

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- **The board layout and the circuit diagram of the interface are to be provided to the student during the examination.**

1. a) Search a key element in a list of 'n' 16-bit numbers using the Binary search algorithm.

   b) Read the status of eight input bits from the Logic Controller Interface and display 'FF' if it is the parity of the input read is even; otherwise display 00.

2. a) Write two ALP modules stored in two different files; one module is to read a character from the keyboard and the other one is to display a character. Use the above two modules to read a string of characters from the keyboard terminated by the carriage return and print the string on the display in the next line.

   b) Implement a BCD Up-Down Counter on the Logic Controller Interface.

3. a) Sort a given set of 'n' numbers in ascending order using the Bubble Sort algorithm.

   b) Read the status of two 8-bit inputs (X & Y) from the Logic Controller Interface and display X*Y.

4. a) Read an alphanumeric character and display its equivalent ASCII code at the center of the screen.

   b) Display messages FIRE and HELP alternately with flickering effects on a 7-segment display interface for a suitable period of time. Ensure a flashing rate that makes it easy to read both the messages (Examiner does not specify these delay values nor is it necessary for the student to compute these values).

5. a) Reverse a given string and check whether it is a palindrome or not.

   b) Assume any suitable message of 12 characters length and display it in the rolling fashion on a 7-segment display interface for a suitable period of time. Ensure a flashing rate that makes it easy to read both the messages. (Examiner does not specify these delay values nor is it necessary for the student to compute these values).

6. a) Read two strings, store them in locations STR1 and STR2. Check whether they are equal or not and display appropriate messages. Also display the length of the stored strings.

b) Convert a 16-bit binary value (assumed to be an unsigned integer) to BCD and display it from left to right and right to left for specified number of times on a 7-segment display interface.

7. a) Read your name from the keyboard and display it at a specified location on the screen after the message "**What is your name?"** You must clear the entire screen before display.

    b) Scan a 8 x 3 keypad for key closure and to store the code of the key pressed in a memory location or display on screen. Also display row and column numbers of the key pressed.

8. a) Compute **nCr** using recursive procedure. Assume that 'n' and 'r' are non-negative integers.

    b) Drive a Stepper Motor interface to rotate the motor in specified direction (clockwise or counter-clockwise) by N steps (Direction and N are specified by the examiner). Introduce suitable delay between successive steps. (Any arbitrary value for the delay may be assumed by the student).

9. a) Read the current time from the system and display it in the standard format on the screen.

    b) Generate the Sine Wave using DAC interface (The output of the DAC is to be displayed on the CRO).

10. a) Write a program to simulate a Decimal Up-counter to display 00-99.

    b) Generate a Half Rectified Sine wave form using the DAC interface. (The output of the DAC is to be displayed on the CRO).

11. a) Read a pair of input co-ordinates in BCD and move the cursor to the specified location on the screen.

    b) Generate a Fully Rectified Sine waveform using the DAC interface. (The output of the DAC is to be displayed on the CRO).

12. a) Write a program to create a file (input file) and to delete an existing file.

    b) Drive an elevator interface in the following way:
    i. Initially the elevator should be in the ground floor, with all requests in OFF state.
    ii. When a request is made from a floor, the elevator should move to that floor, wait there for a couple of seconds (approximately), and then come down to ground floor and

stop. If some requests occur during going up or coming
down they should be ignored.

 **Note: In the examination *each* student picks one question from
the lot of *all* 12 questions.**

V SEMESTER

SOFTWARE ENGINEERING

Subject Code: 10IS51	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART – A

UNIT – 1   **6 Hours**
Overview: Introduction: FAQ's about software engineering, Professional and
ethical responsibility.
Socio-Technical systems: Emergent system properties; Systems engineering;
Organizations, people and computer systems; Legacy systems.

UNIT – 2   **6 Hours**
Critical Systems, Software Processes: Critical Systems: A simple safety-
critical system; System dependability; Availability and reliability.
Software Processes: Models, Process iteration, Process activities; The
Rational Unified Process; Computer Aided Software Engineering.

UNIT – 3   **7 Hours**
Requirements: Software Requirements: Functional and Non-functional
requirements; User requirements; System requirements; Interface
specification; The software requirements document.
Requirements Engineering Processes: Feasibility studies; Requirements
elicitation and analysis; Requirements validation; Requirements
management.

UNIT – 4   **7 Hours**
System models, Project Management: System Models: Context models;
Behavioral models; Data models; Object models; Structured methods.
Project Management: Management activities; Project planning; Project
scheduling; Risk management.

PART - B

UNIT – 5   **7 Hours**

Software Design : Architectural Design: Architectural design decisions; System organization; Modular decomposition styles; Control styles.
Object-Oriented design: Objects and Object Classes; An Object-Oriented design process; Design evolution.

UNIT – 6   **6 Hours**

Development: Rapid Software Development: Agile methods; Extreme programming; Rapid application development.
Software Evolution: Program evolution dynamics; Software maintenance; Evolution processes; Legacy system evolution.

UNIT – 7   **7 Hours**

Verification and Validation: Verification and Validation: Planning; Software inspections; Automated static analysis; Verification and formal methods.
Software testing: System testing; Component testing; Test case design; Test automation.

UNIT – 8   **6 Hours**

Management: Managing People: Selecting staff; Motivating people; Managing people; The People Capability Maturity Model.
Software Cost Estimation: Productivity; Estimation techniques; Algorithmic cost modeling, Project duration and staffing.

Text Books:
1. Ian Sommerville: Software Engineering, 8th Edition, Pearson Education, 2007.
   (Chapters-: 1, 2, 3, 4, 5, 6, 7, 8, 11, 14, 17, 21, 22, 23, 25, 26)

Reference Books:
1. Roger.S.Pressman: Software Engineering-A Practitioners approach, 7th Edition, McGraw Hill, 2007.
2. Pankaj Jalote: An Integrated Approach to Software Engineering, Wiley India, 2009.

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SYSTEM SOFTWARE

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Subject Code: 10CS52   **I.A. Marks : 25**
Hours/Week : 04   **Exam Hours: 03**
Total Hours : 52   **Exam Marks: 100**

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PART – A

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UNIT – 1   **6 Hours**

Machine Architecture: Introduction, System Software and Machine Architecture, Simplified Instructional Computer (SIC) - SIC Machine Architecture, SIC/XE Machine Architecture, SIC Programming Examples.

UNIT – 2   **6 Hours**
Assemblers -1: Basic Assembler Function - A Simple SIC Assembler, Assembler Algorithm and Data Structures, Machine Dependent Assembler Features - Instruction Formats & Addressing Modes, Program Relocation.

UNIT – 3   **6 Hours**
Assemblers -2: Machine Independent Assembler Features – Literals, Symbol-Definition Statements, Expression, Program Blocks, Control Sections and Programming Linking, Assembler Design Operations - One-Pass Assembler, Multi-Pass Assembler, Implementation Examples - MASM Assembler.

UNIT – 4   **8 Hours**
Loaders and Linkers: Basic Loader Functions - Design of an Absolute Loader, A Simple Bootstrap Loader, Machine-Dependent Loader Features – Relocation, Program Linking, Algorithm and Data Structures for a Linking Loader; Machine-Independent Loader Features - Automatic Library Search, Loader Options, Loader Design Options - Linkage Editor, Dynamic Linkage, Bootstrap Loaders, Implementation Examples - MS-DOS Linker.

PART – B

UNIT – 5   **6 Hours**
Editors and Debugging Systems: Text Editors - Overview of Editing Process, User Interface, Editor Structure, Interactive Debugging Systems - Debugging Functions and Capabilities, Relationship With Other Parts Of The System, User-Interface Criteria

UNIT – 6   **8 Hours**
Macro Processor: Basic Macro Processor Functions - Macro Definitions and Expansion, Macro Processor Algorithm and Data Structures, Machine-Independent Macro Processor Features - Concatenation of Macro Parameters, Generation of Unique Labels, Conditional Macro Expansion, Keyword Macro Parameters, Macro Processor Design Options - Recursive Macro Expansion, General-Purpose Macro Processors, Macro Processing Within Language Translators, Implementation Examples - MASM Macro Processor, ANSI C Macro Processor.

UNIT – 7   **6 Hours**

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Lex and Yacc – 1: Lex and Yacc - The Simplest Lex Program, Recognizing Words With LEX, Symbol Tables, Grammars, Parser-Lexer Communication, The Parts of Speech Lexer, A YACC Parser, The Rules Section, Running LEX and YACC, LEX and Hand- Written Lexers, Using LEX - Regular Expression, Examples of Regular Expressions, A Word Counting Program, Parsing a Command Line.

UNIT – 8   6 Hours
Lex and Yacc - 2

Using YACC – Grammars, Recursive Rules, Shift/Reduce Parsing, What YACC Cannot Parse, A YACC Parser - The Definition Section, The Rules Section, Symbol Values and Actions, The LEXER, Compiling and Running a Simple Parser, Arithmetic Expressions and Ambiguity, Variables and Typed Tokens.

Text Books:
1. Leland.L.Beck: System Software, 3rd Edition, Pearson Education, 1997.
   (Chapters 1.1 to 1.3, 2 (except 2.5.2 and 2.5.3), 3 (except 3.5.2 and 3.5.3), 4 (except 4.4.3))
2. John.R.Levine, Tony Mason and Doug Brown: Lex and Yacc, O'Reilly, SPD, 1998.
   (Chapters 1, 2 (Page 2-42), 3 (Page 51-65))

Reference Books:
1. D.M.Dhamdhere: System Programming and Operating Systems, 2nd Edition, Tata McGraw - Hill, 1999.

OPERATING SYSTEMS

Subject Code: 10CS53		**I.A. Marks : 25**	
Hours/Week : 04		**Exam Hours: 03**	
Total Hours : 52		**Exam Marks: 100**	

PART – A

UNIT – 1   6 Hours
Introduction to Operating Systems, System structures: What operating systems do; Computer System organization; Computer System architecture; Operating System structure; Operating System operations; Process management; Memory management; Storage management; Protection and security; Distributed system; Special-purpose systems; Computing environments.Operating System Services; User - Operating System interface; System calls; Types of system calls; System programs; Operating System

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design and implementation; Operating System structure; Virtual machines; Operating System generation; System boot.

UNIT – 2   **7 Hours**
Process Management: Process concept; Process scheduling; Operations on processes; Inter-process communication. Multi-Threaded Programming: Overview; Multithreading models; Thread Libraries; Threading issues. Process Scheduling: Basic concepts; Scheduling criteria; Scheduling algorithms; Multiple-Processor scheduling; Thread scheduling.

UNIT – 3   **7 Hours**
Process Synchronization : Synchronization: The Critical section problem; Peterson's solution; Synchronization hardware; Semaphores; Classical problems of synchronization; Monitors.

UNIT – 4   **6 Hours**
Deadlocks: Deadlocks: System model; Deadlock characterization; Methods for handling deadlocks; Deadlock prevention; Deadlock avoidance; Deadlock detection and recovery from deadlock.

UNIT – 5   **7 Hours**
Memory Management: Memory Management Strategies: Background; Swapping; Contiguous memory allocation; Paging; Structure of page table; Segmentation. Virtual Memory Management: Background; Demand paging; Copy-on-write; Page replacement; Allocation of frames; Thrashing.

UNIT – 6   **7 Hours**
File System, Implementation of File System: File System: File concept; Access methods; Directory structure; File system mounting; File sharing; Protection. Implementing File System: File system structure; File system implementation; Directory implementation; Allocation methods; Free space management

UNIT – 7   **6 Hours**
Secondary Storage Structures, Protection : Mass storage structures; Disk structure; Disk attachment; Disk scheduling; Disk management; Swap space management. Protection: Goals of protection, Principles of protection, Domain of protection, Access matrix, Implementation of access matrix, Access control, Revocation of access rights, Capability-Based systems.

UNIT – 8   **6 Hours**
Case Study: The Linux Operating System: Linux history; Design principles; Kernel modules; Process management; Scheduling; Memory management; File systems, Input and output; Inter-process communication.

Text Books:
1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne: Operating System Principles, 8th edition, Wiley India, 2009.
   (Chapters: 1, 2, 3.1 to 3.4 , 4.1 to 4.4, 5.1 to 5.5, 6.1 to 6.7, 7, 8.1 to 8.6, 9.1 to 9.6, 10, 11.1 to 11.5, 12.1 to 12.6, 17.1 to 17.8, 21.1 to 21.9)

Reference Books:
1. D.M Dhamdhere: Operating systems - A concept based Approach, 2nd Edition, Tata McGraw- Hill, 2002.
2. P.C.P. Bhatt: Introduction to Operating Systems: Concepts and Practice, 2nd Edition, PHI, 2008.
3. Harvey M Deital: Operating systems, 3rd Edition, Pearson Education, 1990.

DATABASE MANAGEMENT SYSTEMS

Subject Code: 10CS54   I.A. Marks : 25
Hours/Week : 04   Exam Hours: 03
Total Hours : 52   Exam Marks: 100

PART - A

UNIT – 1   6 Hours

Introduction: Introduction; An example; Characteristics of Database approach; Actors on the screen; Workers behind the scene; Advantages of using DBMS approach; A brief history of database applications; when not to use a DBMS.

Data models, schemas and instances; Three-schema architecture and data independence; Database languages and interfaces; The database system environment; Centralized and client-server architectures; Classification of Database Management systems.

UNIT – 2   6 Hours

Entity-Relationship Model: Using High-Level Conceptual Data Models for Database Design; An Example Database Application; Entity Types, Entity Sets, Attributes and Keys; Relationship types, Relationship Sets, Roles and Structural Constraints; Weak Entity Types; Refining the ER Design; ER Diagrams, Naming Conventions and Design Issues; Relationship types of degree higher than two.

UNIT – 3   8 Hours

Relational Model and Relational Algebra : Relational Model Concepts; Relational Model Constraints and Relational Database Schemas; Update Operations, Transactions and dealing with constraint violations; Unary Relational Operations: SELECT and PROJECT; Relational Algebra Operations from Set Theory; Binary Relational Operations : JOIN and DIVISION; Additional Relational Operations; Examples of Queries in Relational Algebra; Relational Database Design Using ER- to-Relational Mapping.

UNIT – 4   6 Hours

SQL – 1: SQL Data Definition and Data Types; Specifying basic constraints in SQL; Schema change statements in SQL; Basic queries in SQL; More complex SQL Queries.

UNIT – 5 6 Hours

SQL – 2: Insert, Delete and Update statements in SQL; Specifying constraints as Assertion and Trigger; Views (Virtual Tables) in SQL; Additional features of SQL; Database programming issues and techniques; Embedded SQL, Dynamic SQL; Database stored procedures and SQL / PSM.

UNIT – 6 6 Hours

Database Design – 1: Informal Design Guidelines for Relation Schemas; Functional Dependencies; Normal Forms Based on Primary Keys; General Definitions of Second and Third Normal Forms; Boyce-Codd Normal Form

UNIT – 7 6 Hours

Database Design -2: Properties of Relational Decompositions; Algorithms for Relational Database Schema Design; Multivalued Dependencies and Fourth Normal Form; Join Dependencies and Fifth Normal Form; Inclusion Dependencies; Other Dependencies and Normal Forms

UNIT – 8 8 Hours

Transaction Management: The ACID Properties; Transactions and Schedules; Concurrent Execution of Transactions; Lock- Based Concurrency Control; Performance of locking; Transaction support in SQL; Introduction to crash recovery; 2PL, Serializability and Recoverability; Lock Management; Introduction to ARIES; The log; Other recovery-related structures; The write-ahead log protocol; Checkpointing; Recovering from a System Crash; Media Recovery; Other approaches and interaction with concurrency control.

Text Books:
1. Elmasri and Navathe: Fundamentals of Database Systems, 5th Edition, Pearson Education, 2007.
   (Chapters 1, 2, 3 except 3.8, 5, 6.1 to 6.5, 7.1, 8, 9.1, 9.2 except SQLJ, 9.4, 10)
2. Raghu Ramakrishnan and Johannes Gehrke: Database Management Systems, 3rd Edition, McGraw-Hill, 2003.
   (Chapters 16, 17.1, 17.2, 18)

Reference Books:
1. Silberschatz, Korth and Sudharshan: Data base System Concepts, 6th Edition, Mc-GrawHill, 2010.
2. C.J. Date, A. Kannan, S. Swamynatham: An Introduction to Database Systems, 8th Edition, Pearson Education, 2006.

COMPUTER NETWORKS - I

Subject Code: 10CS55   **I.A. Marks : 25**
Hours/Week : 04   **Exam Hours: 03**
Total Hours : 52   **Exam Marks: 100**

PART – A

UNIT - 1   **7 Hours**
Introduction: Data Communications, Networks, The Internet, Protocols & Standards, Layered Tasks,
The OSI model, Layers in OSI model, TCP/IP Protocol suite, Addressing

UNIT- 2   **7 Hours**
Physical Layer-1: Analog & Digital Signals, Transmission Impairment, Data Rate limits, Performance, Digital-digital conversion (Only Line coding: Polar, Bipolar and Manchester coding), Analog-to-digital conversion (only PCM), Transmission Modes, Digital-to-analog conversion

UNIT- 3   **6 Hours**
Physical Layer-2 and Switching: Multiplexing, Spread Spectrum, Introduction to switching, Circuit Switched Networks, Datagram Networks, Virtual Circuit Networks

UNIT- 4   **6 Hours**
Data Link Layer-1: Error Detection & Correction: Introduction, Block coding, Linear block codes, Cyclic codes, Checksum.

PART - B

UNIT- 5   **6 Hours**
Data Link Layer-2: Framing, Flow and Error Control, Protocols, Noiseless Channels, Noisy channels, HDLC, PPP (Framing, Transition phases only)

UNIT- 6   **7 Hours**
Multiple Access & Ethernet: Random access, Controlled Access, Channelization, Ethernet: IEEE standards, Standard
Ethernet, Changes in the standard, Fast Ethernet, Gigabit Ethernet

UNIT - 7   **6 Hours**
Wireless LANs and Cellular Networks: Introduction, IEEE 802.11, Bluetooth, Connecting devices, Cellular Telephony

UNIT - 8:   **7 Hours**

Network Layer: Introduction, Logical addressing, IPv4 addresses, IPv6 addresses, Internetworking basics,
IPv4, IPv6, Comparison of IPv4 and IPv6 Headers.

Text Books:
1. Behrouz A. Forouzan,: Data Communication and Networking, 4th Edition Tata McGraw-Hill, 2006.
(Chapters 1.1 to 1.4, 2.1 to 2.5, 3.1 To 3.6, 4.1 to 4.3, 5.1, 6.1, 6.2, 8.1 to 8.3, 10.1 to 10.5, 11.1 to 11.7, 12.1 to 12.3, 13.1 to 13.5, 14.1, 14.2, 15.1, 16.1, 19.1, 19.2, 20.1 to 20.3)

Reference Books:
1. Alberto Leon-Garcia and Indra Widjaja: Communication Networks - Fundamental Concepts and Key architectures, 2nd Edition Tata McGraw-Hill, 2004.
2. William Stallings: Data and Computer Communication, 8th Edition, Pearson Education, 2007.
3. Larry L. Peterson and Bruce S. Davie: Computer Networks – A Systems Approach, 4th Edition, Elsevier, 2007.
4. Nader F. Mir: Computer and Communication Networks, Pearson Education, 2007.

FORMAL LANGUAGES AND AUTOMATA THEORY

Subject Code: 10CS56	I.A. Marks : 25
Hours/Week : 04	Exam Hours: 03
Total Hours : 52	Exam Marks: 100

PART - A

UNIT – 1   **7 Hours**
Introduction to Finite Automata: Introduction to Finite Automata; The central concepts of Automata theory; Deterministic finite automata; Nondeterministic finite automata

UNIT – 2   **7 Hours**
Finite Automata, Regular Expressions: An application of finite automata; Finite automata with Epsilon-transitions; Regular expressions; Finite Automata and Regular Expressions; Applications of Regular Expressions

UNIT – 3   **6 Hours**
Regular Languages, Properties of Regular Languages: Regular
languages; Proving languages not to be regular languages; Closure properties
of regular languages; Decision properties of regular languages; Equivalence
and minimization of automata

UNIT – 4   **6 Hours**
Context-Free Grammars And Languages : Context –free grammars; Parse
trees; Applications; Ambiguity in grammars and Languages   .

PART – B

UNIT – 5   **7 Hours**
Pushdown Automata: Definition of the Pushdown automata; the languages
of a PDA; Equivalence of PDA's and CFG's; Deterministic Pushdown
Automata

UNIT – 6   **6 Hours**
Properties of Context-Free Languages: Normal forms for CFGs; The
pumping lemma for CFGs; Closure properties of CFLs

UNIT – 7   **7 Hours**
Introduction To Turing Machine: Problems that Computers cannot solve;
The turning machine; Programming techniques for Turning Machines;
Extensions to the basic Turning Machines; Turing Machine and Computers.

UNIT – 8   **6 Hours**
Undecidability: A Language that is not recursively enumerable; An
Undecidable problem that is RE; Post's Correspondence problem; Other
undecidable problems.

Text Books:
1. John E. Hopcroft, Rajeev Motwani, Jeffrey D.Ullman: Introduction
   to Automata Theory, Languages and Computation, 3rd Edition,
   Pearson Education, 2007.
   (Chapters: 1.1, 1.5, 2.2 to 2.5, 3.1 to 3.3, 4, 5, 6, 7, 8.1 to
   8.4, 8.6, 9.1, 9.2, 9.4.1, 9.5)

Reference Books:
1. K.L.P. Mishra: Theory of Computer Science, Automata, Languages,
   and Computation, 3rd Edition, PHI, 2007.
2. Raymond Greenlaw, H.James Hoover: Fundamentals of the Theory
   of Computation, Principles and Practice, Morgan Kaufmann, 1998.

3. John C Martin: Introduction to Languages and Automata Theory, 3rd Edition, Tata McGraw-Hill, 2007.
4. Thomas A. Sudkamp: An Introduction to the Theory of Computer Science, Languages and Machines, 3rd Edition, Pearson Education, 2006.

