# MCA Syllabus