DATABASE APPLICATIONS LABORATORY

Subject Code: 10CSL57   **I.A. Marks   : 25**
Hours/Week : 03   **Exam Hours: 03**
Total Hours : 42   **Exam Marks: 50**

1. Consider the following relations:
    Student (*snum:* integer, *sname:* string, *major:* string, *level:* string, *age:* integer)
    Class (*name:* string, *meets at:* string, *room:* string, *d:* integer)
    Enrolled (*snum:* integer, *cname:* string)
    Faculty (fi*d*: integer, *fname:* string, *deptid:* integer)
    The meaning of these relations is straightforward; for example, Enrolled has one record per student-class pair such that the student is enrolled in the class. Level is a two character code with 4 different values (example: Junior: JR etc)
    Write the following queries in SQL. No duplicates should be printed in any of the answers.

    i.   Find the names of all Juniors (level = JR) who are enrolled in a class taught by Prof. Harshith
    ii. Find the names of all classes that either meet in room R128 or have five or more Students enrolled.
    iii. Find the names of all students who are enrolled in two classes that meet at the same time.
    iv. Find the names of faculty members who teach in every room in which some class is taught.
    v.   Find the names of faculty members for whom the combined enrollment of the courses that they teach is less than five.

2. The following relations keep track of airline flight information:
    Flights (*no:* integer, *from:* string, *to:* string, *distance:* integer, *Departs:* time, *arrives:* time, *price:* real)
    Aircraft (*aid:* integer, *aname:* string, *cruisingrange:* integer)
    Certified (*eid:* integer, *aid:* integer)
    Employees (*eid:* integer, *ename:* string, *salary:* integer)
    Note that the Employees relation describes pilots and other kinds of employees as well;   Every pilot is certified for some aircraft, and only pilots are certified to fly.

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Write each of the following queries in SQL.

    i.   Find the names of aircraft such that all pilots certified to operate them have salaries more than Rs.80, 000.

    ii.   For each pilot who is certified for more than three aircrafts, find the *eid* and the maximum *cruisingrange* of the aircraft for which she or he is certified.

    iii.   Find the names of pilots whose *salary* is less than the price of the cheapest route from Bengaluru to Frankfurt.

    iv.   For all aircraft with *cruisingrange* over 1000 Kms, .find the name of the aircraft and the average salary of all pilots certified for this aircraft.

    v.   Find the names of pilots certified for some Boeing aircraft.

    vi.   Find the *aid*s of all aircraft that can be used on routes from Bengaluru to New Delhi.

3. Consider the following database of student enrollment in courses & books adopted for each course.
   STUDENT (regno: string, name: string, major: string, bdate:date)
   COURSE (course #:int, cname:string, dept:string)
   ENROLL (regno:string, course#:int, sem:int, marks:int)
   BOOK _ ADOPTION (course# :int, sem:int, book-ISBN:int)
   TEXT (book-ISBN:int, book-title:string, publisher:string, author:string)

       i.   Create the above tables by properly specifying the primary keys and the foreign keys.

       ii.   Enter at least five tuples for each relation.

       iii.   Demonstrate how you add a new text book to the database and make this book be adopted by some department.

       iv.   Produce a list of text books (include Course #, Book-ISBN, Book-title) in the alphabetical order for courses offered by the 'CS' department that use more than two books.

       v.   List any department that has *all* its adopted books published by a specific publisher.

       vi.   Generate suitable reports.

       vii.   Create suitable front end for querying and displaying the results.

4. The following tables are maintained by a book dealer.
   AUTHOR (author-id:int, name:string, city:string, country:string)
   PUBLISHER (publisher-id:int, name:string, city:string, country:string)
   CATALOG (book-id:int, title:string, author-id:int, publisher-id:int, category-id:int, year:int, price:int)
   CATEGORY (category-id:int, description:string)

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ORDER-DETAILS (<u>order-no</u>:int, <u>book-id</u>:int, quantity:int)

     i.   Create the above tables by properly specifying the primary keys and the foreign keys.

    ii.   Enter at least five tuples for each relation.

   iii.   Give the details of the authors who have 2 or more books in the catalog and the price of the books is greater than the average price of the books in the catalog and the year of publication is after 2000.

   iv.   Find the author of the book which has maximum sales.

    v.   Demonstrate how you increase the price of books published by a specific publisher by 10%.

   vi.   Generate suitable reports.

   vii.   Create suitable front end for querying and displaying the results.

5.   Consider the following database for a banking enterprise

BRANCH(<u>branch-name</u>:string, branch-city:string, assets:real)
ACCOUNT(<u>accno</u>:int, branch-name:string, balance:real)
DEPOSITOR(<u>customer-name</u>:string, <u>accno</u>:int)
CUSTOMER(<u>customer-name</u>:string, customer-street:string, customer-city:string)
LOAN(<u>loan-number</u>:int, branch-name:string, amount:real)
BORROWER(<u>customer-name</u>:string, <u>loan-number</u>:int)

     i.   Create the above tables by properly specifying the primary keys and the foreign keys

    ii.   Enter at least five tuples for each relation

   iii.   Find all the customers who have at least two accounts at the *Main* branch.

   iv.   Find all the customers who have an account at *all* the branches located in a specific city.

    v.   Demonstrate how you delete all account tuples at every branch located in a specific city.

   vi.   Generate suitable reports.

   vii.   Create suitable front end for querying and displaying the results.

Instructions:

1.   The exercises are to be solved in an RDBMS environment like Oracle or DB2.

2.   Suitable tuples have to be entered so that queries are executed correctly.

3.   Front end may be created using either VB or VAJ or any other similar tool.

4.   The student need not create the front end in the examination. The results of the queries may be displayed directly.

5. Relevant queries other than the ones listed along with the exercises may also be asked in the examination.
6. Questions must be asked based on lots.

**SYSTEM SOFTWARE & OPERATING SYSTEMS
LABORATORY**

Subject Code: 10CSL58	I.A. Marks : 25
Hours/Week : 03	Exam Hours: 03
Total Hours : 42	Exam Marks: 50

PART - A

LEX and YACC Programs:
   Design, develop, and execute the following programs using LEX:

1. a) Program to count the number of characters, words, spaces and lines in a given input file.
   b) Program to count the numbers of comment lines in a given C program. Also eliminate them and copy the resulting program into separate file.

2. a) Program to recognize a valid arithmetic expression and to recognize the identifiers and operators present. Print them separately.
   b) Program to recognize whether a given sentence is simple or compound.

3. Program to recognize and count the number of identifiers in a given input file.

   Design, develop, and execute the following programs using YACC:

4. a) Program to recognize a valid arithmetic expression that uses operators +, -, * and /.
   b) Program to recognize a valid variable, which starts with a letter, followed by any number of letters or digits.

5. a) Program to evaluate an arithmetic expression involving operators +, -, * and /.
   b) Program to recognize strings 'aaab', 'abbb', 'ab' and 'a' using the grammar ($a^n b^n$, n>= 0).

6. Program to recognize the grammar ($a^n b$, n>= 10).

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UNIX Programming:

Design, develop, and execute the following programs:

7. a) Non-recursive shell script that accepts any number of arguments and prints them in the Reverse order, (For example, if the script is named rargs, then executing rargs A B C should produce C B A on the standard output).

    b) C program that creates a child process to read commands from the standard input and execute them (a minimal implementation of a shell – like program). You can assume that no arguments will be passed to the commands to be executed.

8. a) Shell script that accepts two file names as arguments, checks if the permissions for these files are identical and if the permissions are identical, outputs the common permissions, otherwise outputs each file name followed by its permissions.

    b) C program to create a file with 16 bytes of arbitrary data from the beginning and another 16 bytes of arbitrary data from an offset of 48. Display the file contents to demonstrate how the hole in file is handled.

9. a) Shell script that accepts file names specified as arguments and creates a shell script that contains this file as well as the code to recreate these files. Thus if the script generated by your script is executed, it would recreate the original files(This is same as the "bundle" script described by Brain W. Kernighan and Rob Pike in " The Unix Programming Environment", Prentice – Hall India).

    b) C program to do the following: Using fork( ) create a child process. The child process prints its own process-id and id of its parent and then exits. The parent process waits for its child to finish (by executing the wait( )) and prints its own process-id and the id of its child process and then exits.

Operating Systems:

10. Design, develop and execute a program in C / C++ to simulate the working of Shortest Remaining Time and Round-Robin Scheduling Algorithms. Experiment with different quantum sizes for the Round-Robin algorithm. In all cases, determine the average turn-around time. The input can be read from key board or from a file.

11. Using OpenMP, Design, develop and run a multi-threaded program to generate and print Fibonacci Series. One thread has to generate

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the numbers up to the specified limit and another thread has to print them. Ensure proper synchronization.
12. Design, develop and run a program to implement the Banker's Algorithm. Demonstrate its working with different data values.

Instructions:
In the examination, a combination of one LEX and one YACC problem has to be asked from Part A for a total of 30 marks and one programming exercise from Part B has to be asked for a total of 20 marks.

VI SEMESTER

MANAGEMENT AND ENTREPRENEURSHIP
(Common to All Branches)

Subject Code: 10AL61	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

UNIX SYSTEM PROGRAMMING

Subject Code: 10CS62	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART - A
UNIT – 1   **6 Hours**
Introduction: UNIX and ANSI Standards: The ANSI C Standard, The ANSI/ISO C++ Standards, Difference between ANSI C and C++, The POSIX Standards, The POSIX.1 FIPS Standard, The X/Open Standards.
UNIX and POSIX APIs: The POSIX APIs, The UNIX and POSIX Development Environment, API Common Characteristics.

UNIT – 2   **6 Hours**
UNIX Files: File Types, The UNIX and POSIX File System, The UNIX and POSIX File Attributes, Inodes in UNIX System V, Application Program Interface to Files, UNIX Kernel Support for Files, Relationship of C Stream Pointers and File Descriptors, Directory Files, Hard and Symbolic Links.

UNIT – 3   **7 Hours**
UNIX File APIs: General File APIs, File and Record Locking, Directory File APIs, Device File APIs, FIFO File APIs, Symbolic Link File APIs, General File Class, regfile Class for Regular Files, dirfile Class for Directory Files, FIFO File Class, Device File Class, Symbolic Link File Class, File Listing Program.

UNIT – 4   **7 Hours**
UNIX Processes: The Environment of a UNIX Process: Introduction, main function, Process Termination, Command-Line Arguments, Environment List, Memory Layout of a C Program, Shared Libraries, Memory Allocation, Environment Variables, setjmp and longjmp Functions, getrlimit, setrlimit Functions, UNIX Kernel Support for Processes.

PART - B

UNIT – 5   **7 Hours**
Process Control : Introduction, Process Identifiers, fork, vfork, exit, wait, waitpid, wait3, wait4 Functions, Race Conditions, exec Functions, Changing User IDs and Group IDs, Interpreter Files, system Function, Process Accounting, User Identification, Process Times, I/O Redirection.
Process Relationships: Introduction, Terminal Logins, Network Logins, Process Groups, Sessions, Controlling Terminal, tcgetpgrp and tcsetpgrp Functions, Job Control, Shell Execution of Programs, Orphaned Process Groups.

UNIT – 6   **7 Hours**
Signals and Daemon Processes: Signals: The UNIX Kernel Support for Signals, signal, Signal Mask, sigaction, The SIGCHLD Signal and the waitpid Function, The sigsetjmp and siglongjmp Functions, Kill, Alarm, Interval Timers, POSIX.lb Timers.
Daemon Processes: Introduction, Daemon Characteristics, Coding Rules, Error Logging, Client-Server Model.

UNIT – 7   **6 Hours**
Interprocess Communication – 1: Overview of IPC Methods, Pipes, popen, pclose Functions, Coprocesses, FIFOs, System V IPC, Message Queues, Semaphores.

UNIT – 8   **6 Hours**
Interprocess Communication – 2: Shared Memory, Client-Server Properties, Stream Pipes, Passing File Descriptors, An Open Server-Version 1, Client-Server Connection Functions.

Text Books:
1. Terrence Chan: UNIX System Programming Using C++, Prentice Hall India, 1999.
(Chapters 1, 5, 6, 7, 8, 9, 10)
2. W. Richard Stevens: Advanced Programming in the UNIX Environment, 2nd Edition, Pearson Education, 2005.
(Chapters 7, 8, 9, 13, 14, 15)

Reference Books:
1. Marc J. Rochkind: Advanced UNIX Programming, 2nd Edition, Pearson Education, 2005.
2. Maurice J Bach: The Design of the UNIX Operating System, Pearson Education, 1987.
3. Uresh Vahalia: UNIX Internals: The New Frontiers, Pearson Education, 2001.

FILE STRUCTURES

Subject Code: 10IS63	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART – A

UNIT – 1 7 Hours

Introduction: File Structures: The Heart of the file structure Design, A Short History of File Structure Design, A Conceptual Toolkit; Fundamental File Operations: Physical Files and Logical Files, Opening Files, Closing Files, Reading and Writing, Seeking, Special Characters, The Unix Directory Structure, Physical devices and Logical Files, File-related Header Files, UNIX file System Commands; Secondary Storage and System Software: Disks, Magnetic Tape, Disk versus Tape; CD-ROM: Introduction, Physical Organization, Strengths and Weaknesses; Storage as Hierarchy, A journey of a Byte, Buffer Management, Input /Output in UNIX.

UNIT – 2 6 Hours

Fundamental File Structure Concepts, Managing Files of Records :
Field and Record Organization, Using Classes to Manipulate Buffers, Using Inheritance for Record Buffer Classes, Managing Fixed Length, Fixed Field Buffers, An Object-Oriented Class for Record Files, Record Access, More about Record Structures, Encapsulating Record Operations in a Single Class, File Access and File Organization.

UNIT – 3   **7 Hours**
Organization of Files for Performance, Indexing: Data Compression, Reclaiming Space in files, Internal Sorting and Binary Searching, Keysorting; What is an Index? A Simple Index for Entry-Sequenced File, Using Template Classes in C++ for Object I/O, Object-Oriented support for Indexed, Entry-Sequenced Files of Data Objects, Indexes that are too large to hold in Memory, Indexing to provide access by Multiple keys, Retrieval Using Combinations of Secondary Keys, Improving the Secondary Index structure: Inverted Lists, Selective indexes, Binding.

UNIT – 4   **6 Hours**
Cosequential Processing and the Sorting of Large Files: A Model for Implementing Cosequential Processes, Application of the Model to a General Ledger Program, Extension of the Model to include Mutiway Merging, A Second Look at Sorting in Memory, Merging as a Way of Sorting Large Files on Disk.

PART - B

UNIT – 5   **7 Hours**
Multi-Level Indexing and B-Trees: The invention of B-Tree, Statement of the problem, Indexing with Binary Search Trees; Multi-Level Indexing, B-Trees, Example of Creating a B-Tree, An Object-Oriented Representation of B-Trees, B-Tree Methods; Nomenclature, Formal Definition of B-Tree Properties, Worst-case Search Depth, Deletion, Merging and Redistribution, Redistribution during insertion; B* Trees, Buffering of pages; Virtual B-Trees; Variable-length Records and keys.

UNIT – 6   **6 Hours**
Indexed Sequential File Access and Prefix B + Trees: Indexed Sequential Access, Maintaining a Sequence Set, Adding a Simple Index to the Sequence Set, The Content of the Index: Separators Instead of Keys, The Simple Prefix B+ Tree and its maintenance, Index Set Block Size, Internal Structure of Index Set Blocks: A Variable-order B- Tree, Loading a Simple Prefix B+ Trees, B-Trees, B+ Trees and Simple Prefix B+ Trees in Perspective.

UNIT – 7   **7 Hours**
Hashing: Introduction, A Simple Hashing Algorithm, Hashing Functions and Record Distribution, How much Extra Memory should be used?, Collision resolution by progressive overflow, Buckets, Making deletions, Other collision resolution techniques, Patterns of record access.

UNIT – 8   **6 Hours**
Extendible Hashing: How Extendible Hashing Works, Implementation, Deletion, Extendible Hashing Performance, Alternative Approaches.

Text Books:
1. Michael J. Folk, Bill Zoellick, Greg Riccardi: File Structures-An Object Oriented Approach with C++, 3rd Edition, Pearson Education, 1998.
   (Chapters 1 to 12 excluding 1.4, 1.5, 5.5, 5.6, 8.6, 8.7, 8.8)

Reference Books:
1. K.R. Venugopal, K.G. Srinivas, P.M. Krishnaraj: File Structures Using C++, Tata McGraw-Hill, 2008.
2. Scot Robert Ladd: C++ Components and Algorithms, BPB Publications, 1993.
3. Raghu Ramakrishan and Johannes Gehrke: Database Management Systems, 3rd Edition, McGraw Hill, 2003.

COMPUTER NETWORKS - II

Subject Code: 10CS64	I.A. Marks : 25
Hours/Week : 04	Exam Hours: 03
Total Hours : 52	Exam Marks: 100

PART - A

UNIT - 1   **6 Hours**
Packet Switching Networks - 1: Network services and internal network operation, Packet network topology, Routing in Packet networks, Shortest path routing: Bellman-Ford algorithm.

UNIT – 2   **6 Hours**
Packet Switching Networks – 2: Shortest path routing (continued), Traffic management at the Packet level, Traffic management at Flow level, Traffic management at flow aggregate level.

UNIT – 3   **6 Hours**
 TCP/IP-1: TCP/IP architecture, The Internet Protocol, IPv6, UDP.

UNIT – 4   **8 Hours**
TCP/IP-2: TCP, Internet Routing Protocols, Multicast Routing, DHCP, NAT and Mobile IP.

UNIT - 5   **7 Hours**

Applications, Network Management, Network Security: Application layer overview, Domain Name System (DNS), Remote Login Protocols, E-mail, File Transfer and FTP, World Wide Web and HTTP, Network management, Overview of network security, Overview of security methods, Secret-key encryption protocols, Public-key encryption protocols, Authentication, Authentication and digital signature, Firewalls.

UNIT – 6   **6 Hours**

QoS, VPNs, Tunneling, Overlay Networks: Overview of QoS, Integrated Services QoS, Differentiated services QoS, Virtual Private Networks, MPLS, Overlay networks.

UNIT - 7   **7 Hours**

Multimedia Networking: Overview of data compression, Digital voice and compression, JPEG, MPEG, Limits of compression with loss, Compression methods without loss, Overview of IP Telephony, VoIP signaling protocols, Real-Time Media Transport Protocols, Stream control Transmission Protocol (SCTP)

UNIT – 8   **6 Hours**

Mobile AdHoc Networks and Wireless Sensor Neworks: Overview of Wireless Ad-Hoc networks, Routing in AdHOc Networks, Routing protocols for and Security of AdHoc networks, Sensor Networks and protocol structures, Communication Energy model, Clustering protocols, Routing protocols, ZigBee technology and 802.15.4.

Text Books:
1. Communication Networks – Fundamental Concepts & key architectures, Alberto Leon Garcia & Indra Widjaja, 2nd Edition, Tata McGraw-Hill, India
   (7 - excluding 7.6, 8)
2. Computer & Communication Networks, Nadir F Mir, Pearson Education, India
   (9, 10 excluding 10.7, 12.1 to 12.3, 16, 17.1 to 17.6, 18.1 to18.3, 18.5, 19, 20)

Reference Books:
1. Behrouz A. Forouzan: Data Communications and Networking, 4th Edition, Tata McGraw-Hill, 2006.
2. William Stallings: Data and Computer Communication, 8th Edition, Pearson Education, 2007.
3. Larry L Peterson and Bruce S Davie: Computer Networks – A Systems Approach, 4th Edition, Elsevier, 2007.
4. Wayne Tomasi: Introduction to Data Communications and Networking, Pearson Education, 2005.

SOFTWARE TESTING

Subject Code: 10IS65	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART – A

UNIT 1   **6 Hours**
A Perspective on Testing, Examples: Basic definitions, Test cases, Insights from a Venn diagram, Identifying test cases, Error and fault taxonomies, Levels of testing. Examples: Generalized pseudocode, The triangle problem, The NextDate function, The commission problem, The SATM (Simple Automatic Teller Machine) problem, The currency converter, Saturn windshield wiper.

UNIT 2   **7 Hours**
Boundary Value Testing, Equivalence Class Testing, Decision Table-Based Testing: Boundary value analysis, Robustness testing, Worst-case testing, Special value testing, Examples, Random testing, Equivalence classes, Equivalence test cases for the triangle problem, NextDate function, and the commission problem, Guidelines and observations. Decision tables, Test cases for the triangle problem, NextDate function, and the commission problem, Guidelines and observations.

UNIT 3   **7 Hours**
Path Testing, Data Flow Testing: DD paths, Test coverage metrics, Basis path testing, guidelines and observations. Definition-Use testing, Slice-based testing, Guidelines and observations.

UNIT 4   **6 Hours**
Levels of Testing, Integration Testing: Traditional view of testing levels, Alternative life-cycle models, The SATM system, Separating integration and

system testing. A closer look at the SATM system, Decomposition-based, call graph-based, Path-based integrations

PART – B

UNIT 5   7 Hours
System Testing, Interaction Testing: Threads, Basic concepts for requirements specification, Finding threads, Structural strategies and functional strategies for thread testing, SATM test threads, System testing guidelines, ASF (Atomic System Functions) testing example. Context of interaction, A taxonomy of interactions, Interaction, composition, and determinism, Client/Server Testing,.

UNIT 6   7 Hours
Process Framework: Validation and verification, Degrees of freedom, Varieties of software. Basic principles: Sensitivity, redundancy, restriction, partition, visibility, Feedback. The quality process, Planning and monitoring, Quality goals, Dependability properties, Analysis, Testing, Improving the process, Organizational factors.

UNIT 7   6 Hours
Fault-Based Testing, Test Execution: Overview, Assumptions in fault-based testing, Mutation analysis, Fault-based adequacy criteria, Variations on mutation analysis. Test Execution: Overview, from test case specifications to test cases, Scaffolding, Generic versus specific scaffolding, Test oracles, Self-checks as oracles, Capture and replay.

UNIT 8   6 Hours
Planning and Monitoring the Process, Documenting Analysis and Test: Quality and process, Test and analysis strategies and plans, Risk planning, Monitoring the process, Improving the process, The quality team, Organizing documents, Test strategy document, Analysis and test plan, Test design specifications documents, Test and analysis reports.

TEXT BOOKS:
1. Paul C. Jorgensen: Software Testing, A Craftsman's Approach, 3rd Edition, Auerbach Publications, 2008.
   (Listed topics only from Chapters 1, 2, 5, 6, 7, 9, 10, 12, 1314, 15)
2. Mauro Pezze, Michal Young: Software Testing and Analysis – Process, Principles and Techniques, Wiley India, 2008.
   (Listed topics only from Chapters 2, 3, 4, 16, 17, 20, 24)

REFERENCE BOOKS:
1. Aditya P Mathur**:** Foundations of Software Testing, Pearson Education, 2008.
2. Srinivasan Desikan, Gopalaswamy Ramesh: Software testing Principles and Practices, 2nd Edition, Pearson Education, 2007.
3. Brian Marrick: The Craft of Software Testing, Pearson Education, 1995.

OPERATIONS RESEARCH

Subject Code: 10IS661	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART - A

UNIT – 1   **6 Hours**
Introduction, Linear Programming – 1: Introduction: The origin, nature and impact of OR; Defining the problem and gathering data; Formulating a mathematical model; Deriving solutions from the model; Testing the model; Preparing to apply the model; Implementation .
Introduction to Linear Programming: Prototype example; The linear programming (LP) model.

UNIT – 2   **7 Hours**
LP – 2, Simplex Method – 1: Assumptions of LP; Additional examples.
The essence of the simplex method; Setting up the simplex method; Algebra of the simplex method; the simplex method in tabular form; Tie breaking in the simplex method

UNIT – 3   **6 Hours**
Simplex Method – 2: Adapting to other model forms; Post optimality analysis; Computer implementation
Foundation of the simplex method.

UNIT – 4   **7 Hours**
Simplex Method – 2, Duality Theory: The revised simplex method, a fundamental insight.
The essence of duality theory; Economic interpretation of duality, Primal dual relationship; Adapting to other primal forms

PART - B

UNIT – 5   **7 Hours**
Duality Theory and Sensitivity Analysis, Other Algorithms for LP : The role of duality in sensitive analysis; The essence of sensitivity analysis; Applying sensitivity analysis. The dual simplex method; Parametric linear programming; The upper bound technique.

UNIT – 6   **7 Hours**
Transportation and Assignment Problems: The transportation problem; A streamlined simplex method for the transportation problem; The assignment problem; A special algorithm for the assignment problem.

UNIT – 7   **6 Hours**
Game Theory, Decision Analysis: Game Theory: The formulation of two persons, zero sum games; Solving simple games- a prototype example; Games with mixed strategies; Graphical solution procedure; Solving by linear programming, Extensions.
Decision Analysis: A prototype example; Decision making without experimentation; Decision making with experimentation; Decision trees.

UNIT – 8   **6 Hours**
Metaheuristics: The nature of Metaheuristics, Tabu Search, Simulated Annealing, Genetic Algorithms.

Text Books:
1. Frederick S. Hillier and Gerald J. Lieberman: Introduction to Operations Research: Concepts and Cases, 8th Edition, Tata McGraw Hill, 2005.
   (Chapters: 1, 2, 3.1 to 3.4, 4.1 to 4.8, 5, 6.1 to 6.7, 7.1 to 7.3, 8, 13, 14, 15.1 to 15.4)

Reference Books:
1. Wayne L. Winston: Operations Research Applications and Algorithms, 4th Edition, Cengage Learning, 2003.
2. Hamdy A Taha: Operations Research: An Introduction, 8th Edition, Pearson Education, 2007.

COMPILER DESIGN

Subject Code: 10IS662	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART – A

UNIT – 1   **8 Hours**
Introduction, Lexical analysis: Language processors; The structure of a Compiler; The evolution pf programming languages; The science of building a Compiler; Applications of compiler technology; Programming language basics.
Lexical analysis: The Role of Lexical Analyzer; Input Buffering; Specifications of Tokens; Recognition of Tokens.

UNIT – 2   **6 Hours**
Syntax Analysis – 1: Introduction; Context-free Grammars; Writing a Grammar. Top-down Parsing; Bottom-up Parsing.

UNIT – 3   **6 Hours**
Syntax Analysis – 2: Top-down Parsing; Bottom-up Parsing.

UNIT – 4   **6 Hours**
Syntax Analysis – 3: Introduction to LR Parsing: Simple LR; More powerful LR parsers (excluding Efficient construction and compaction of parsing tables) ; Using ambiguous grammars; Parser Generators.

PART – B

UNIT – 5   **7 Hours**
Syntax-Directed Translation: Syntax-directed definitions; Evaluation orders for SDDs; Applications of syntax-directed translation; Syntax-directed translation schemes.

UNIT – 6   **6 Hours**
Intermediate Code Generation: Variants of syntax trees; Three-address code; Translation of expressions; Control flow; Back patching; Switch-statements; Procedure calls.

UNIT – 7   **6 Hours**
Run-Time Environments: Storage Organization; Stack allocation of space; Access to non-local data on the stack; Heap management; Introduction to garbage collection.

UNIT – 8   **7 Hours**
Code Generation: Issues in the design of Code Generator; The Target Language; Addresses in the target code; Basic blocks and Flow graphs; Optimization of basic blocks; A Simple Code Generator

Text Books:
1. Alfred V Aho, Monica S.Lam, Ravi Sethi, Jeffrey D Ullman: Compilers- Principles, Techniques and Tools, 2nd Edition, Pearson Education, 2007.
   (Chapters 1, 3.1 to 3.4, 4 excluding 4.7.5 and 4.7.6, 5.1 to 5.4, 6.1, 6.2, 6.4, 6.6, 6.7 to 6.9, 7.1 to 7.5, 8.1 to 8.6.)

Reference Books:
1. Charles N. Fischer, Richard J. leBlanc, Jr.: Crafting a Compiler with C, Pearson Education, 1991.
2. Andrew W Apple: Modern Compiler Implementation in C, Cambridge University Press, 1997.
3. Kenneth C Louden: Compiler Construction Principles & Practice, Cengage Learning, 1997.

DATA COMPRESSION

Subject Code: 10IS663	**I.A. Marks : 25**	
Hours/Week : 04	**Exam Hours: 03**	
Total Hours : 52	**Exam Marks: 100**	

PART – A

UNIT –1   **7 Hours**
Introduction, Lossless Compression -1: Compression techniques; Modeling and coding.
Mathematical preliminaries for lossless compression: Overview; Basic concepts of Information Theory; Models; Coding; Algorithmic information theory; Minimum description length principle.
Huffman coding: Overview; The Huffman coding algorithm, Minimumvariance Huffman codes; Application of Huffman coding for text compression.

UNIT – 2   **6 Hours**
Lossless Compression – 2: Dictionary Techniques: Overview; Introduction; Static dictionary; Adaptive dictionary; Applications: UNIX compress, GIF, PNG, V.42.
Lossless image compression: Overview; Introduction; Basics; CALIC; JPEG-LS; Multiresoution approaches; Facsimile encoding: Run-length coding, T.4 and T.6.

UNIT – 3   **6 Hours**
Basics of Lossy Coding: Some mathematical concepts: Overview; Introduction; Distortion criteria; Models.
Scalar quantization: Overview; Introduction; The quantization problem; Uniform quantizer; Adaptive quantization.

UNIT – 4   **7 Hours**
Vector Quantization, Differential Encoding: Vector quantization: Overview; Introduction; Advantages of vector quantization over scalar quantization; The LBG algorithm.
Differential Encoding: Overview; Introduction; The basic algorithm; Prediction in DPCM; Adaptive DPCM; Delta modulation; Speech coding; Image coding.

PART - B

UNIT – 5   **7 Hours**
Some Mathematical Concepts, Transform coding: Some mathematical concepts: Linear systems; Sampling; Discrete Fourier transform; Z-transform.
Transform coding: Overview; introduction; The transform; Transforms of interest; Quantization and coding for transform coefficients; Application to image compression – JPEG; Application to audio compression – MDCT.

UNIT – 6   **6 Hours**
Subband Coding, Audio Coding: Subband Coding: Overview; introduction; Filters; The basic subband coding algorithm; Bit allocation; Application to speech coding – G.722; Application to audio coding – MPEG audio; Application to image compression.
Audio Coding: Overview; Introduction; MPEG audio coding; MPEG advanced audio coding; Dolby AC3; Other standards.

UNIT – 7   **6 Hours**
Wavelet-Based Compression: Overview; Introduction; Wavelets; Multiresolution and the scaling function; Implementation using Filters; Image compression; Embedded zerotree coder; Set partitioning in hierarchical trees; JPEG 2000.

UNIT – 8   **7 Hours**
Video Compression: Overview; Introduction; Motion compensation; Video signal representation; H.261; Model-based coding; Asymmetric applications; MPEG-1 and MPEG-2; H.263; H.264, MPEG-4 and advanced video coding; Packet video.

Text Books:
1. Khalid Sayood: Introduction to Data Compression, 3rd Edition, Elsevier, 2006.   (Chapters 1, 2 excluding 2.2.1 and 2.4.3, 3.1, 3.2, 3.2.1, 3.8.2, 5, 7.1 to 7.5, 7.6, 7.6.1, 7.6.2, 8.1 to 8.3, 8.6, 9.1 to 9.5, 10.1 to 10.4, 11, 12.6 to 12.9, 13, 14.1 to 14.4, 14.9 to 14.12, 15, 16, 18.1 to 18.13)

Reference Books:
1. D. Salomon: Data Compression: The Complete Reference, Springer, 1998.

PATTERN RECOGNITION

Subject Code: 10IS664	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART – A

UNIT – 1   **6 Hours**
Introduction: Machine perception, an example; Pattern Recognition System; The Design Cycle; Learning and Adaptation.

UNIT – 2   **7 Hours**
Bayesian Decision Theory: Introduction, Bayesian Decision Theory; Continuous Features, Minimum error rate, classification, classifiers, discriminant functions, and decision surfaces; The normal density; Discriminant functions for the normal density.

UNIT – 3   **7 Hours**
Maximum-likelihood and Bayesian Parameter Estimation: Introduction; Maximum-likelihood estimation; Bayesian Estimation; Bayesian parameter estimation: Gaussian Case, general theory; Hidden Markov Models.

UNIT – 4   **6 Hours**
Non-parametric Techniques: Introduction; Density Estimation; Parzen windows; k_n – Nearest- Neighbor Estimation; The Nearest- Neighbor Rule; Metrics and Nearest-Neighbor Classification.

PART – B

UNIT – 5   **7 Hours**
Linear Discriminant Functions: Introduction; Linear Discriminant Functions and Decision Surfaces; Generalized Linear Discriminant Functions; The Two-Category Linearly Separable case; Minimizing the Perception Criterion Functions; Relaxation Procedures; Non-separable Behavior; Minimum Squared-Error procedures; The Ho-Kashyap procedures.

UNIT – 6   **6 Hours**
Stochastic Methods: Introduction; Stochastic Search; Boltzmann Learning; Boltzmann Networks and Graphical Models; Evolutionary Methods.

UNIT – 7   **6 Hours**
Non-Metric Methods: Introduction; Decision Trees; CART; Other Tree Methods; Recognition with Strings; Grammatical Methods.

UNIT – 8   **7 Hours**
Unsupervised Learning and Clustering: Introduction; Mixture Densities and Identifiability; Maximum-Likelihood Estimates; Application to Normal Mixtures; Unsupervised Bayesian Learning; Data Description and Clustering; Criterion Functions for Clustering.

Text Books:
1. Richard O. Duda, Peter E. Hart, and David G.Stork: Pattern Classification, 2nd Edition, Wiley-Interscience, 2001.

Reference Books:
1. Earl Gose, Richard Johnsonbaugh, Steve Jost: Pattern Recognition and Image Analysis, PHI, Indian Reprint 2008.

COMPUTER GRAPHICS AND VISUALIZATION

Subject Code: 10IS665   I.A. Marks : 25
Hours/Week : 04   Exam Hours: 03
Total Hours : 52   Exam Marks: 100

PART - A

UNIT – 1   **7 Hours**
Introduction: Applications of computer graphics; A graphics system; Images: Physical and synthetic; Imaging Systems; The synthetic camera model; The programmer's interface; Graphics architectures; Programmable Pipelines; Performance Characteristics
Graphics Programming: The Sierpinski gasket; Programming Two Dimensional Applications.

UNIT – 2   **6 Hours**
The OpenGL: The OpenGL API; Primitives and attributes; Color; Viewing; Control functions; The Gasket program; Polygons and recursion; The three-dimensional gasket; Plotting Implicit Functions

UNIT – 3   **7 Hours**
Input and Interaction: Interaction; Input devices; Clients and Servers; Display Lists; Display Lists and Modeling; Programming Event Driven Input; Menus; Picking; A simple CAD program; Building Interactive Models; Animating Interactive Programs; Design of Interactive Programs; Logic Operations

UNIT – 4   **6 Hours**
Geometric Objects and Transformations-I: Scalars, Points, and Vectors; Three-dimensional Primitives; Coordinate Systems and Frames; Modeling a Colored Cube; Affine Transformations; Rotation, Translation and Scaling;

PART - B

UNIT – 5   **5 Hours**
Geometric Objects and Transformations-II: Geometric Objects and Transformations; Transformation in Homogeneous Coordinates; Concatenation of Transformations; OpenGL Transformation Matrices; Interfaces to three-dimensional applications; Quaternion's.

UNIT – 6   **7 Hours**
Viewing: Classical and computer viewing; Viewing with a Computer; Positioning of the camera; Simple projections; Projections in OpenGL; Hidden-

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surface removal; Interactive Mesh Displays; Parallel-projection matrices; Perspective-projection matrices; Projections and Shadows.

UNIT – 7   **6 Hours**
Lighting and Shading: Light and Matter; Light Sources; The Phong Lighting model; Computation of vectors; Polygonal Shading; Approximation of a sphere by recursive subdivisions; Light sources in OpenGL; Specification of materials in OpenGL; Shading of the sphere model; Global Illumination.

UNIT – 8   **8 Hours**
Implementation: Basic Implementation Strategies; Four major tasks; Clipping; Line-segment clipping; Polygon clipping; Clipping of other primitives; Clipping in three dimensions; Rasterization; Bresenham's algorithm; Polygon Rasterization; Hidden-surface removal; Antialiasing; Display considerations.

Text Books:
1. Edward Angel: Interactive Computer Graphics A Top-Down Approach with OpenGL, 5th Edition, Pearson Education, 2008. (Chapters 1 to 7)

Reference Books:
1. Donald Hearn and Pauline Baker: Computer Graphics- OpenGL Version, 3rd Edition, Pearson Education, 2004.
2. F.S. Hill Jr.: Computer Graphics Using OpenGL, 3rd Edition, PHI, 2009.
3. James D Foley, Andries Van Dam, Steven K Feiner, John F Hughes, Computer Graphics, Pearson Education 1997.

PROGRAMMING LANGUAGES

Subject Code: 10IS666	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART - A

UNIT – 1   **7 Hours**
Introduction; Names, Scopes, and Bindings: The art of language design; Programming language spectrum; Why study programming languages? Compilation and interpretation; Programming environments.
Names, scope, and bindings: The notion of binding time; Object lifetime and storage management; Scope rules; Implementing scope; The meaning of names within a scope; The binding of referencing environments; Macro expansion.

UNIT – 2   **7 Hours**
Control Flow: Expression evaluation; Structured and unstructured flow; Sequencing; Selection; Iteration; Recursion; Non-determinacy

UNIT – 3   **6 Hours**
Data Types: Type systems; Type checking; Records and variants; Arrays; Strings; Sets; Pointers and recursive types; Lists; Files and Input/Output; Equality testing and assignment.

UNIT – 4   **6 Hours**
Subroutines and Control Abstraction: Review of stack layout; Calling sequences; Parameter passing; Generic subroutines and modules; Exception handling; Coroutines; Events.

PART – B

UNIT – 5   **6 Hours**
Data Abstraction and Object Orientation: Object oriented programming; Encapsulation and Inheritance; Initialization and finalization; Dynamic method binding; Multiple inheritance; Object oriented programming revisited.

UNIT – 6   **7 Hours**
Functional Languages, and Logic Languages: Functional Languages: Origins; Concepts; A review/overview of scheme; Evaluation order revisited; Higher-order functions; Functional programming in perspective. Logic Languages: Concepts; Prolog; Logic programming in perspective.

UNIT – 7   **6 Hours**
Concurrency: Background and motivation; Concurrency programming fundamentals; Implementing synchronization; Language-level mechanisms; Message passing.

UNIT – 8   **7 Hours**
Run-Time Program Management: Virtual machines; Late binding of machine code; Inspection/introspection.
Text Books:
1. Michael L. Scott: Programming Language Pragmatics, 3rd Edition, Elsevier, 2009.
   (Chapters 1.1 to 1.5, 3.1 to 3.7, 6 excluding the sections on CD, 7 excluding the ML type system, 8, 9, 10 excluding the sections on CD, 11 excluding the sections on CD, 12, 15. Note: Text Boxes titled Design & Implementation are excluded)

Reference Books:
1. Ravi Sethi: Programming languages Concepts and Constructs, 2nd Edition, Pearson Education, 1996.
2. R Sebesta: Concepts of Programming Languages, 8th Edition, Pearson Education, 2008.
3. Allen Tucker, Robert Nonan: Programming Languages, Principles and Paradigms, 2nd Edition, Tata McGraw-Hill, 2007.

FILE STRUCTURES LABORATORY

Subject Code: 10ISL67   **I.A. Marks   : 25**
Hours/Week : 03   **Exam Hours: 03**
Total Hours : 42   **Exam Marks: 50**

PART - A

Design, develop, and implement the following programs

1. Write a C++ program to read series of names, one per line, from standard input and write these names spelled in reverse order to the standard output using I/O redirection and pipes. Repeat the exercise using an input file specified by the user instead of the standard input and using an output file specified by the user instead of the standard output.

2. Write a C++ program to read and write student objects with fixed-length records and the fields delimited by "|". Implement pack ( ), unpack ( ), modify ( ) and search ( ) methods.

3. Write a C++ program to read and write student objects with Variable - Length records using any suitable record structure. Implement pack ( ), unpack ( ), modify ( ) and search ( ) methods.

4. Write a C++ program to write student objects with Variable - Length records using any suitable record structure and to read from this file a student record using RRN.

5. Write a C++ program to implement simple index on primary key for a file of student objects. Implement add ( ), search ( ), delete ( ) using the index.

6. Write a C++ program to implement index on secondary key, the name, for a file of student objects. Implement add ( ), search ( ), delete ( ) using the secondary index.

7. Write a C++ program to read two lists of names and then match the names in the two lists using Cosequential Match based on a single loop. Output the names common to both the lists.

8. Write a C++ program to read k Lists of names and merge them using k-way merge algorithm with k = 8.

9. Write a C++ program to implement B-Tree for a given set of integers and its operations insert ( ) and search ( ). Display the tree.

10. Write a C++ program to implement B+ tree for a given set of integers and its operations insert ( ), and search ( ). Display the tree.

11. Write a C++ program to store and retrieve student data from file using hashing. Use any collision resolution technique.

12. Write a C++ program to reclaim the free space resulting from the deletion of records using linked lists.

Note: In the examination *each* student picks one question from the lot of *all* 12 questions.

SOFTWARE TESTING LABORATORY

Subject Code: 10ISL68   **I.A. Marks   : 25**
Hours/Week : 03   **Exam Hours: 03**
Total Hours : 42   **Exam Marks: 50**

1. Design and develop a program in a language of your choice to solve the triangle problem defined as follows: Accept three integers which are supposed to be the three sides of a triangle and determine if the three values represent an equilateral triangle, isosceles triangle, scalene triangle, or they do not form a triangle at all. Derive test cases for your program based on decision-table approach, execute the test cases and discuss the results.

2. Design and develop a program in a language of your choice to solve the triangle problem defined as follows: Accept three integers which are supposed to be the three sides of a triangle and determine if the three values represent an equilateral triangle, isosceles triangle, scalene triangle, or they do not form a triangle at all. Assume that the upper limit for the size of any side is 10. Derive test cases for your program based on boundary-value analysis, execute the test cases and discuss the results.

3. Design and develop a program in a language of your choice to solve the triangle problem defined as follows: Accept three integers which are supposed to be the three sides of a triangle and determine if the three values represent an equilateral triangle, isosceles triangle, scalene triangle, or they do not form a triangle at all. Assume that the upper limit for the size of any side is 10. Derive test cases for your program based on equivalence class partitioning, execute the test cases and discuss the results.

4. Design, develop, code and run the program in any suitable language to solve the commission problem. Analyze it from the perspective of dataflow testing, derive different test cases, execute these test cases and discuss the test results.

5. Design, develop, code and run the program in any suitable language to solve the commission problem. Analyze it from the perspective of boundary value testing, derive different test cases, execute these test cases and discuss the test results.

6. Design, develop, code and run the program in any suitable language to solve the commission problem. Analyze it from the perspective of equivalence class testing, derive different test cases, execute these test cases and discuss the test results.

7. Design, develop, code and run the program in any suitable language to solve the commission problem. Analyze it from the perspective of decision table-based testing, derive different test cases, execute these test cases and discuss the test results.

8. Design, develop, code and run the program in any suitable language to implement the binary search algorithm. Determine the basis paths and using them derive different test cases, execute these test cases and discuss the test results.

9. Design, develop, code and run the program in any suitable language to implement the quicksort algorithm. Determine the basis paths and using them derive different test cases, execute these test cases and discuss the test results.

10. Design, develop, code and run the program in any suitable language to implement an absolute letter grading procedure, making suitable assumptions. Determine the basis paths and using them derive different test cases, execute these test cases and discuss the test results.

11. Design, develop, code and run the program in any suitable language to implement the NextDate function. Analyze it from the perspective of boundary value testing, derive different test cases, execute these test cases and discuss the test results.

12. Design, develop, code and run the program in any suitable language to implement the NextDate function. Analyze it from the perspective of equivalence class value testing, derive different test cases, execute these test cases and discuss the test results.

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Notes:
- **In the examination *each* student picks one question from the lot of *all* 12 questions.**
- **The programs must be executed in UNIX / LINUX environment.**

VII SEMESTER

OBJECT-ORIENTED MODELING AND DESIGN

Subject Code: 10CS71   I.A. Marks : 25
Hours/Week : 04   Exam Hours: 03
Total Hours : 52   Exam Marks: 100

PART – A

UNIT – 1   **7 Hours**
Introduction, Modeling Concepts, class Modeling: What is Object Orientation? What is OO development? OO themes; Evidence for usefulness of OO development; OO modeling history
Modeling as Design Technique: Modeling; abstraction; The three models.
Class Modeling: Object and class concepts; Link and associations concepts; Generalization and inheritance; A sample class model; Navigation of class models; Practical tips.

UNIT – 2   **6 Hours**
Advanced Class Modeling, State Modeling: Advanced object and class concepts; Association ends; N-ary associations; Aggregation; Abstract classes; Multiple inheritance; Metadata; Reification; Constraints; Derived data; Packages; Practical tips.
State Modeling: Events, States, Transitions and Conditions; State diagrams; State diagram behavior; Practical tips.

UNIT – 3   **6 Hours**
Advanced State Modeling, Interaction Modeling: Advanced State Modeling: Nested state diagrams; Nested states; Signal generalization; Concurrency; A sample state model; Relation of class and state models; Practical tips.
Interaction Modeling: Use case models; Sequence models; Activity models.
Use case relationships; Procedural sequence models; Special constructs for activity models.

UNIT – 4   **7 Hours**
Process Overview, System Conception, Domain Analysis: Process Overview: Development stages; Development life cycle.
System Conception: Devising a system concept; Elaborating a concept; Preparing a problem statement.
Domain Analysis: Overview of analysis; Domain class model; Domain state model; Domain interaction model; Iterating the analysis.

PART – B

UNIT – 5   **7 Hours**
Application Analysis, System Design: Application Analysis: Application interaction model; Application class model; Application state model; Adding operations.
Overview of system design; Estimating performance; Making a reuse plan; Breaking a system in to sub-systems; Identifying concurrency; Allocation of sub-systems; Management of data storage; Handling global resources; Choosing a software control strategy; Handling boundary conditions; Setting the trade-off priorities; Common architectural styles; Architecture of the ATM system as the example.

UNIT – 6   **7 Hours**
Class Design, Implementation Modeling, Legacy Systems: Class Design: Overview of class design; Bridging the gap; Realizing use cases; Designing algorithms; Recursing downwards, Refactoring; Design optimization; Reification of behavior; Adjustment of inheritance; Organizing a class design; ATM example.
Implementation Modeling: Overview of implementation; Fine-tuning classes; Fine-tuning generalizations; Realizing associations; Testing.
Legacy Systems: Reverse engineering; Building the class models; Building the interaction model; Building the state model; Reverse engineering tips; Wrapping; Maintenance.

UNIT – 7   **6 Hours**
Design Patterns – 1: What is a pattern and what makes a pattern? Pattern categories; Relationships between patterns; Pattern description
Communication Patterns: Forwarder-Receiver; Client-Dispatcher-Server; Publisher-Subscriber.

UNIT – 8   **6 Hours**
Design Patterns – 2, Idioms: Management Patterns: Command processor; View handler.
Idioms: Introduction; what can idioms provide? Idioms and style; Where to find idioms; Counted Pointer example

Text Books:
1. Michael Blaha, James Rumbaugh: Object-Oriented Modeling and Design with UML, 2nd Edition, Pearson Education, 2005.
   (Chapters 1 to 17, 23)
2. Frank Buschmann, Regine Meunier, Hans Rohnert, Peter Sommerlad, Michael Stal: Pattern-Oriented Software Architecture, A System of Patterns, Volume 1, John Wiley and Sons, 2007.
   (Chapters 1, 3.5, 3.6, 4)

Reference Books:
1. Grady Booch et al: Object-Oriented Analysis and Design with Applications, 3rd Edition, Pearson Education, 2007.
2. Brahma Dathan, Sarnath Ramnath: Object-Oriented Analysis, Design, and Implementation, Universities Press, 2009.
3. Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado: UML 2 Toolkit, Wiley- Dreamtech India, 2004.
4. Simon Bennett, Steve McRobb and Ray Farmer: Object-Oriented Systems Analysis and Design Using UML, 2nd Edition, Tata McGraw-Hill, 2002.

INFORMATION SYSTEMS

Sub Code: 10IS72   **IA Marks   :25**
Hrs/Week   : 04   **Exam Hours :03**
Total Hrs   : 52   **Exam Marks :100**

PART – A
UNIT – 1
Foundation Concepts – 1   **7 Hours**
Information Systems in Business: Introduction, The real world of Information Systems, Networks, What you need to know, The fundamental role of IS in business, Trends in IS, Managerial challenges of IT.
System Concepts: A foundation, Components of an Information System, Information System Resources, Information System activities, Recognizing Information Systems.

UNIT – 2
Foundation Concepts – 2   **6 Hours**
Fundamentals of strategic advantages: Strategic IT, Competitive strategy concepts, The competitive advantage of IT, Strategic uses of IT, Building a customer-focused business, The value chain and strategic IS, Reengineering business processes, Becoming an agile company Creating a virtual company, Building a knowledge-creating company.

UNIT – 3
Electronic Business Systems   **6 Hours**
Enterprise Business Systems: Introduction, Cross-functional enterprise applications, Enterprise application integration, Transaction processing systems, Enterprise collaboration systems.
Functional Business Systems: Introduction, Marketing systems, Manufacturing systems, Human resource systems, Accounting systems, Financial management systems.

UNIT – 4
Enterprise Business Systems   **7 Hours**
Customer relationship management: Introduction, What is CRM? The three phases of CRM, Benefits and challenges of CRM, Trends in CRM
Enterprise resource planning: Introduction, What is ERP? Benefits and challenges of ERP, Trends in ERP.
Supply chain Management: Introduction, What is SCM? The role of SCM, Benefits and challenges of SCM, Trends in SCM

PART – B

UNIT – 5
Electronic Commerce Systems   **6 Hours**
Electronic commerce fundamentals: Introduction, The scope of e-commerce, Essential e-commerce, processes, Electronic payment processes.
e-Commerce applications and issues: E-commerce application trends, Business-to- Consumer e-commerce, Web store requirements, Business-to-Business e-commerce, e-commerce marketplaces, Clicks and bricks in e-commerce.

UNIT – 6
Decision Support Systems   **7 Hours**
Decision support in business: Introduction, Decision support trends, Decision support systems (DSS), Management Information Systems, On-line analytical processing, Using DSS, Executive information systems, Enterprise portals and decision support, Knowledge management systems, Business and Artificial Intelligence (AI), An overview of AI, Expert systems.

UNIT – 7
Security and Ethical Challenges   **7 Hours**
Security, Ethical and societal challenges of IT: Introduction, Ethical responsibility of business professionals, Computer crime, Privacy issues, Other challenges, Health issues, Societal solutions.

Security management of IT: Introduction, Tools of security management, Internetworked security defenses, Other security measures, System Controls and audits.

UNIT – 8
Enterprise and Global Management of IT   **6 Hours**
Managing IT: Business and IT, Managing IT, Business / IT planning, Managing the IS function, Failures of IT management.
Managing global IT: The International Dimension, Global IT Management, Cultural, Political and Geo - Economic challenges, Global Business/ IT strategies, Global Business / IT applications, Global IT Platforms, Global data access issues, Global Systems development.

Text Books:
1. James A. O' Brien, George M. Marakas: Management Information Systems, 7th Edition, Tata McGraw Hill, 2006.
   (Chapters 1, 2, 7, 8, 9, 10, 13, 14)

Reference Books:
1. Kenneth C. Laudon and Jane P. Laudon: Management Information System, Managing the Digital Firm, 11th Edition, Pearson Education, 2006.
2. Steven Alter: Information Systems The Foundation of E-Business, 4th Edition, Pearson Education, 2002.
3. W.S. Jawadekar: Management Information Systems, Tata McGraw Hill 1998.

PROGRAMMING THE WEB

> **Subject Code: 10CS73**   **I.A. Marks   : 25**
> **Hours/Week : 04**   **Exam Hours: 03**
> **Total Hours : 52**   **Exam Marks: 100**

UNIT – 1   **6 Hours**
Fundamentals of Web, XHTML – 1: Internet, WWW, Web Browsers and Web Servers, URLs, MIME, HTTP, Security, The Web Programmers Toolbox.
XHTML: Basic syntax, Standard structure, Basic text markup, Images, Hypertext Links.

UNIT – 2   **7 Hours**
XHTML – 2, CSS: XHTML (continued): Lists, Tables, Forms, Frames
CSS: Introduction, Levels of style sheets, Style specification formats, Selector forms, Property value forms, Font properties, List properties, Color,

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Alignment of text, The box model, Background images, The <span> and <div> tags, Conflict resolution.

UNIT – 3   **6 Hours**
Javascript: Overview of Javascript, Object orientation and Javascript, Syntactic characteristics, Primitives, operations, and expressions, Screen output and keyboard input, Control statements, Object creation and modification, Arrays, Functions, Constructors, Pattern matching using regular expressions, Errors in scripts, Examples.

UNIT – 4   **7 Hours**
Javascript and HTML Documents, Dynamic Documents with Javascript: The Javascript execution environment, The Document Object Model, Element access in Javascript, Events and event handling, Handling events from the Body elements, Button elements, Text box and Password elements, The DOM 2 event model, The navigator object, DOM tree traversal and modification.
Introduction to dynamic documents, Positioning elements, Moving elements, Element visibility, Changing colors and fonts, Dynamic content, Stacking elements, Locating the mouse cursor, Reacting to a mouse click, Slow movement of elements, Dragging and dropping elements.

PART - B

UNIT – 5   **6 Hours**
XML: Introduction, Syntax, Document structure, Document type definitions, Namespaces, XML schemas, Displaying raw XML documents, Displaying XML documents with CSS, XSLT style sheets, XML processors, Web services.

UNIT – 6   **7 Hours**
Perl, CGI Programming: Origins and uses of Perl, Scalars and their operations, Assignment statements and simple input and output, Control statements, Fundamentals of arrays, Hashes, References, Functions, Pattern matching, File input and output; Examples.
The Common Gateway Interface; CGI linkage; Query string format; CGI.pm module; A survey example; Cookies.
Database access with Perl and MySQL

UNIT – 7   **6 Hours**
PHP: Origins and uses of PHP, Overview of PHP, General syntactic characteristics, Primitives, operations and expressions, Output, Control statements, Arrays, Functions, Pattern matching, Form handling, Files, Cookies, Session tracking, Database access with PHP and MySQL.

UNIT – 8   **7 Hours**

Ruby, Rails: Origins and uses of Ruby, Scalar types and their operations, Simple input and output, Control statements, Arrays, Hashes, Methods, Classes, Code blocks and iterators, Pattern matching.
Overview of Rails, Document requests, Processing forms, Rails applications with Databases, Layouts.

Text Books:
1. Robert W. Sebesta: Programming the World Wide Web, 4th Edition, Pearson Education, 2008.
   (Listed topics only from Chapters 1 to 9, 11 to 15)

Reference Books:
1. M. Deitel, P.J. Deitel, A. B. Goldberg: Internet & World Wide Web How to Program, 4th Edition, Pearson Education, 2004.
2. Chris Bates: Web Programming Building Internet Applications, 3rd Edition, Wiley India, 2007.
3. Xue Bai et al: The web Warrior Guide to Web Programming, Cengage Learning, 2003.

DATA WAREHOUSING AND DATA MINING

Subject Code: 10IS74	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART – A

UNIT – 1   **6 Hours**

Data Warehousing:
Introduction, Operational Data Stores (ODS), Extraction Transformation Loading (ETL), Data Warehouses. Design Issues, Guidelines for Data Warehouse Implementation, Data Warehouse Metadata

UNIT – 2   **6 Hours**

Online Analytical Processing (OLAP): Introduction, Characteristics of OLAP systems, Multidimensional view and Data cube, Data Cube Implementations, Data Cube operations, Implementation of OLAP and overview on OLAP Softwares.

UNIT – 3   **6 Hours**
Data Mining: Introduction, Challenges, Data Mining Tasks, Types of Data, Data Preprocessing, Measures of Similarity and Dissimilarity, Data Mining Applications

UNIT – 4   **8 Hours**
Association Analysis: Basic Concepts and Algorithms: Frequent Itemset Generation, Rule Generation, Compact Representation of Frequent Itemsets, Alternative methods for generating Frequent Itemsets, FP Growth Algorithm, Evaluation of Association Patterns

PART - B
UNIT – 5   **6 Hours**
Classification -1 : Basics, General approach to solve classification problem, Decision Trees, Rule Based Classifiers, Nearest Neighbor Classifiers.

UNIT – 6   **6 Hours**
Classification - 2: Bayesian Classifiers, Estimating Predictive accuracy of classification methods, Improving accuracy of clarification methods, Evaluation criteria for classification methods, Multiclass Problem.

UNIT – 7   **8 Hours**
Clustering Techniques: Overview, Features of cluster analysis, Types of Data and Computing Distance, Types of Cluster Analysis Methods, Partitional Methods, Hierarchical Methods, Density Based Methods, Quality and Validity of Cluster Analysis

UNIT – 8   **6 Hours**
Web Mining: Introduction, Web content mining, Text Mining, Unstructured Text, Text clustering, Mining Spatial and Temporal Databases.

Text Books:
1. Pang-Ning Tan, Michael Steinbach, Vipin Kumar: Introduction to Data Mining, Pearson Education, 2005.
2. G. K. Gupta: Introduction to Data Mining with Case Studies, 3rd Edition, PHI, New Delhi, 2009.

Reference Books:
1. Arun K Pujari: Data Mining Techniques, 2nd Edition, Universities Press, 2009.
2. Jiawei Han and Micheline Kamber: Data Mining - Concepts and Techniques, 2nd Edition, Morgan Kaufmann Publisher, 2006.
3. Alex Berson and Stephen J. Smith: Data Warehousing, Data Mining, and OLAP Computing, Mc GrawHill Publisher, 1997.

ADVANCED DBMS

Subject Code: 10IS751　　　　**I.A. Marks : 25**
Hours/Week : 04　　　　　　　**Exam Hours: 03**
Total Hours : 52　　　　　　　**Exam Marks: 100**

PART - A

UNIT – 1　　　　　　　　　　　　　　　　**7 Hours**
Overview of Storage and Indexing, Disks and Files: Data on external storage; File organizations and indexing; Index data structures; Comparison of file organizations; Indexes and performance tuning
Memory hierarchy; RAID; Disk space management; Buffer manager; Files of records; Page formats and record formats

UNIT – 2　　　　　　　　　　　　　　　　**7 Hours**
Tree Structured Indexing: Intuition for tree indexes; Indexed sequential access method; B+ trees, Search, Insert, Delete, Duplicates, B+ trees in practice

UNIT – 3　　　　　　　　　　　　　　　　**6 Hours**
Hash-Based Indexing: Static hashing; Extendible hashing, Linear hashing, comparisons

UNIT – 4　　　　　　　　　　　　　　　　**6 Hours**
Overview of Query Evaluation, External Sorting : The system catalog; Introduction to operator evaluation; Algorithms for relational operations; Introduction to query optimization; Alternative plans: A motivating example; what a typical optimizer does.
When does a DBMS sort data? A simple two-way merge sort; External merge sort

PART - B

UNIT – 5　　　　　　　　　　　　　　　　**6 Hours**
Evaluating Relational Operators : The Selection operation; General selection conditions; The Projection operation; The Join operation; The Set operations; Aggregate operations; The impact of buffering

UNIT – 6　　　　　　　　　　　　　　　　**7 Hours**
A Typical Relational Query Optimizer: Translating SQL queries in to Relational Algebra; Estimating the cost of a plan; Relational algebra equivalences; Enumeration of alternative plans; Nested sub-queries; other approaches to query optimization.

UNIT – 7   **7 Hours**
Physical Database Design and Tuning: Introduction; Guidelines for index selection, examples; Clustering and indexing; Indexes that enable index-only plans; Tools to assist in index selection; Overview of database tuning; Choices in tuning the conceptual schema; Choices in tuning queries and views; Impact of concurrency; DBMS benchmarking.

UNIT – 8   **6 Hours**
More Recent Applications: Mobile databases; Multimedia databases; Geographical Information Systems; Genome data management

Text Books:
1. Raghu Ramakrishnan and Johannes Gehrke: Database Management Systems, 3rd Edition, McGraw-Hill, 2003.
   (Chapters 8, 9, 10, 11, 12, 13.1 to 13.3, 14, 15, 20)
2. Elmasri and Navathe: Fundamentals of Database Systems, 5th Edition, Pearson Education, 2007.
   (Chapter 30)

Reference Books:
1. Connolly and Begg: Database Systems, 4th Edition, Pearson Education, 2002.

EMBEDDED COMPUTING SYSTEMS

Subject Code: **10IS752**   I.A. Marks   : **25**
Hours/Week : **04**   Exam Hours: **03**
Total Hours : **52**   Exam Marks: **100**

PART- A

UNIT – 1   **6 Hours**
Embedded Computing: Introduction, Complex Systems and Microprocessors, Embedded Systems Design Process, Formalism for System design
Design Example: Model Train Controller.

UNIT – 2   **7 Hours**
Instruction Sets, CPUs: Preliminaries, ARM Processor, Programming Input and Output, Supervisor mode, Exceptions, Traps, Coprocessors, Memory Systems Mechanisms, CPU Performance, CPU Power Consumption. Design Example: Data Compressor.

UNIT – 3   **6 Hours**
Bus-Based Computer Systems: CPU Bus, Memory Devices, I/O devices, Component Interfacing, Designing with Microprocessor, Development and Debugging, System-Level Performance Analysis
Design Example: Alarm Clock.

UNIT – 4   **7 Hours**
Program Design and Analysis: Components for embedded programs, Models of programs, Assembly, Linking and Loading, Basic Compilation Techniques, Program optimization, Program-Level performance analysis, Software performance optimization, Program-Level energy and power analysis, Analysis and optimization of program size, Program validation and testing. Design Example: Software modem.

PART- B

UNIT – 5   **6 Hours**
Real Time Operating System (RTOS) Based Design – 1: Basics of OS, Kernel, types of OSs, tasks, processes, Threads, Multitasking and Multiprocessing, Context switching, Scheduling Policies, Task Communication, Task Synchronization.

UNIT – 6   **6 Hours**
RTOS-Based Design - 2: Inter process Communication mechanisms, Evaluating OS performance, Choice of RTOS, Power Optimization. Design Example: Telephone Answering machine

UNIT – 7   **7 Hours**
Distributed Embedded Systems: Distributed Network Architectures, Networks for Embedded Systems: I2C Bus, CAN Bus, SHARC Link Ports, Ethernet, Myrinet, Internet, Network Based Design. Design Example: Elevator Controller.

UNIT – 8   **7 Hours**
Embedded Systems Development Environment: The Integrated Development Environment, Types of File generated on Cross Compilation, Dis-assembler /Decompiler, Simulators, Emulators, and Debugging, Target Hardware Debugging.

Text Books:
   1. Wayne Wolf: Computers as Components, Principles of Embedded Computing Systems Design, 2nd Edition, Elsevier, 2008.
   2. Shibu K V: Introduction to Embedded Systems, Tata McGraw Hill, 2009

(Chapters 10, 13)

Reference Books:
1. James K. Peckol: Embedded Systems, A contemporary Design Tool, Wiley India, 2008.
2. Tammy Neorgaard: Embedded Systems Architecture, Elsevier, 2005.

JAVA AND J2EE

Subject Code: 10IS753	**IA Marks: 25**
Hours/Week: 4	**Exam Marks: 100**
Total Hours: 52	**Exam Hours: 3**

PART - A

UNIT – 1   **6 Hours**
Introduction to Java: Java and Java applications; Java Development Kit (JDK); Java is interpreted, Byte Code, JVM; Object-oriented programming; Simple Java programs.
Data types and other tokens: Boolean variables, int, long, char, operators, arrays, white spaces, literals, assigning values; Creating and destroying objects; Access specifiers.
Operators and Expressions: Arithmetic Operators, Bitwise operators, Relational operators, The Assignment Operator, The ? Operator; Operator Precedence; Logical expression; Type casting; Strings
Control Statements: Selection statements, iteration statements, Jump Statements.

UNIT – 2   **6 Hours**
Classes, Inheritance, Exceptions, Applets: Classes: Classes in Java; Declaring a class; Class name; Super classes; Constructors; Creating instances of class; Inner classes.
Inheritance: Simple, multiple, and multilevel inheritance; Overriding, overloading.
Exception handling**:** Exception handling in Java.
The Applet Class: Two types of Applets; Applet basics; Applet Architecture; An Applet skeleton; Simple Applet display methods; Requesting repainting; Using the Status Window; The HTML APPLET tag; Passing parameters to Applets; getDocumentbase() and getCodebase(); ApletContext and showDocument(); The AudioClip Interface; The AppletStub Interface; Output to the Console.

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UNIT – 3   **7 Hours**
Multi Threaded Programming, Event Handling: Multi Threaded
Programming: What are threads? How to make the classes threadable;
Extending threads; Implementing runnable; Synchronization; Changing state
of the thread; Bounded buffer problems, read-write problem, producer-
consumer problems.
Event Handling: Two event handling mechanisms; The delegation event
model; Event classes; Sources of events; Event listener interfaces; Using the
delegation event model; Adapter classes; Inner classes.

UNIT – 4   **7 Hours**
Swings: Swings: The origins of Swing; Two key Swing features;
Components and Containers; The Swing Packages; A simple Swing
Application; Create a Swing Applet; Jlabel and ImageIcon; JTextField;The
Swing Buttons; JTabbedpane; JScrollPane; JList; JComboBox; JTable.

PART – B

UNIT – 5   **6 Hours**
Java 2 Enterprise Edition Overview, Database Access: Overview of J2EE
and J2SE
The Concept of JDBC; JDBC Driver Types; JDBC Packages; A Brief
Overview of the JDBC process; Database Connection; Associating the
JDBC/ODBC Bridge with the Database; Statement Objects; ResultSet;
Transaction Processing; Metadata, Data types; Exceptions.

UNIT – 6   **7 Hours**
Servlets: Background; The Life Cycle of a Servlet; Using Tomcat for Servlet
Development; A simple Servlet; The Servlet API; The Javax.servlet Package;
Reading Servlet Parameter; The Javax.servlet.http package; Handling HTTP
Requests and Responses; Using Cookies; Session Tracking.

UNIT – 7   **6 Hours**
JSP, RMI: Java Server Pages (JSP): JSP, JSP Tags, Tomcat, Request String,
User Sessions, Cookies, Session Objects.
Java Remote Method Invocation: Remote Method Invocation concept; Server
side, Client side.

UNIT – 8   **7 Hours**
Enterprise Java Beans: Enterprise java Beans; Deployment Descriptors;
Session Java Bean, Entity Java Bean; Message-Driven Bean; The JAR File.

Text Books:
1. Herbert Schildt: Java - The Complete Reference, 7th Edition, Tata
   McGraw Hill, 2007.

(Chapters 1, 2, 3, 4, 5, 6, 8, 10, 11, 21, 22, 29, 30, 31)
2. Jim Keogh: J2EE - The Complete Reference, Tata McGraw Hill, 2007.
(Chapters 5, 6, 11, 12, 15)

Reference Books:
1. Y. Daniel Liang: Introduction to JAVA Programming, 7th Edition, Pearson Education, 2007.
2. Stephanie Bodoff et al: The J2EE Tutorial, 2nd Edition, Pearson Education, 2004.

MULTIMEDIA COMPUTING

Subject Code: 10IS754	I.A. Marks : 25
Hours/Week : 04	Exam Hours: 03
Total Hours : 52	Exam Marks: 100

PART – A

UNIT – 1   **7 Hours**
Introduction, Media and Data Streams, Audio Technology: Multimedia Elements; Multimedia Applications; Multimedia Systems Architecture; Evolving Technologies for Multimedia Systems; Defining Objects for Multimedia Systems; Multimedia Data Interface Standards; The need for Data Compression; Multimedia Databases.
Media: Perception Media, Representation Media, Presentation Media, Storage Media, Transmission Media, Information Exchange Media, Presentation Spaces & Values, and Presentation Dimensions; Key Properties of a Multimedia System: Discrete & Continuous Media, Independence Media, Computer Controlled Systems, Integration; Characterizing Data Streams: Asynchronous Transmission Mode, Synchronous Transmission Mode, Isochronous Transmission Mode; Characterizing Continuous Media Data Streams.
Sound: Frequency, Amplitude, Sound Perception and Psychoacoustics; Audio Representation on Computers; Three Dimensional Sound Projection; Music and MIDI Standards; Speech Signals; Speech Output; Speech Input; Speech Transmission.

UNIT – 2   **7 Hours**
Graphics and Images, Video Technology, Computer-Based Animation: Capturing Graphics and Images Computer Assisted Graphics and Image Processing; Reconstructing Images; Graphics and Image Output Options.
Basics; Television Systems; Digitalization of Video Signals; Digital Television; Basic Concepts; Specification of Animations; Methods of

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Controlling Animation; Display of Animation; Transmission of Animation; Virtual Reality Modeling Language.

UNIT – 3   **7 Hours**
Data Compression – 1: Storage Space; Coding Requirements; Source, Entropy, and Hybrid Coding; Basic Compression Techniques; JPEG: Image Preparation, Lossy Sequential DCT-based Mode, Expanded Lossy DCT-based Mode, Lossless Mode, Hierarchical Mode

UNIT – 4   **6 Hours**
Data Compression – 2: H.261 (Px64) and H.263: Image Preparation, Coding Algorithms, Data Stream, H.263+ and H.263L; MPEG: Video Encoding, Audio Coding, Data Stream, MPEG-2, MPEG-4, MPEG-7; Fractal Compression.

PART - B

UNIT – 5   **6 Hours**
Optical Storage Media: History of Optical Storage; Basic Technology; Video Discs and Other WORMs; Compact Disc Digital Audio; Compact Disc Read Only Memory; CD-ROM Extended Architecture; Further CD-ROM-Based Developments; Compact Disc Recordable; Compact Disc Magneto-Optical; Compact Disc Read/Write; Digital Versatile Disc.

UNIT – 6   **6 Hours**
Content Analysis : Simple Vs. Complex Features; Analysis of Individual Images; Analysis of Image Sequences; Audio Analysis; Applications.

UNIT – 7   **6 Hours**
Data and File Format Standards: Rich-Text Format; TIFF File Format; Resource Interchange File Format (RIFF); MIDI File Format; JPEG DIB File Format for Still and Motion Images; AVI Indeo File Format; MPEG Standards; TWAIN

UNIT – 8   **7 Hours**
Multimedia Application Design : Multimedia Application Classes; Types of Multimedia Systems; Virtual Reality Design; Components of Multimedia Systems; Organizing Multimedia Databases; Application Workflow Design Issues; Distributed Application Design Issues.

Text Books:
1. Ralf Steinmetz, Klara Narstedt: Multimedia Fundamentals: Vol 1-Media Coding and Content Processing, 2nd Edition, PHI, Indian Reprint 2008.
(Chapters 2, 3, 4, 5, 6, 7, 8, 9)

2. Prabhat K. Andleigh, Kiran Thakrar: Multimedia Systems Design, PHI, 2003.
(Chapters 1, 3, 7)

Reference Books:
1. K.R Rao, Zoran S. Bojkovic and Dragorad A. Milovanovic: Multimedia Communication Systems: Techniques, Standards, and Networks, Pearson Education, 2002.
2. Nalin K Sharad: Multimedia Information Networking, PHI, 2002.

ADVANCED SOFTWARE ENGINEERING

Subject Code: 10IS755   I.A. Marks   : 25
Hours/Week : 04   Exam Hours: 03
Total Hours : 52   Exam Marks: 100

PART - A

UNIT – 1   **7 Hours**
Quality Management: Quality Concepts: Quality, Software quality; The software quality dilemma; Achieving software quality.
Review techniques: Cost impact of Software defects; Defect amplification and removal; Review metrics and their use; Reviews: A formal spectrum; Informal reviews; Formal technical reviews.
Software Quality Assurance: Background issues, Elements of SQA; SQA tasks, goals and metrics; Formal approaches to SQA; Statistical software quality assurance; Software reliability; The ISO 9000 Quality standards; The SQA plan.

UNIT – 2   **6 Hours**
Formal Modeling and Verification: The Cleanroom Strategy; Functional specification; Cleanroom design; Cleanroom testing; Formal methods concepts; Applying mathematical notation for formal specification; Formal specification languages.

UNIT – 3   **7 Hours**
Process Improvement, Configuration Management: Process and product quality; Process classification; Process measurement; Process analysis and modeling; Process change; The CMMI process improvement framework
Configuration management planning; Change management; Version and release management; System building; CASE tools for configuration management

UNIT – 4   6 Hours
Software Process and Project Metrics: Metrics in the Process and Project Domains; Software Measurement; Metrics for software quality; Integrating metrics within the software process; Metrics for small organizations; Establishing a software metrics program.

PART - B

UNIT – 5   7 Hours
Software Reuse, CBSE: The reuse landscape; Design patterns; Generator-based reuse; Application frameworks; Application system reuse.
Components and component models; The CBSE process; Component composition

UNIT – 6   6 Hours
Critical Systems Development and Validation: Dependable processes; Dependable programming; Fault tolerance; Fault-tolerant architectures
Reliability validation; Safety assurance; Security assessment; Safety and dependability cases

UNIT – 7   7 Hours
User Interface Design, Maintenance and Reengineering: User interface design issues; The UI design process; User analysis; User interface prototyping; Interface evaluation.
Software maintenance; Reengineering; Business process reengineering; Software reengineering; Reverse engineering; Restructuring; Forward engineering; The economics of reengineering.

UNIT – 8   6 Hours
Service-Oriented Software Engineering, Aspect-Oriented Software Development: Services as reusable components; Service engineering; Software development with services
Aspect-Oriented Software Development: The separation of concerns; Aspects, join points and pointcuts; Software engineering with aspects.

Text Books:
1. Roger S. Pressman: Software Engineering: A Practitioner's Approach, 7th Edition, McGraw Hill, 2007.
   (Chapters 14, 15, 16, 21, 25, 29)
2. Sommerville: Software Engineering, 8th Edition, Pearson Education, 2007.
   (Chapters 16, 18, 19, 20, 24, 28, 29, 31, 32)

Reference Books:

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1. Pfleeger: Software Engineering Theory and Practice, 3rd Edition, Pearson Education, 2001.
2. Waman S Jawadekar: Software Engineering Principles and Practice, Tata McGraw Hill, 2004.

NEURAL NETWORKS

Subject Code: 10IS756	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART – A

UNIT – 1

Introduction **7 Hours**

What is a Neural Network?, Human Brain, Models of Neuron, Neural Networks viewed as directed graphs, Feedback, Network Architectures, Knowledge representation, Artificial Intelligence and Neural Networks.

UNIT – 2

Learning Processes – 1 **6 Hours**

Introduction, Error-correction learning, Memory-based learning, Hebbian learning, Competitive learning,Boltzamann learning, Credit Assignment problem, Learning with a Teacher, Learning without a Teacher, Learning tasks, Memory, Adaptation.

UNIT – 3 **7 Hours**

Learning Processes – 2, **Single Layer Perceptrons:** Statistical nature of the learning process, Statistical learning theory, Approximately correct model of learning.

Single Layer Perceptrons: Introduction, Adaptive filtering problem, Unconstrained optimization techniques, Linear least-squares filters**,** Least-mean square algorithm, Learning curves, Learning rate annealing techniques, Perceptron, Perceptron convergence theorem, Relation between the Perceptron and Bayes classifier for a Gaussian environment.

UNIT – 4 **6 Hours**

Multilayer Perceptrons – 1: Introduction, Some preliminaries, Back-propagation Algorithm, Summary of back-propagation algorithm, XOR problem, Heuristics for making the back-propagation algorithm perform better, Output representation and decision rule, Computer experiment, Feature detection, Back-propagation and differentiation.

UNIT – 5   **7 Hours**
Multilayer Perceptrons – 2: Hessian matrix, Generalization, approximation of functions, Cross validation, Network pruning techniques, virtues and limitations of back- propagation learning, Accelerated convergence of back propagation learning, Supervised learning viewed as an optimization problem, Convolution networks.

UNIT – 6   **6 Hours**
Radial-Basic Function Networks – 1: Introduction, Cover's theorem on the separability of patterns, Interpolation problem, Supervised learning as an ill-posed Hypersurface reconstruction problem, Regularization theory, Regularization networks, Generalized radial-basis function networks, XOR problem, Estimation of the regularization parameter.

UNIT – 7   **6 Hours**
Radial-Basic Function Networks – 2, Optimization – 1: Approximation properties of RBF networks, Comparison of RBF networks and multilayer Perceptrons, Kernel regression and it's relation to RBF networks, Learning strategies, Computer experiment.
Optimization using Hopfield networks: Traveling salesperson problem, Solving simultaneous linear equations, Allocating documents to multiprocessors.

UNIT – 8   **7 Hours**
Optimization Methods – 2:
Iterated gradient descent,   Simulated Annealing, Random Search, Evolutionary computation- Evolutionary algorithms, Initialization, Termination criterion, Reproduction, Operators, Replacement, Schema theorem.

Text Books:
1. Simon Haykin: Neural Networks - A Comprehensive Foundation, 2nd Edition, Pearson Education, 1999.
    (Chapters 1.1-1.8, 2.1-2.15, 3.1-3.10, 4.1-4.19, 5.1-5.14)
2. Kishan Mehrotra, Chilkuri K. Mohan, Sanjay Ranka: Artificial Neural Networks, Penram International Publishing, 1997.
    (Chapters 7.1-7.5)

Reference Books:
1. B.Yegnanarayana: Artificial Neural Networks, PHI, 2001.

C# PROGRAMMING AND .NET

Subject Code: 10IS761   I.A. Marks : 25
Hours/Week : 04   Exam Hours: 03
Total Hours : 52   Exam Marks: 100

PART – A

UNIT – 1   6 Hours
The Philosophy of .NET: Understanding the Previous State of Affairs, The.NET Solution, The Building Block of the .NET Platform (CLR,CTS, and CLS), The Role of the .NET Base Class Libraries, What C# Brings to the Table, An Overview of .NET Binaries (aka Assemblies), the Role of the Common Intermediate Language, The Role of .NET Type Metadata, The Role of the assembly Manifast, Compiling CIL to Platform – Specific Instructions, Understanding the Common Type System, Intrinsic CTS Data Types, Understanding the Common Languages Specification, Understanding the Common Language Runtime A tour of the .NET Namespaces, Increasing Your Namespace Nomenclature, Deploying the .NET Runtime.

UNIT – 2   6 Hours
Building C# Applications: The Role of the Command Line Complier (csc.exe), Building C# Application using csc.exe Working with csc.exe Response Files, Generating Bug Reports, Remaining g C# Complier Options, The Command Line Debugger (cordbg.exe) Using the, Visual studio .NET IDE, Other Key Aspects of the VS.NET IDE, C# "Preprocessor:" Directives, an Interesting Aside: The System. Environment Class.

UNIT – 3   8 Hours
C# Language Fundamentals: The Anatomy of Basic C# Class, Creating objects: Constructor Basics, The Composition of a C# Application, Default assignment and Variable Scope, The C# Member Initialisation Syntax, Basic Input and Output with the Console Class, Understanding Value Types and Reference Types, The Master Node: System, Object, The System Data Types (and C# Aliases), Converting Between Value Types and Reference Types: Boxing and Unboxing, Defining Program Constants, C# Iteration Constructs, C# Controls Flow Constructs, The Complete Set of C# Operators, Defining Custom Class Methods, Understating Static Methods, Methods Parameter Modifies, Array Manipulation in C#, String Manipulation in C#, C# Enumerations, Defining Structures in C#, Defining Custom Namespaces.

UNIT – 4   6 Hours
Object- Oriented Programming with C#: Forms Defining of the C# Class, Definition the "Default Public Interface" of a Type, Recapping the Pillars of

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OOP, The First Pillars: C#'s Encapsulation Services, Pseudo- Encapsulation: Creating Read-Only Fields, The Second Pillar: C#'s Inheritance Supports, keeping Family Secrets: The " Protected" Keyword, Nested Type Definitions, The Third Pillar: C #'s Polymorphic Support, Casting Between .

PART – B

UNIT – 5   6 Hours
Exceptions and Object Lifetime: Ode to Errors, Bugs, and Exceptions, The Role of .NET Exception Handing, the System. Exception Base Class, Throwing a Generic Exception, Catching Exception, CLR System – Level Exception(System. System Exception), Custom Application-Level Exception(System. System Exception), Handling Multiple Exception, The Family Block, the Last Chance Exception Dynamically Identifying Application – and System Level Exception Debugging System Exception Using VS. NET, Understanding Object Lifetime, the CIT of "new', The Basics of Garbage Collection,, Finalization a Type, The Finalization Process, Building an Ad Hoc Destruction Method, Garbage Collection Optimizations, The System. GC Type.

UNIT – 6   6 Hours
Interfaces and Collections: Defining Interfaces Using C# Invoking Interface Members at the object Level, Exercising the Shapes Hierarchy, Understanding Explicit Interface Implementation, Interfaces As Polymorphic Agents, Building Interface Hierarchies, Implementing, Implementation, Interfaces Using VS .NET, understanding the IConvertible Interface, Building a Custom Enumerator (IEnumerable and Enumerator), Building Cloneable objects (ICloneable), Building Comparable Objects (I Comparable), Exploring the system. Collections Namespace, Building a Custom Container (Retrofitting the Cars Type).

UNIT – 7   8 Hours
Callback Interfaces, Delegates, and Events, Advanced Techniques: Understanding Callback Interfaces, Understanding the .NET Delegate Type, Members of System. Multicast Delegate, The Simplest Possible Delegate Example, , Building More a Elaborate Delegate Example, Understanding Asynchronous Delegates, Understanding (and Using)Events.
The Advances Keywords of C#, A Catalog of C# Keywords Building a Custom Indexer, A Variation of the Cars Indexer Internal Representation of Type Indexer . Using C# Indexer from VB .NET. Overloading operators, The Internal Representation of Overloading Operators, interacting with Overload Operator from Overloaded- Operator- Challenged Languages, Creating Custom Conversion Routines, Defining Implicit Conversion Routines, The Internal Representations of Customs Conversion Routines

UNIT – 8   **6 Hours**

Understanding .NET Assembles: Problems with Classic COM Binaries, An Overview of .NET Assembly, Building a Simple File Test Assembly, A C#. Client Application, A Visual Basic .NET Client Application, Cross Language Inheritance, Exploring the CarLibrary's, Manifest, Exploring the CarLibrary's Types, Building the Multifile Assembly, Using Assembly, Understanding Private Assemblies, Probing for Private Assemblies (The Basics), Private A Assemblies XML Configurations Files, Probing for Private Assemblies (The Details), Understanding Shared Assembly, Understanding Shared Names, Building a Shared Assembly, Understanding Delay Signing, Installing/Removing Shared Assembly, Using a Shared Assembly

Text Books:
1. Andrew Troelsen: Pro C# with .NET 3.0, 4th Edition, Wiley India, 2009.
   Chapters: 1 to 11 (up to pp. 369)
2. E. Balagurusamy: Programming in C#, 2nd Edition, Tata McGraw Hill, 2004.
   (Programming Examples 3.7, 3.10, 5.5, 6.1, 7.2, 7.4, 7.5, 7.6, 8.1, 8.2, 8.3, 8.5, 8.7, 8.8, 9.1, 9.2, 9.3, 9.4, 10.2, 10.4, 11.2, 11.4, 12.1, 12.4, 12.5, 12.6, 13.1, 13.2, 13.3, 13.6, 14.1, 14.2, 14.4, 15.2, 15.3, 16.1, 16.2, 16.3, 18.3, 18.5.18.6)

Reference Books:
1. Tom Archer: Inside C#, WP Publishers, 2001.
2. Herbert Schildt: C# The Complete Reference, Tata McGraw Hill, 2004.

DIGITAL IMAGE PROCESSING

Subject Code: 10IS762 **I.A. Marks : 25**
Hours/Week : 04 **Exam Hours: 03**
Total Hours : 52 **Exam Marks: 100**

PART - A

UNIT – 1 **6 Hours**
Digitized Image and its properties:
Basic concepts, Image digitization, Digital image properties

UNIT – 2 **7 Hours**
Image Preprocessing: Image pre-processing: Brightness and geometric transformations, local preprocessing.

UNIT – 3 **7 Hours**
Segmentation – 1: Thresholding, Edge-based segmentation.

UNIT – 4 **6 Hours**
Segmentation – 2: Region based segmentation, Matching.

PART – B

UNIT – 5 **7 Hours**
Image Enhancement: Image enhancement in the spatial domain: Background, Some basic gray level transformations, Histogram processing, Enhancement using arithmetic/ logic operations, Basics of spatial filtering, Smoothing spatial filters, Sharpening spatial filters. Image enhancement in the frequency domain: Background, Introduction to the Fourier transform and the frequency domain, Smoothing Frequency-Domain filters, Sharpening Frequency Domain filters, Homomorphic filtering.

UNIT – 6 **6 Hours**
Image Compression: Image compression: Fundamentals, Image compression models, Elements of information theory, Error-Free Compression, Lossy compression.

UNIT – 7 **7 Hours**
Shape representation: Region identification, Contour-based shape representation and description, Region based shape representation and description, Shape classes.

UNIT – 8   **6 Hours**
Morphology: Basic morphological concepts, Morphology principles, Binary dilation and erosion, Gray-scale dilation and erosion, Morphological segmentation and watersheds

Text Books:
1. Milan Sonka, Vaclav Hlavac and Roger Boyle: Image Processing, Analysis and Machine Vision, 2nd Edition, Thomoson Learning, 2001.
   (Chapters 2, 4.1 to 4.3, 5.1 to 5.4, 6, 11.1 to 11.4, 11.7)
2. Rafel C Gonzalez and Richard E Woods: Digital Image Processing, 3rd Edition, Pearson Education, 2003.
   (Chapters 3.1 to 3.7, 4.1 to 4.5, 8.1 to 8.5)

Reference Books:
1. Anil K Jain, "Fundamentals of Digital Image Processing", PHI, 1997, Indian Reprint 2009.
2. B.Chanda, D Dutta Majumder, "Digital Image Processing and Analysis", PHI, 2002.

GAME THEORY

Subject Code: 10IS763	I.A. Marks : 25
Hours/Week : 04	Exam Hours: 03
Total Hours : 52	Exam Marks: 100

PART - A

UNIT – 1   **8 Hours**
Introduction, Strategic Games: What is game theory? The theory of rational choice; Interacting decision makers.
Strategic games; Examples: The prisoner's dilemma, Bach or Stravinsky, Matching pennies; Nash equilibrium; Examples of Nash equilibrium; Best-response functions; Dominated actions; Equilibrium in a single population: symmetric games and symmetric equilibria.

UNIT – 2   **6 Hours**
Mixed Strategy Equilibrium: Introduction; Strategic games in which players may randomize; Mixed strategy Nash equilibrium; Dominated actions; Pure equilibria when randomization is allowed, Illustration: Expert Diagnosis; Equilibrium in a single population, Illustration: Reporting a crime; The

formation of players' beliefs; Extensions; Representing preferences by expected payoffs.

UNIT – 3   **6 Hours**
Extensive Games: Extensive games with perfect information; Strategies and outcomes; Nash equilibrium; Subgame perfect equilibrium; Finding subgame perfect equilibria of finite horizon games: Backward induction. Illustrations: The ultimatum game, Stackelberg's model of duopoly, Buying votes.

UNIT – 4   **6 Hours**
Extensive games: Extensions and Discussions: Extensions: Allowing for simultaneous moves, Illustrations: Entry in to a monopolized industry, Electoral competition with strategic voters, Committee decision making, Exit from a declining industry; Allowing for exogenous uncertainty, Discussion: subgame perfect equilibrium and backward induction.

PART – B

UNIT – 5   **7 Hours**
Bayesian Games, Extensive Games with Imperfect Information: Motivational examples; General definitions; Two examples concerning information; Illustrations: Cournot's duopoly game with imperfect information, Providing a public good, Auctions; Auctions with an arbitrary distribution of valuations.
Extensive games with imperfect information; Strategies; Nash equilibrium; Beliefs and sequential equilibrium; Signaling games; Illustration: Strategic information transmission.

UNIT – 6   **7 Hours**
Strictly Competitive Games, Evolutionary Equilibrium: Strictly competitive games and maximization; Maximization and Nash equilibrium; Strictly competitive games; Maximization and Nash equilibrium in strictly competitive games.
Evolutionary Equilibrium: Monomorphic pure strategy equilibrium; Mixed strategies and polymorphic equilibrium; Asymmetric contests; Variations on themes: Sibling behavior, Nesting behavior of wasps, The evolution of sex ratio.

UNIT – 7   **6 Hours**
Iterated Games: Repeated games: The main idea; Preferences; Repeated games; Finitely and infinitely repeated Prisoner's dilemma; Strategies in an infinitely repeated Prisoner's dilemma; Some Nash equilibria of an infinitely repeated Prisoner's dilemma, Nash equilibrium payoffs of an infinitely repeated Prisoner's dilemma.

UNIT – 8   6 Hours
Coalitional Games and Bargaining: Coalitional games. The Core. Illustrations: Ownership and distribution of wealth, Exchanging homogeneous items, Exchanging heterogeneous items, Voting, Matching. Bargaining as an extensive game; Illustration of trade in a market; Nash's axiomatic model of bargaining

Text Books:
1. Martin Osborne: An Introduction to Game Theory, Oxford University Press, Indian   Edition, 2004.
   (Listed topics only from Chapters 1 to 11, 13, 14, 16)

Reference Books:
1. Roger B. Myerson: Game Theory: Analysis of Conflict, Harvard University Press, 1997.
2. Andreu Mas-Colell, Michael D. Whinston, and Jerry R. Green: Microeconomic Theory. Oxford University Press, New York, 1995.
3. Philip D. Straffin, Jr.: Game Theory and Strategy, The Mathematical Association of America, January 1993.

ARTIFICIAL INTELLIGENCE

Subject Code: 10IS764   I.A. Marks   : 25
Hours/Week : 04   Exam Hours: 03
Total Hours : 52   Exam Marks: 100

PART – A

UNIT – 1   7 Hours
Introduction: What is AI? Intelligent Agents: Agents and environment; Rationality; the nature of environment; the structure of agents. Problem-solving: Problem-solving agents; Example problems; Searching for solution; Uninformed search strategies.

UNIT – 2   7 Hours
Informed Search, Exploration, Constraint Satisfaction, Adversial Search: Informed search strategies; Heuristic functions; On-line search agents and unknown environment. Constraint satisfaction problems; Backtracking search for CSPs. Adversial search: Games; Optimal decisions in games; Alpha-Beta pruning.

UNIT – 3   6 Hours

Logical Agents: Knowledge-based agents; The wumpus world as an example world; Logic; propositional logic Reasoning patterns in propositional logic; Effective propositional inference; Agents based on propositional logic.

UNIT – 4   **6 Hours**
First-Order Logic, Inference in First-Order Logic – 1: Representation revisited; Syntax and semantics of first-order logic; Using first-order logic; Knowledge engineering in first-order logic. Propositional versus first-order inference; Unification and lifting

PART – B

UNIT – 5   **6 Hours**
Inference in First-Order Logic – 2: Forward chaining; Backward chaining; Resolution.

UNIT – 6   **7 Hours**
Knowledge Representation: Ontological engineering; Categories and objects; Actions, situations, and events; Mental events and mental objects; The Internet shopping world; Reasoning systems for categories; Reasoning with default information; Truth maintenance systems.

UNIT – 7   **7 Hours**
Planning, Uncertainty, Probabilistic Reasoning: Planning: The problem; Planning with state-space approach; Planning graphs; Planning with propositional logic.
Uncertainty: Acting under certainty; Inference using full joint distributions; Independence; Bayes' rule and its use.
Probabilistic Reasoning: Representing knowledge in an uncertain domain; The semantics of Bayesian networks; Efficient representation of conditional distributions; Exact inference in Bayesian networks.

UNIT – 8   **6 Hours**
Learning, AI: Present and Future: Learning: Forms of Learning; Inductive learning; Learning decision trees; Ensemble learning; Computational learning theory.
AI: Present and Future: Agent components; Agent architectures; Are we going in the right direction? What if AI does succeed?

Text Books:
  1. Stuart Russel, Peter Norvig: Artificial Intelligence A Modern Approach, 2nd Edition, Pearson Education, 2003.
     (Chapters 1.1, 2, 3.1 to 3.4, 4.1, 4.2, 4.5, 5.1, 5.2, 6.1, 6.2, 6.3, 7, 8, 9, 10, 11.1, 11.2, 11.4, 11.5, 13.1, 13.4, 13.5, 13.6, 14.1, 14.2, 14.3, 14.4, 18, 27)

Reference Books:
1. Elaine Rich, Kevin Knight: Artificial Intelligence, 3rd Edition, Tata McGraw Hill, 2009.
2. Nils J. Nilsson: Principles of Artificial Intelligence, Elsevier, 1980.

STORAGE AREA NETWORKS

Subject Code: 10IS765   I.A. Marks : 25
Hours/Week : 04   Exam Hours: 03
Total Hours : 52   Exam Marks: 100

PART –A

UNIT - 1   **7 Hours**
Introduction to Information Storage and Management, Storage System Environment: Information Storage, Evolution of Storage Technology and Architecture, Data Center Infrastructure, Key Challenges in Managing Information, Information Lifecycle
Components of Storage System Environment, Disk Drive Components, Disk Drive Performance, Fundamental Laws Governing Disk Performance, Logical Components of the Host, Application Requirements and Disk Performance.

UNIT - 2   **6 Hours**
Data Protection, Intelligent Storage system: Implementation of RAID, RAID Array Components, RAID Levels, RAID Comparison, RAID Impact on Disk Performance, Hot Spares
Components of an Intelligent Storage System, Intelligent Storage Array

UNIT - 3   **7 Hours**
Direct-Attached Storage, SCSI, and Storage Area Networks: Types of DAS, DAS Benefits and Limitations, Disk Drive Interfaces, Introduction to Parallel SCSI, Overview of Fibre Channel, The SAN and Its Evolution, Components of SAN, FC Connectivity, Fibre Channel Ports, Fibre Channel Architecture, Zoning, Fibre Channel Login Types, FC Topologies.

UNIT - 4   **6 Hours**
NAS, IP SAN: General – Purpose Service vs. NAS Devices, Benefits of NAS, NAS File I / O, Components of NAS, NAS Implementations, NAS File-Sharing Protocols, NAS I/O Operations, Factors Affecting NAS Performance and Availability. iSCSI, FCIP.

UNIT - 5   **6 Hours**

Content-Addressed Storage, Storage Virtualization: Fixed Content and Archives, Types of Archive, Features and Benefits of CAS, CAS Architecture, Object Storage and Retrieval in CAS, CAS Examples

Forms of Virtualization, SNIA Storage Virtualization Taxonomy, Storage Virtualizations Configurations, Storage Virtualization Challenges, Types of Storage Virtualization

UNIT - 6   **6 Hours**

Business Continuity, Backup and Recovery: Information Availability, BC Terminology, BC Planning Lifecycle, Failure Analysis, Business Impact Analysis, BC Technology Solutions.

Backup Purpose, Backup Considerations, Backup Granularity, Recovery Considerations, Backup Methods, Backup Process, Backup and restore Operations, Backup Topologies, Backup in NAS Environments, Backup Technologies.

UNIT - 7   **7 Hours**

Local Replication, Remote Replication: Source and Target, Uses of Local Replicas, Data Consistency, Local Replication Technologies, Restore and Restart Considerations, Creating Multiple Replicas, Management Interface, Modes of Remote Replication, Remote Replication Technologies, Network Infrastructure.

UNIT - 8   **7 Hours**

Securing the Storage Infrastructure, Managing the Storage Infrastructure: Storage Security Framework, Risk Triad, Storage Security Domains, Security Implementations in Storage Networking

Monitoring the Storage Infrastructure, Storage Management Activities, Storage Infrastructure Management Challenges, Developing an Ideal Solution.

Text Books:
1. G. Somasundaram, Alok Shrivastava (Editors): Information Storage and Management, EMC Education Services, Wiley India, 2009.

Reference Books:
1. Ulf Troppens, Rainer Erkens and Wolfgang Muller: Storage Networks Explained, Wiley India, 2003.
2. Rebert Spalding: Storage Networks, The Complete Reference, Tata McGraw Hill, 2003.

3. Richard Barker and Paul Massiglia: Storage Area Networks Essentials A Complete Guide to Understanding and Implementing SANs, Wiley India, 2002.

FUZZY LOGIC

Subject Code: 10IS766   **I.A. Marks : 25**
Hours/Week : 04   **Exam Hours: 03**
Total Hours : 52   **Exam Marks: 100**

PART – A

UNIT – 1   **7 Hours**
Introduction, Classical Sets and Fuzzy Sets: Background, Uncertainty and Imprecision, Statistics and Random Processes, Uncertainty in Information, Fuzzy Sets and Membership, Chance versus Ambiguity.
Classical Sets - Operations on Classical Sets, Properties of Classical (Crisp) Sets, Mapping of Classical Sets to Functions
Fuzzy Sets - Fuzzy Set operations, Properties of Fuzzy Sets. Sets as Points in Hypercubes

UNIT – 2   **6 Hours**
Classical Relations and Fuzzy Relations: Cartesian Product, Crisp Relations - Cardinality of Crisp Relations, Operations on Crisp Relations, Properties of Crisp Relations, Composition. Fuzzy Relations - Cardinality of Fuzzy Relations, Operations on Fuzzy Relations, Properties of Fuzzy Relations, Fuzzy Cartesian Product and Composition, Non-interactive Fuzzy Sets. Tolerance and Equivalence Relations - Crisp Equivalence Relation, Crisp Tolerance Relation, Fuzzy Tolerance and Equivalence Relations. Value Assignments - Cosine Amplitude, Max-min Method, Other Similarity methods

UNIT – 3   **6 Hours**
Membership Functions: Features of the Membership Function, Standard Forms and Boundaries, Fuzzification, Membership Value Assignments – Intuition, Inference, Rank Ordering, Angular Fuzzy Sets, Neural Networks, Genetic Algorithms, Inductive Reasoning.

UNIT – 4   **7 Hours**
Fuzzy-to-Crisp Conversions, Fuzzy Arithmetic: Lambda-Cuts for Fuzzy Sets, Lambda-Cuts for Fuzzy Relations, Defuzzification Methods

Extension Principle - Crisp Functions, Mapping and Relations, Functions of fuzzy Sets – Extension Principle, Fuzzy Transform (Mapping), Practical Considerations, Fuzzy Numbers

Interval Analysis in Arithmetic, Approximate Methods of Extension - Vertex method, DSW Algorithm, Restricted DSW Algorithm, Comparisons, Fuzzy Vectors

PART - B

UNIT – 5   6 Hours
Classical Logic and Fuzzy Logic: Classical Predicate Logic – Tautologies, Contradictions, Equivalence, Exclusive OR and Exclusive NOR, Logical Proofs, Deductive Inferences. Fuzzy Logic, Approximate Reasoning, Fuzzy Tautologies, Contradictions, Equivalence and Logical Proofs, Other forms of the Implication Operation, Other forms of the Composition Operation

UNIT – 6   6 Hours
Fuzzy Rule- Based Systems: Natural Language, Linguistic Hedges, Rule-Based Systems - Canonical Rule Forms, Decomposition of Compound Rules, Likelihood and Truth Qualification, Aggregation of Fuzzy Rules, Graphical Techniques of Inference

UNIT – 7   7 Hours
Fuzzy Decision Making : Fuzzy Synthetic Evaluation, Fuzzy Ordering, Preference and consensus, Multiobjective Decision Making, Fuzzy Bayesian Decision Method, Decision Making under Fuzzy States and Fuzzy Actions.

UNIT – 8   7 Hours
Fuzzy Classification: Classification by Equivalence Relations - Crisp Relations, Fuzzy Relations. Cluster Analysis, Cluster Validity, c-Means Clustering - Hard c-Means (HCM), Fuzzy c-Means (FCM). Classification Metric, Hardening the Fuzzy c-Partition, Similarity Relations from Clustering

Text Books:
1. Timothy J. Ross: Fuzzy Logic with Engineering Applications, 2nd Edition, Wiley India, 2007.
   (Chapter 1 (pp 1-14), Chapter 2 (pp 17-34), Chapter 3 (pp 46-70), Chapter 4 (pp 87-122), Chapter 5 (pp 130-146), Chapter 6 (pp 151-178), Chapter 7 (pp 183-210), Chapter 8 (pp 232-254), Chapter 9 (pp 313-352), Chapter 10 (pp 371 – 400))

Reference Books:
1. B Kosko: Neural Networks and Fuzzy systems: A Dynamical System approach, PHI, 1991.

Networks Laboratory

Subject Code: 10CSL77　　　　**I.A. Marks　: 25**
Hours/Week : 03　　　　　　　**Exam　Hours: 03**
Total Hours : 42　　　　　　　**Exam Marks: 50**

Note: Student is required to solve one problem from PART-A and one problem from PART-B. The questions are allotted based on lots. Both questions carry equal marks.

PART A – Simulation Exercises

The following experiments shall be conducted using either NS228/OPNET or any other suitable simulator.

1. Simulate a three nodes point – to – point network with duplex links between them. Set the queue size and vary the bandwidth and find the number of packets dropped.
2. Simulate a four node point-to-point network with the links connected as follows:
   n0 – n2, n1 – n2 and n2 – n3. Apply TCP agent between n0-n3 and UDP between n1-n3. Apply relevant applications over TCP and UDP agents changing the parameter and determine the number of packets sent by TCP / UDP.
3. Simulate the transmission of ping messages over a network topology consisting of 6 nodes and find the number of packets dropped due to congestion.
4. Simulate an Ethernet LAN using n nodes (6-10), change error rate and data rate and compare throughput.
5. Simulate an Ethernet LAN using n nodes and set multiple traffic nodes and plot congestion window for different source / destination.
6. Simulate simple ESS and with transmitting nodes in wire-less LAN by simulation and determine the performance with respect to transmission of packets.

PART-B
Implement the following in C/C++:

7. Write a program for error detecting code using CRC-CCITT (16- bits).
8. Write a program for distance vector algorithm to find suitable path for transmission.
9. Using TCP/IP sockets, write a client – server program to make the client send the file name and to make the server send back the contents of the requested file if present.

10. Implement the above program using as message queues or FIFOs as IPC channels.
11. Write a program for simple RSA algorithm to encrypt and decrypt the data.
12. Write a program for congestion control using leaky bucket algorithm.

Note:
In the examination, a combination of one problem has to be asked from Part A for a total of 25 marks and one problem from Part B has to be asked for a total of 25 marks. The choice must be based on random selection from the entire lots.

Web Programming Laboratory

Subject Code: 10CSL78   **I.A. Marks : 25**
Hours/Week : 03   **Exam Hours: 03**
Total Hours : 42   **Exam Marks: 50**

1. Develop and demonstrate a XHTML file that includes Javascript script for the following problems:
   a) Input: A number n obtained using prompt
       Output: The first n Fibonacci numbers
   b) Input: A number n obtained using prompt
       Output: A table of numbers from 1 to n and their squares using **alert**
2. a) Develop and demonstrate, using Javascript script, a XHTML document that collects the USN (the valid format is: A digit from 1 to 4 followed by two upper-case characters followed by two digits followed by two upper-case characters followed by three digits; no embedded spaces allowed) of the user. Event handler must be included for the form element that collects this information to validate the input. Messages in the alert windows must be produced when errors are detected.
   b) Modify the above program to get the current semester also (restricted to be a number from 1 to 8)
3. a) Develop and demonstrate, using Javascript script, a XHTML document that contains three short paragraphs of text, stacked on top of each other, with only enough of each showing so that the mouse cursor can be placed over some part of them. When the cursor is placed over the exposed part of any paragraph, it should rise to the top to become completely visible.
   b) Modify the above document so that when a paragraph is moved from the top stacking position, it returns to its original position rather than to the bottom.
4. a) Design an XML document to store information about a student in an engineering college affiliated to VTU. The information must include

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USN, Name, Name of the College, Brach, Year of Joining, and e-mail id. Make up sample data for 3 students. Create a CSS style sheet and use it to display the document.

b) Create an XSLT style sheet for one student element of the above document and use it to create a display of that element.

5. a) Write a Perl program to display various Server Information like Server Name, Server Software, Server protocol, CGI Revision etc.

b) Write a Perl program to accept UNIX command from a HTML form and to display the output of the command executed.

6. a) Write a Perl program to accept the User Name and display a greeting message randomly chosen from a list of 4 greeting messages.

b) Write a Perl program to keep track of the number of visitors visiting the web page and to display this count of visitors, with proper headings.

7. Write a Perl program to display a digital clock which displays the current time of the server.

8. Write a Perl program to insert name and age information entered by the user into a table created using MySQL and to display the current contents of this table.

9. Write a PHP program to store current date-time in a COOKIE and display the 'Last visited on' date-time on the web page upon reopening of the same page.

10. Write a PHP program to store page views count in SESSION, to increment the count on each refresh, and to show the count on web page.

11. Create a XHTML form with Name, Address Line 1, Address Line 2, and E-mail text fields. On submitting, store the values in MySQL table. Retrieve and display the data based on Name.

12. Build a Rails application to accept book information viz. Accession number, title, authors, edition and publisher from a web page and store the information in a database and to search for a book with the title specified by the user and to display the search results with proper headings.

Note: In the examination *each* student picks one question from the lot of *all* 12 questions.

SOFTWARE ARCHITECTURES

Subject Code: 10IS81   **I.A. Marks : 25**
Hours/Week : 04   **Exam Hours: 03**
Total Hours : 52   **Exam Marks: 100**

PART – A

UNIT – 1   **6 Hours**
Introduction: The Architecture Business Cycle: Where do architectures come from? Software processes and the architecture business cycle; What makes a "good" architecture? What software architecture is and what it is not; Other points of view; Architectural patterns, reference models and reference architectures; Importance of software architecture; Architectural structures and views.

UNIT – 2   **7 Hours**
Architectural Styles and Case Studies: Architectural styles; Pipes and filters; Data abstraction and object-oriented organization; Event-based, implicit invocation; Layered systems; Repositories; Interpreters; Process control; Other familiar architectures; Heterogeneous architectures. Case Studies: Keyword in Context; Instrumentation software; Mobile robotics; Cruise control; Three vignettes in mixed style.

UNIT – 3   **6 Hours**
Quality: Functionality and architecture; Architecture and quality attributes; System quality attributes; Quality attribute scenarios in practice; Other system quality attributes; Business qualities; Architecture qualities. Achieving Quality: Introducing tactics; Availability tactics; Modifiability tactics; Performance tactics; Security tactics; Testability tactics; Usability tactics; Relationship of tactics to architectural patterns; Architectural patterns and styles.

UNIT – 4   **7 Hours**
Architectural Patterns – 1: Introduction; From mud to structure: Layers, Pipes and Filters, Blackboard.

PART – B

UNIT – 5   **7 Hours**
Architectural Patterns – 2: Distributed Systems: Broker; Interactive Systems: MVC, Presentation-Abstraction-Control.

UNIT – 6   **6 Hours**
Architectural Patterns – 3: Adaptable Systems: Microkernel; Reflection.

UNIT – 7   **6 Hours**
Some Design Patterns: Structural decomposition: Whole – Part;
Organization of work: Master – Slave; Access Control: Proxy.

UNIT – 8   **7 Hours**
Designing and Documenting Software Architecture: Architecture in the
life cycle; Designing the architecture; Forming the team structure; Creating a
skeletal system. Uses of architectural documentation; Views; Choosing the
relevant views; Documenting a view; Documentation across views.

Text Books:
1. Len Bass, Paul Clements, Rick Kazman: Software Architecture in
   Practice, 2nd Edition, Pearson Education, 2003.
   (Chapters 1, 2, 4, 5, 7, 9)
2. Frank Buschmann, Regine Meunier, Hans Rohnert, Peter
   Sommerlad, Michael Stal: Pattern-Oriented Software Architecture,
   A System of Patterns, Volume 1, John Wiley and Sons, 2007.
   (Chapters 2, 3.1 to 3.4)
3. Mary Shaw and David Garlan: Software Architecture- Perspectives
   on an Emerging Discipline, Prentice-Hall of India, 2007.
   (Chapters 1.1, 2, 3)

Reference Books:
1. E. Gamma, R. Helm, R. Johnson, J. Vlissides: Design Patterns-
   Elements of Reusable Object-Oriented Software, Pearson Education,
   1995.

Web Reference: http://www.hillside.net/patterns/

SYSTEM MODELING AND SIMULATION

Sub Code: 10CS82   **IA Marks**   **: 25**
Hrs/Week: 04   **Exam Hours   : 03**
Total Hrs   : 52   **Exam**
Marks   : 100

PART – A
UNIT – 1   **8 Hours**
Introduction: When simulation is the appropriate tool and when it is not
appropriate; Advantages and disadvantages of Simulation; Areas of

application; Systems and system environment; Components of a system; Discrete and continuous systems; Model of a system; Types of Models; Discrete-Event System Simulation; Steps in a Simulation Study. The basics of Spreadsheet simulation, Simulation example: Simulation of queuing systems in a spreadsheet.

UNIT – 2   **6 Hours**
General Principles, Simulation Software: Concepts in Discrete-Event Simulation: The Event-Scheduling / Time-Advance Algorithm, World Views, Manual simulation Using Event Scheduling; List processing. Simulation in Java; Simulation in GPSS

UNIT – 3   **6 Hours**
Statistical Models in Simulation: Review of terminology and concepts; Useful statistical models; Discrete distributions; Continuous distributions; Poisson process; Empirical distributions.

UNIT – 4   **6 Hours**
Queuing Models: Characteristics of queuing systems; Queuing notation; Long-run measures of performance of queuing systems; Steady-state behavior of M/G/1 queue; Networks of queues; Rough-cut modeling: An illustration..

PART – B

UNIT – 5   **8 Hours**
Random-Number Generation, Random-Variate Generation: Properties of random numbers; Generation of pseudo-random numbers; Techniques for generating random numbers; Tests for Random Numbers Random-Variate Generation: Inverse transform technique; Acceptance-Rejection technique; Special properties.

UNIT – 6   **6 Hours**
Input Modeling : Data Collection; Identifying the distribution with data; Parameter estimation; Goodness of Fit Tests; Fitting a non-stationary Poisson process; Selecting input models without data; Multivariate and Time-Series input models.

UNIT – 7   **6 Hours**
Estimation of Absolute Performance: Types of simulations with respect to output analysis; Stochastic nature of output data; Absolute measures of performance and their estimation; Output analysis for terminating simulations; Output analysis for steady-state simulations.

UNIT – 8   **6 Hours**
Verification, Calibration, and Validation; Optimization: Model building, verification and validation; Verification of simulation models; Calibration and validation of models, Optimization via Simulation

Text Books:
1. Jerry Banks, John S. Carson II, Barry L. Nelson, David M. Nicol: Discrete-Event System Simulation, 5th Edition, Pearson Education, 2010.
   (Listed topics only from Chapters1 to 12)

Reference Books:
1. Lawrence M. Leemis, Stephen K. Park: Discrete – Event Simulation: A First Course, Pearson Education, 2006.
2. Averill M. Law: Simulation Modeling and Analysis, 4th Edition, Tata McGraw-Hill, 2007.

WIRELESS NETWORKS AND MOBILE COMPUTING

Sub Code: 10IS831	**IA Marks**	**: 25**
Hrs/Week: 04	**Exam Hours**	**: 03**
Total Hrs: 52	**Exam Marks**	**: 100**

PART-A
UNIT – 1   **6 Hours**
Mobile Computing Architecture: Types of Networks, Architecture for Mobile Computing, 3-tier Architecture, Design Considerations for Mobile Computing

UNIT – 2   **7 Hours**
Wireless Networks – 1: GSM and SMS: Global Systems for Mobile Communication (GSM and Short Service Messages (SMS): GSM Architecture, Entities, Call routing in GSM, PLMN Interface, GSM Addresses and Identities, Network Aspects in GSM, Mobility Management, GSM Frequency allocation. Introduction to SMS, SMS Architecture, SM MT, SM MO, SMS as Information bearer, applications

UNIT – 3   **6 Hours**
Wireless Networks – 2: GPRS : GPRS and Packet Data Network, GPRS Network Architecture, GPRS Network Operations, Data Services in GPRS, Applications for GPRS, Billing and Charging in GPRS

UNIT – 4   **7 Hours**
Wireless Networks – 3: CDMA, 3G and WiMAX: Spread Spectrum technology, IS-95, CDMA versus GSM, Wireless Data, Third Generation Networks, Applications on 3G, Introduction to WiMAX.

PART - B
UNIT – 5   **6 Hours**
Mobile Client: Moving beyond desktop, Mobile handset overview, Mobile phones and their features, PDA, Design Constraints in applications for handheld devices.Mobile IP: Introduction, discovery, Registration, Tunneling, Cellular IP, Mobile IP with IPv6

UNIT – 6   **7 Hours**
Mobile OS and Computing Environment: Smart Client Architecture, The Client: User Interface, Data Storage, Performance, Data Synchronization, Messaging. The Server: Data Synchronization, Enterprise Data Source, Messaging. Mobile Operating Systems: WinCE, Palm OS, Symbian OS, Linux, Proprietary OS Client Development : The development process, Need analysis phase, Design phase, Implementation and Testing phase, Deployment phase, Development Tools, Device Emulators.

UNIT – 7   **6 Hours**
Building, Mobile Internet Applications: Thin client: Architecture, the client, Middleware, messaging Servers, Processing a Wireless request, Wireless Applications Protocol (WAP) Overview, Wireless Languages: Markup Languages, HDML, WML, HTML, cHTML, XHTML, VoiceXML.

UNIT – 8   **7 Hours**
J2ME: Introduction, CDC, CLDC, MIDP; Programming for CLDC, MIDlet model, Provisioning, MIDlet life-cycle, Creating new application, MIDlet event handling, GUI in MIDP, Low level GUI Components, Multimedia APIs; Communication in MIDP, Security Considerations in MIDP.

Text Books:

1. Dr. Ashok Talukder, Ms Roopa Yavagal, Mr. Hasan Ahmed: Mobile Computing, Technology, Applications and Service Creation, 2d Edition, Tata McGraw Hill, 2010
2. Martyn Mallik: Mobile and Wireless Design Essentials, Wiley, 2003

Reference Books:
1. Raj kamal: Mobile Computing, Oxford University Press, 2007.
2. Iti Saha Misra: Wireless Communications and Networks, 3G and Beyond, Tata McGraw Hill, 2009.

WEB 2.0 AND RICH INTERNET APPLICATIONS

Sub Code: 10IS832   **IA Marks**   **: 25**
Hrs/ Week: 04   **Exam Hours**   **: 03**
Total Hours: 52   **Exam Marks**   **: 100**

PART - A

UNIT – 1   **6 Hours**
Introduction, Ajax – 1: Web 2.0 and Rich Internet Applications, Overview of Ajax, Examples of usage of Ajax: Updating web page text, Chatting in real time, Dragging and dropping, Downloading images. Creating Ajax Applications: An example, Analysis of example ajax.html, Creating the JavaScript, Creating and opening the XMLHttpRequest object, Data download, Displaying the fetched data, Connecting to the server, Adding Server-side programming, Sending data to the server using GET and POST, Using Ajax together with XML.

UNIT – 2   **7 Hours**
Ajax – 2: Handling multiple XMLHttpRequest objects in the same page, Using two XMLHttpRequest objects, Using an array of XMLHttpRequest objects, Using inner functions, Downloading JavaScript, connecting to Google Suggest, Creating google.php, Downloading from other domains with Ajax, HTML header request and Ajax, Defeating caching, Examples.Building XML and working with XML in JavaScript, Getting the document element, Accessing any XML element, Handling whitespace in Firefox, Handling cross-browser whitespace, Accessing XML data directly, Validating XML, Further examples of Rich Internet Applications with Ajax.

UNIT – 3   **6 Hours**
Ajax – 3: Drawing user's attention to downloaded text, Styling text, colors and background using CSS, Setting element location in the web pages, Setting the stacking order of web page elements, Further examples of using Ajax. Displaying all the data in an HTML form, Working with PHP server variables, Getting the data in to array format, Wrapping applications in to a single PHP page, Validating input from the user, Validating integers and text, DOM, Appending new elements to a web page using the DOM and Ajax, Replacing elements using the DOM, Handling timeouts in Ajax, Downloading images with Ajax, Example programs.

UNIT – 4   **7 Hours**
Flex – 1 : Introduction: Understanding Flex Application Technologies, Using Flex Elements, Working with Data Services (Loading Data at Runtime), The Differences between Traditional and Flex Web Applications, Understanding

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How Flex Applications Work, Understanding Flex and Flash Authoring. Building Applications with the Flex Framework: Using Flex Tool Sets, Creating Projects, Building Applications, Deploying Applications Framework Fundamentals: Understanding How Flex Applications Are Structured, Loading and Initializing Flex Applications, Understanding the Component Life Cycles, Loading One Flex Application into Another Flex Application, Differentiating Between Flash Player and the Flex Framework, Caching the Framework, Understanding Application Domains, Localization, Managing Layout: Flex Layout Overview, Making Fluid Interfaces, Putting It All Together.

PART B
UNIT – 5   7 Hours
Flex – 2: MXML: Understanding MXML Syntax and Structure, Making MXML Interactive Working with UI Components: Understanding UI Components, Buttons, Value Selectors, Text Components, List-Based Controls, Pop-Up Controls, Navigators, Control Bars Customizing Application Appearance: Using Styles, Skinning components, Customizing the preloader, Themes, Runtime CSS

UNIT – 6   6 Hours
Flex – 3: ActionScript: Using ActionScript, MXML and ActionScript Correlations, Understanding ActionScript Syntax, Variables and Properties, Inheritance, Interfaces, Handling Events, Error Handling, Using XML

UNIT – 7   7 Hours
Flex – 4: Managing State: Creating States, Applying States, Defining States, Adding and Removing Components, Setting Properties, Setting Styles, Setting Event Handlers, Using Action Scripts to Define States, Managing Object Creation Policies, Handling State Events, Understanding State Life Cycles, When To Use States.Using Effects and Transitions: Using Effects, Creating Custom Effects, Using Transitions, Creating Custom Transitions.

UNIT – 8   6 Hours
Flex – 5: Working with Data: Using Data Models, Data Binding, Enabling Data Binding for Custom Classes, Data Binding Examples, Building data binding proxies.Validating and Formatting Data: Validating user input, Formatting Data.

Text Books:
1. Steven Holzner: Ajax: A Beginner's Guide, Tata McGraw Hill, 2009.
   (Listed topics from Chapters 3, 4, 6, 7, 11, 12)

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2. Chafic Kazon and Joey Lott: Programming Flex 3, O'Reilly, June 2009.
(Listed topics from Chapters 1 to 8, 12 to 15)

Reference Books:
1. Jack Herrington and Emily Kim: Getting Started with Flex 3, O'Reilly, 1st Edition, 2008.
2. Michele E. Davis and John A. Phillips: Flex 3 - A Beginner's Guide, Tata McGraw-Hill, 2008.
3. Colin Moock: Essential Actionscript 3.0, O'Reilly Publications, 2007.
4. Nicholas C Zakas et al : Professional Ajax, 2nd Edition, Wrox / Wiley India, 2007.

USER INTERFACE DESIGN

Sub Code: 10IS833   IA Marks   : 25
Hrs/Week: 04   Exam Hours : 03
Total Hrs: 52   Exam Marks : 100

PART - A

UNIT 1   **8 Hours**
Usability of Interactive Systems: Introduction, Usability Requirements, Usability measures, Usability
Motivations, Universal Usability, Goals for our profession
Guideline, principles, and Theories: Introduction, Guidelines, principles, Theories, Object-Action Interface Model

UNIT 2   **5 Hours**
Managing Design Processes: Introduction, Organizational Design to support Usability, The Three pillars of design, Development Methodologies, Ethnographic Observation, Participatory Design, Scenario Development, Social Impact statement for Early Design Review, Legal Issues.

UNIT 3   **7 Hours**
Evaluating Interface Designs: Introduction, Expert Reviews, Usability Testing and Laboratories, Survey Instruments, Acceptance Tests, Evaluation During Active Use, Controlled Psychologically Oriented Experiments.
Software Tools: Introduction, Specification Methods, Interface-Building Tools, Evaluation and Critiquing Tools.

UNIT 4   **8 Hours**

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Direct Manipulation and Virtual Environments: Introduction, Examples of Direct Manipulation, 3D Interfaces, Teleoperation, Virtual and Augmented Reality.

Menu Selection, Form Fillin, and Dialog Boxes: Introduction, Task-Related Menu Organization, Single Menus, Combinations of Multiple Menus, Content Organization, Fast Movement Through Menus, Data Entry with Menus: Form Fillin, Dialog Boxes, and Alternatives, Audio Menus and Menus for small Displays.

PART - B

UNIT 5   **8 Hours**

Command and Natural Languages: Introduction, Functionality to Support User's Tasks, Command-Organization Strategies, The Benefits of Structure, Naming and Abbreviations, Natural Language in Computing.

Interaction Devices: Introduction, Keyboards and Keypads, Pointing Devices, Speech and Auditory interfaces, Displays-Small and Large, Printers.

UNIT 6   **6 Hours**

Quality of Service: Introduction, Models of Response-Time Impacts, Expectations and Attitudes, User Productivity, Variability in Response Time, Frustrating Experiences.

Balancing Function and Fashion: Introduction, Error Messages, Nonanthropomorphic Design, Display Design, Window Design, Color.

UNIT 7   **5 Hours**

User Manuals, Online Help, and Tutorials: Introduction, Paper versus Online Manuals, Reading from Paper Verses from Displays, Shaping the Content of the Manuals, Online Manuals and Help, Online Tutorials, Demonstrations, and Guides, Online Communities for User Assistance, the Development Process.

UNIT 8

5 Hours

Information Search and Visualization: Introduction, Search in Textual Documents and Database Querying, Multimedia Document Searches, Advanced Filtering and Search Interfaces, Information Visualization

Text Books:
1. Ben Shneiderman: Designing the User Interface, 4rd Edition, Pearson Education, 2009.
   (Chapters 1 to 9 and 11 to 14)

Reference Books:
1. Alan J Dix et. al.: Human-Computer Interaction, II Edition, Prentice-Hall India, 1998.

2. Eberts: User Interface Design, Prentice-Hall, 1994.
3. Wilber O Galitz: The Essential Guide to User Interface Design - An Introduction to GUI Design, Principles and Techniques, Wiley-Dreamtech India Pvt. Ltd, 1998.

NETWORK MANAGEMENT SYSTEMS

Sub Code: 10IS834	**IA Marks**	**: 25**
Hrs/Week: 04	**Exam Hours**	**: 03**
Total Hrs: 52	**Exam Marks**	**: 100**

PART – A

UNIT 1   7 Hours
Introduction: Analogy of Telephone Network Management, Data and Telecommunication Network Distributed computing Environments, TCP/IP-Based Networks: The Internet and Intranets, Communications Protocols and Standards- Communication Architectures, Protocol Layers and Services; Case Histories of Networking and Management – The Importance of topology , Filtering Does Not Reduce Load on Node, Some Common Network Problems; Challenges of Information Technology Managers, Network Management: Goals, Organization, and Functions- Goal of Network Management, Network Provisioning, Network Operations and the NOC, Network Installation and Maintenance; Network and System Management, Network Management System platform, Current Status and Future of Network Management.

UNIT 2   6 Hours
Basic Foundations: Standards, Models, and Language: Network Management Standards, Network Management Model, Organization Model, Information Model – Management Information Trees, Managed Object Perspectives, Communication Model; ASN.1- Terminology, Symbols, and Conventions, Objects and Data Types, Object Names, An Example of ASN.1 from ISO 8824; Encoding Structure; Macros, Functional Model.

UNIT 3   6 Hours
SNMPv1 Network Management - 1: Managed Network: The History of SNMP Management, Internet Organizations and standards, Internet Documents, The SNMP Model, The Organization Model, System Overview.

UNIT 4   7 Hours
SNMPv1 Network Management – 2: The Information Model – Introduction, The Structure of Management Information, Managed Objects, Management Information Base.The SNMP Communication Model – The SNMP Architecture, Administrative Model, SNMP Specifications, SNMP

Operations, SNMP MIB Group, Functional Model

PART - B

UNIT 5   **6 Hours**
SNMP Management – RMON: Remote Monitoring, RMON SMI and MIB, RMONI1- RMON1 Textual Conventions, RMON1 Groups and Functions, Relationship Between Control and Data Tables, RMON1 Common and Ethernet Groups, RMON Token Ring Extension Groups, RMON2 – The RMON2 Management Information Base, RMON2 Conformance Specifications; ATM Remote Monitoring, A Case Study of Internet Traffic Using RMON.

UNIT 6   **6 Hours**
Broadband Network Management: ATM Networks: Broadband Networks and Services, ATM Technology – Virtual Path-Virtual Circuit, TM Packet Size, Integrated Service, SONET, ATM LAN Emulation, Virtual LAN; ATM Network Management – The ATM Network Reference Model, The Integrated Local Management Interface, The ATM Management Information Base, The Role of SNMP and ILMI in ATM Management, M1 Interface: Management of ATM Network Element, M2 Interface: Management of Private Networks, M3 Interface: Customer Network Management of Public Networks, M4 Interface: Public Network Management, Management of LAN Emulation, ATM Digital Exchange Interface Management.

UNIT 7   **6 Hours**
Broadband Network Management: Broadband Access Networks and Technologies – Broadband Access Networks, roadband Access Technology; HFCT Technology – The Broadband LAN, The Cable Modem, The Cable Modem Termination System, The HFC Plant, The RF Spectrum for Cable Modem; Data Over Cable Reference Architecture; HFC Management – Cable Modem and CMTS Management, HFC Link Management, RF Spectrum Management, DSL Technology; Asymmetric Digital Subscriber Line Technology – Role of the ADSL Access Network in an Overall Network, ADSL Architecture, ADSL Channeling Schemes, ADSL Encoding Schemes; ADSL Management – ADSL Network Management Elements, ADSL Configuration Management, ADSL Fault Management, ADSL Performance Management, SNMP-Based ADSL Line MIB, MIB Integration with Interfaces Groups in MIB-2, ADSL Configuration Profiles.

UNIT 8   **8 Hours**
Network Management Applications: Configuration Management- Network Provisioning, Inventory Management, Network Topology, Fault Management- Fault Detection, Fault Location and Isolation Techniques,

Performance Management – Performance Metrics, Data Monitoring, Problem Isolation, Performance Statistics; Event Correlation Techniques – Rule-Based Reasoning, Model-Based Reasoning, Case-Based Reasoning, Codebook correlation Model, State Transition Graph Model, Finite State Machine Model, Security Management – Policies and Procedures, Security Breaches and the Resources Needed to Prevent Them, Firewalls, Cryptography, Authentication and Authorization, Client/Server Authentication Systems, Messages Transfer Security, Protection of Networks from Virus Attacks, Accounting Management, Report Management, Policy-Based Management, Service Level Management.

Text Books:
1. Mani Subramanian: Network Management- Principles and Practice, 2nd Edition, Pearson Education, 2010.

Reference Books:
1. J. Richard Burke: Network management Concepts and Practices: a Hands-On Approach, PHI, 2008.

INFORMATION AND NETWORK SECURITY

Subject Code: 10IS835	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART – A

UNIT 1   **6 Hours**
Planning for Security: Introduction; Information Security Policy, Standards, and Practices; The Information Security Blue Print; Contingency plan and a model for contingency plan

UNIT 2   **6 Hours**
Security Technology-1: Introduction; Physical design; Firewalls; Protecting Remote Connections

UNIT 3   **6 Hours**
Security Technology – 2: Introduction; Intrusion Detection Systems (IDS); Honey Pots, Honey Nets, and Padded cell systems; Scanning and Analysis Tools

UNIT 4   **8 Hours**
Cryptography: Introduction; A short History of Cryptography; Principles of Cryptography; Cryptography Tools; Attacks on Cryptosystems.

PART - B

UNIT 5   **8 Hours**
Introduction to Network Security, Authentication Applications: Attacks, services, and Mechanisms; Security Attacks; Security Services; A model for Internetwork Security; Internet Standards and RFCs Kerberos, X.509 Directory Authentication Service.

UNIT 6   **6 Hours**
Electronic Mail Security: Pretty Good Privacy (PGP); S/MIME

UNIT 7   **6 Hours**
IP Security: IP Security Overview; IP Security Architecture; Authentication Header; Encapsulating Security Payload; Combining Security Associations; Key Management.

UNIT 8   **6 Hours**
Web Security: Web security requirements; Secure Socket layer (SSL) and Transport layer Security (TLS); Secure Electronic Transaction (SET)

Text Books:
1. Michael E. Whitman and Herbert J. Mattord: Principles of Information Security, 2nd Edition, Cengage Learning, 2005. (Chapters 5, 6, 7, 8; Exclude the topics not mentioned in the syllabus)
2. William Stallings: Network Security Essentials: Applications and Standards, 3rd Edition, Pearson Education, 2007. (Chapters: 1, 4, 5, 6, 7, 8)

Reference Book:
1. Behrouz A. Forouzan: Cryptography and Network Security, Special Indian Edition, Tata McGraw-Hill, 2007.

MICROCONTROLLER-BASED SYSTEMS

Subject Code: 10IS836	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART – A
UNIT 1   **7 Hours**
Introduction, 8051 Assembly Language Programming – 1: Microcontrollers and embedded processors; Overview of the 8051 family 8051 Assembly Language Programming (ALP) -1: Inside the 8051;

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Introduction to 8051 ALP; Assembling and running an 8051 program; The PC and ROM space in 8051; Data types, directives, flag bits, PSW register, register banks, and the stack.

UNIT 2   **6 Hours**
ALP – 2: Jump and loop instructions; Call instructions; Time delay for various 8051 family members; I/O programming; I/O bit manipulation programming. Immediate and register addressing modes; Accessing memory using various addressing modes.

UNIT 3   **7 Hours**
ALP – 3 - Programming in C: Bit addresses for I/O and RAM; Extra 128 bytes of on-chip RAM in 8052.Arithmetic instructions; Signed numbers and arithmetic operations; Logic and compare instructions; rotate instruction and serialization; BCD, ASCII, and other application programs. Programming in C: Data types and time delays; I/O programming; Logic operations; Data conversion programs; Accessing code ROM space; Data serialization.

UNIT 4   **6 Hours**
Pin Description, Timer Programming: Pin description of 8051; Intel Hex file; Programming the 8051 timers; Counter programming; Programming Timers 0 and 1 in C.

PART – B
UNIT 5   **6 Hours**
Serial Port Programming, Interrupt Programming: Basics of serial communications; 8051 connections to RS232; Serial port programming in assembly and in C 8051 interrupts; Programming timer interrupts; Programming external hardware interrupts; Programming the serial communications interrupt; Interrupt priority in 8051 / 8052; Interrupt programming in C.

UNIT 6   **7 Hours**
Interfacing LCD, Keyboard, ADC, DAC and Sensors : LCE interfacing; Keyboard interfacing; Parallel and serial ADC; DAC interfacing; Sensor interfacing and signal conditioning

UNIT 7   **7 Hours**
Interfacing to External Memory, Interfacing with 8255: Memory address decoding; Interfacing 8031 / 8051 with external ROM; 8051 data memory space; Accessing external data memory in C. Interfacing with 8255; Programming 8255 in C.

UNIT 8   **6 Hours**
DS12887 RTC interfacing and Programming, Applications: DS12887
RTC interfacing; DS12887 RTC programming in C; Alarm, SQW, and IRQ
features of DS12886 Relays and opto-isolators; Stepper motor interfacing;
DC motor interfacing and PWM

Text Books:
1. Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D.
   McKinlay: The 8051 Microcontroller and Embedded Systems using
   Assembly and C, 2nd Edition, Pearson Education,2008.

Reference Books:
1. Raj Kamal: Microcontrollers Architecture, Programming,
   Interfacing and System Design, Pearson Education, 2007.
2. Dr. Ramani Kalpathi, Ganesh Raja: Microcontrollers and
   Applications, 1st Revised Edition, Sanguine - Pearson, 2010.

ADHOC NETWORKS

Sub Code: 10IS841	**IA Marks**	**: 25**
Hrs/Week: 04	**Exam Hours**	**: 03**
Total Hrs: 52	**Exam Marks**	**: 100**

PART – A

UNIT 1   **6 Hours**
Introduction: Ad hoc Networks: Introduction, Issues in Ad hoc wireless
networks, Ad hoc wireless internet.
UNIT 2   **7 Hours**
MAC – 1: MAC Protocols for Ad hoc wireless Networks: Introduction,
Issues in designing a MAC protocol for Ad hoc wireless Networks, Design
goals of a MAC protocol for Ad hoc wireless Networks, Classification of
MAC protocols, Contention based protocols with reservation mechanisms.

UNIT 3   **6 Hours**
MAC – 2: Contention-based MAC protocols with scheduling mechanism,
MAC protocols that use directional antennas, Other MAC protocols.

UNIT 4   **7 Hours**
Routing – 1: Routing protocols for Ad hoc wireless Networks: Introduction,
Issues in designing a routing protocol for Ad hoc wireless Networks,
Classification of routing protocols, Table drive routing protocol, On-demand
routing protocol.

PART- B

UNIT 5   **6 Hours**
Routing – 2: Hybrid routing protocol, Routing protocols with effective flooding mechanisms, Hierarchical routing protocols, Power aware routing protocols

UNIT 6   **7 Hours**
Transport Layer: Transport layer protocols for Ad hoc wireless Networks: Introduction, Issues in designing a transport layer protocol for Ad hoc wireless Networks, Design goals of a transport layer protocol for Ad hoc wireless Networks, Classification of transport layer solutions, TCP over Ad hoc wireless Networks, Other transport layer protocols for Ad hoc wireless Networks.

UNIT 7   **6 Hours**
Security: Security: Security in wireless Ad hoc wireless Networks, Network security requirements, Issues & challenges in security provisioning, Network security attacks, Key management, Secure routing in Ad hoc wireless Networks.

UNIT 8   **7 Hours**
QoS: Quality of service in Ad hoc wireless Networks: Introduction, Issues and challenges in providing QoS in Ad hoc wireless Networks, Classification of QoS solutions, MAC layer solutions, network layer solutions.

Text Books:
1. C. Siva Ram Murthy & B. S. Manoj: Ad hoc Wireless Networks, 2nd Edition, Pearson Education, 2005.

Reference Books:
1. Ozan K. Tonguz and Gianguigi Ferrari: Ad hoc Wireless Networks, John Wiley, 2008.
2. Xiuzhen Cheng, Xiao Hung, Ding-Zhu Du: Ad hoc Wireless Networking, Kluwer Academic Publishers, 2004.
3. C.K. Toh: Adhoc Mobile Wireless Networks- Protocols and Systems, Pearson Education, 2002.

INFORMATION RETRIEVAL

Subject Code: 10IS842　　　**I.A. Marks: 25**
Hours/Week:　4　　　　　　**Exam Marks: 100**
Total Hours:　52　　　　　**Exam Hours: 3**

PART – A

UNIT – 1　　　　　　　　　　　　　　　　　**7 Hours**
Introduction, Retrieval Strategies – 1: Introduction; Retrieval Strategies:
Vector Space Model; Probabilistic Retrieval strategies

UNIT – 2　　　　　　　　　　　　　　　　　**6 Hours**
Retrieval Strategies – 2: Some More Retrieval Strategies: Language
Models; Inference Networks; Extended Boolean Retrieval; Latent Semantic
Indexing; Neural Networks; Genetic Algorithms; Fuzzy Set Retrieval.

UNIT – 3　　　　　　　　　　　　　　　　　**7 Hours**
Retrieval Utilities: Relevance feedback; Clustering; Passage-Based
Retrieval; N-Grams; Regression Analysis; Thesauri; Semantic Networks;
Parsing.

UNIT – 4　　　　　　　　　　　　　　　　　**6 Hours**
Indexing and Searching: Introduction; Inverted Files; Other indices for text;
Boolean queries; Sequential searching; Pattern matching; Structural queries;
Compression.

PART – B

UNIT – 5　　　　　　　　　　　　　　　　　**6 Hours**
Cross-Language Information Retrieval and Efficiency: Introduction;
Crossing the language barrier; Cross-Language retrieval strategies; Cross
language utilities. Duplicate Document Detection.

UNIT – 6　　　　　　　　　　　　　　　　　**6 Hours**
Integrating Structured Data and Text: Review of the relational model; A
historical progression; Information retrieval as a relational application; Semi-
structured search using a relational schema; Multi-dimensional data model.

UNIT – 7　　　　　　　　　　　　　　　　　**7 Hours**
Parallel Information Retrieval, Distributed Information Retrieval:
Parallel text scanning; Parallel indexing; Clustering and classification; Large

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parallel systems; A theoretic model of distributed information retrieval; Web search; Result fusion; Peer-to-Peer information systems; Other architectures.

UNIT – 8   7 Hours
Multimedia IR: Introduction; data modeling; Query languages; Spatial access methods; A general multimedia indexing approach; One-dimensional time series; Two-dimensional color images; Automatic picture extraction.

Text Books:
1. David A. Grossman, Ophir Frieder: Information Retrieval Algorithms and Heuristics, 2nd Edition, Springer, 2004.
   (Chapters 1, 2, 3, 4, 5, 6, 7, 8)
2. Ricardo Baeza-Yates, Berthier Ribeiro-Neto: Modern Information Retrieval, Pearson Education, 1999
   (Chapters 8, 11, 12)

Reference Books:
1. William B. Frakes, Ricardo Baeza-Yates (Editors): Information Retrieval Data Structures & Algorithms, Pearson Education, 1992.

SUPPLY CHAIN MANAGEMENT

Subject Code: 10IS843	**I.A. Marks: 25**
Hours/Week: 4	**Exam Marks: 100**
Total Hours: 52	**Exam Hours: 3**

PART – A

UNIT – 1   6 Hours
Introduction to Supply Chain, Performance of Supply Chain: What is a Supply Chain; Decision phases in a supply Chain; Process view of a Supply Chain; The importance of Supply Chain Flows; Examples of Supply Chains.
Competitive and Supply Chain strategies; Achieving strategic fit; Expanding strategic scope.

UNIT – 2   6 Hours
Supply Cain drivers and Obstacles, Designing Distribution Network: Drivers of Supply Chain Performance; A framework for structuring drivers; Facilities, Inventory, Transportation, and Information; Obstacles to achieve strategic fit
The role of distribution in the Supply Chain; factors influencing distribution network design; Design options for a distribution network; the value of distributors in the Supply Chain; Distribution Networks in practice.

UNIT – 3   **7 Hours**
Network Design: The role of network design in the Supply Chain; Factors influencing Network design Decisions; A framework for Network Design Decisions; Models for facility Location and Capacity Allocation; making Network Design decisions in practice.
The impact of uncertainty on Network design; Discounted cash flow analysis; Representations of uncertainty; Evaluating Network Design decisions using Decision Trees; Making Supply Chain decisions under uncertainty in practice.

UNIT – 4   **7 Hours**
Demand Forecasting, Aggregate Planning: The role of forecasting in a Supply Chain; Characteristics of forecast; Components of a forecast and forecasting methods; Basic approach of Demand forecasting; Time series forecasting methods; Measures of forecast errors; The role of aggregate planning in a supply Chain; The aggregate planning problem; Aggregate planning strategies.

PART – B
UNIT – 5   **6 Hours**
Inventory Management: The role of cycle inventory in a supply Chain; Economies of scale to   exploit fixed costs, quantity discounts; Short-term discounting; Managing multi-echelon cycle inventory; Estimating cycle inventory related costs in practice.

UNIT – 6   **7 Hours**
Transportation: The role of transportation in the Supply Chain; Factors affecting   transportation decisions; Modes of transportation and their performance characteristics; Design options for a transportation network; Trade-offs in transportation design; Tailored transportation; Routing and scheduling in transportation; Making transportation decisions in practice.

UNIT – 7   **7 Hours**
Pricing and Revenue Management, Coordination : The role of revenue management in Supply Chain; revenue management for multiple customer segments, perishable assets, seasonal demand, and bulk and spot contracts; Using revenue management in practice
Lack of Supply Chain coordination and Bullwhip effect; Effect of lack of coordination on performance; Obstacles to coordination in the Supply Chain; managerial levers to achieve coordination; Building strategic partnerships and trust within a supply Chain; Achieving coordination in practice.

UNIT – 8   **6 Hours**
IT, Internet and Supply Chain: The role of IT in the Supply Chain; The Supply Chain IT framework; CRM; Internal SCM; Supplier Relationship Management; The transaction management foundation; The future if IT in SCM; Supply Chain It in practice.
The role of E-Business in Supply Chain; The E-Business framework; The B2B addition to the E-Business framework; E-Business in practice

Text Books:
1. Sunil Chopra, Pter Meindl: Supply Chain Management Strategy, Planning, and Operation, 3rd Edition, Pearson Education, 2007. (Chapters 1, 2, 4, 4, 5, 6, 7, 8.1 to 8.3, 10, 14, 15, 16, 17, 18)

Reference Books:
1. David Simchi-Levi, Philp Kaminky, Edith Simchi-Levi: Designing and Managing The Supply Chain Concepts, Strategies & Case Studies, 3rd Edition, Tata McGraw Hill, 2003.
2. R.P. Mohanty, S.G. Deshmukh: Supply Chain Management Theories & Practices, Bizmantra, 2005.
3. Rahul V. Altekar: Supply Chain Management Concepts and Cases, PHI, 2005.
4. M Martin Christopher: Logistics and Supply Chain Management, 2nd Edition, Pearson Education, 1998.

SERVICES ORIENTED ARCHITECTURE

Subject Code: 10IS844   **I.A. Marks: 25**
Hours/Week: 4   **Exam Marks: 100**
Total Hours: 52   **Exam Hours: 3**

PART – A

UNIT 1   **7 Hours**
Introduction o SOA, Evolution of SOA: Fundamental SOA; Common Characteristics of contemporary SOA; Common tangible benefits of SOA;An SOA timeline (from XML to Web services to SOA); The continuing evolution of SOA (Standards organizations and Contributing vendors); The roots of SOA (comparing SOA to Past architectures).

UNIT 2   **6 Hours**
Web Services and Primitive SOA : The Web services framework; Services (as Web services); Service descriptions (with WSDL); Messaging (with SOAP).

UNIT 3   **6 Hours**
Web Services and Contemporary SOA – 1: Message exchange patterns; Service activity; Coordination; Atomic Transactions; Business activities; Orchestration; Choreography

UNIT 4   **7 Hours**
Web Services and Contemporary SOA – 2: Addressing; Reliable messaging; Correlation; Polices; Metadata exchange; Security; Notification and eventing

PART – B

UNIT 5   **7 Hours**
Principles of Service – Orientation: Services-orientation and the enterprise; Anatomy of a service-oriented architecture; Common Principles of Service-orientation; How service orientation principles inter-relate; Service-orientation and object-orientation; Native Web service support for service-orientation principles.

UNIT 6   **6 Hours**
Service Layers: Service-orientation and contemporary SOA; Service layer abstraction; Application service layer, Business service layer, Orchestration service layer; Agnostic services; Service layer configuration scenarios

UNIT 7   **7 Hours**
Business Process Design: WS-BPEL language basics; WS-Coordination overview; Service-oriented business process design; WS-addressing language basics; WS-Reliable Messaging language basics

UNIT 8   **6 Hours**
SOA Platforms: SOA platform basics; SOA support in J2EE; SOA support in .NET; Integration considerations

Text Books:
1. Thomas Erl: Service-Oriented Architecture – Concepts, Technology, and Design, Pearson Education, 2005.

Reference Books:
1. Eric Newcomer, Greg Lomow: Understanding SOA with Web Services, Pearson Education, 2005.

Clouds, Grids, and Clusters

Subject Code: 10IS845   **I.A. Marks: 25**
Hours/Week: 4   **Exam Marks: 100**
Total Hours: 52   **Exam Hours: 3**

PART – A
UNIT - 1   **6 Hours**
Introduction: Overview of Cloud Computing, Applications, Intranets and the Cloud, When can cloud Computing be used? Benefits and limitations, Security concerns, Regulatory issues

UNIT - 2   **6 Hours**
Business Case for Cloud, Examples of Cloud Services: Cloud computing services, Help to the business, Deleting the data center. Examples: Google, Microsoft, IBM, Salesforce.com and its uses, Cloud at Thomson Reuters.

UNIT - 3   **7 Hours**
Technology, Cloud Storage, Standards: Cloud Computing Technology: Clients, Security, Network, Services.
Overview of Cloud storage, Some providers of Cloud storage. Standards: Applications, Clients, Infrastructure, Service.

UNIT - 4   **7 Hours**
Other issues: Overview of SaaS (Software as a Service), Driving forces, Company offerings: Google, Microsoft, IBM. Software plus Service: Overview, Mobile device integration Local Clouds, Thin Clients, Migrating to the Cloud: Virtualization, Server solutions, Thin clients, Cloud services for individuals, mid-markets, and enterprises, Migration.

PART - B
UNIT - 5   **7 Hours**
GRID Computing – 1: Introduction: Data Center, The Grid and the Distributed/ High Performance Computing, Cluster Computing and Grid Computing, Metacomputing – the Precursor of Grid Computing, Scientific, Business and e-Governance Grids, Web services and Grid Computing, Business Computing and the Grid – a Potential Win win Situation, e-Governance and the Grid. Technologies and Architectures for Grid Computing: Clustering and Grid Computing, Issues in Data Grids, Key Functional Requirements in Grid Computing, Standards for Grid Computing , Recent Technological Trends in Large Data Grids.OGSA and WSRF: OGSA for Resource Distribution, Stateful Web Services in OGSA, WSRF (Web Services Resource Framework), Resource Approach to Stateful Services, WSRF Specification.

The Grid and the Database: Issues in Database Integration with the Grid, The Requirements of a Grid enabled database, Storage Request Broker (SRB), How to integrate the Database with the Grid? The Architecture of OGSA-DAI for Offering Grid Database Services

UNIT - 6   **6 Hours**
GRID Computing – 2: World Wide Grid Computing Activities, Organizations and Projects: Standards Organizations, Organizations Developing Grid Computing Tool Kits, Framework and Middleware, Grid Projects and Organizations Building and Using Grid Based Solutions. Web Services and the Service Oriented Architecture (SOA): History and Background, Service Oriented Architecture, How a Web Service Works, SOAP and WSDL, Description, Creating Web Services, Server Side. Globus Toolkit: History of Globus Toolkit, Versions of Globus Toolkit, Applications of GT4 – cases, GT4 – Approaches and Benefits, Infrastructure Management, Monitoring and Discovery, Security, Data, Choreography and Coordination, Main Features of GT4 Functionality – a Summary, GT4 Architecture, GT4 Command Line Programs, GT4 Containers.

UNIT - 7   **7 Hours**
Cluster Computing – 1: Introduction: What is Cluster Computing, Approaches to Parallel Computing, How to Achieve Low Cost Parallel Computing through Clusters, Definition and Architecture of a Cluster, What is the Functionality a Cluster can offer? Categories of Clusters Cluster Middleware: Levels and Layers of Single System Image (SSI), Cluster Middleware Design Objectives, Resource Management and Scheduling, Cluster Programming Environment and Tools. Early Cluster Architectures and High Throughput Computing Clusters: Early Cluster Architectures, High Throughput Computing Clusters, Condor. Setting up and Administering a Cluster: How to set up a Simple Cluster? Design considerations for the Front End of a Cluster, Setting up nodes, Clusters of Clusters or Metaclusters, System Monitoring, Directory Services inside the Clusters & DCE, Global Clocks Sync, Administering heterogeneous Clusters.

UNIT - 8   **6 Hours**
Cluster Computing – 2: Cluster Technology for High Availability: Highly Available Clusters, High Availability Parallel Computing, Mission Critical (or Business Critical or Business Continuity) Applications, Types of Failures and Errors, Cluster Architectures and Configurations for High Availability, Faults and Error Detection, Failure Recovery, Failover / Recovery Clusters. Performance Model and Simulation: Performance Measures and Metrics, Profit Effectiveness of Parallel Computing through Clusters. Process Scheduling, Load Sharing and Load Balancing: Job Management System (JMS) Resource Management System (RMS), Queues, Hosts, Resources, Jobs and Policies, Policies for Resource Utilization, Scheduling Policies

Load Sharing and Load Balancing, Strategies for Load Balancing, Modeling Parameters Case Studies of Cluster Systems: Beowulf, PARAM.

Text Books:
1. Anthony T. Velte, Toby J. Velte, Robert Elsenpeter: Cloud Computing, A Practical Approach, McGraw Fill, 2010.
2. Prabhu: Grid and Cluster Computing, PHI, 2007.

Reference Books:
1. Joshy Joseph, Craig Fellenstein: Grid Computing, Pearson Education, 2007.
2. Internet Resources

DECISION SUPPORT SYSTEMS

Subject Code: 10IS846	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART - A

UNIT – 1   **6 Hours**
Decision Making and Computerized Support – 1: Managers and Decision Making, Managerial-Decision Making and Information Systems, Managers and Computer Support, Computerized Decision Support and the Supporting technologies, A frame work for decision support, The concept of Decision Support systems, Group Decision Support Systems, Enterprise Information Systems, Knowledge Management systems, Expert Systems, Artificial Neural Networks, Hybrid Support Systems.
Decision-Making Systems, Modeling, and Support: Introduction and Definitions, Systems, Models.

UNIT – 2   **6 Hours**
Decision Making and Computerized Support – 2: Phases of Decision-Making Process, Decision-Making: The Intelligence Phase, Decision Making: The Design Phase, Decision Making: The Choice Phase, Decision Making: Implementation Phase, How decisions are supported, Personality types, gender, human cognition, and decision styles; The Decision –Makers.

UNIT – 3   **6 Hours**
Decision Support Systems: An Overview: DSS Configuration, What is DSS? Characteristics and Capabilities of DSS, Components of DSS, The Data Management Subsystem, The   Model Management Subsystem, The

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User Interface Subsystem, The Knowledge-Based Management Subsystem, The User, DSS Hardware, DSS Classification.

UNIT – 4   **6 Hours**
Decision Support Systems Development: Introduction to DSS development, The Traditional System Development Life cycle, Alternate Development Methodologies, Prototyping: The DSS Development Methodology, DSS Technology Levels and Tools, DSS Development Platforms, DSS Development Tool Selection, Team-Developed DSS, End User-Developed DSS, Putting the System Together.

PART - B

UNIT – 5   **6 Hours**
Group Support Systems: Group Decision Making, Communication and Collaboration, Communication Support, Collaboration Support: Computer-Supported Cooperative work, Group Support Systems, Group Support Systems Technologies, Group Systems Meeting Room and Online, The GSS Meeting Process, Distance Learning, Creativity and Idea Generation.

UNIT – 6   **7 Hours**
Enterprise Information Systems: Concepts and definitions, Evolution of Executive and Enterprise Information Systems, Executive's roles and information needs, Characteristics and capabilities of Executive Support Systems, Comparing and integrating EIS and DSS, Supply and Value Chains and Decision Support, Supply Chain problems and solutions, MRP, ERP / ERM, SCM, CRM, PLM, BPM, and BAM.

UNIT – 7   **6 Hours**
Knowledge Management: Introduction, Organizational learning and Transformation, Knowledge management initiatives, Approaches to Knowledge management, IT in Knowledge management, Knowledge management systems implications, Role of people in Knowledge management, Ensuring success of Knowledge management.

UNIT – 8   **6 Hours**
Integration, Impacts, and the Future of Management-Support Systems: System Integration: An Overview, Models of MSS integration, Intelligent DSS, Intelligent modeling and model management, Integration with the Web, Enterprise systems, and Knowledge Management, The impact of MSS: An Overview, MSS impacts on organizations, Impact on individuals, Decision-Making and the Manager's job, Issues of legality, privacy, and ethics, Intelligent Systems and employment levels, Internet communities, Other societal impacts and the Digital Divide, The future of Management-Support Systems.

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Text Books:

1. Efraim Turban. Jay E. Aronson, Ting-Peng Liang: Decision Support Systems and Intelligent Systems, 8th Edition, Pearson Education, 2008.

   (Chapters 1, 2, 3, 6, 7, 8 excluding 8.7 to 8.9, 9, 15)

Reference Books:

1. Sprague R.H. Jr and H.J. Watson: Decision Support Systems, 4th Edition, Prentice Hall, 1996.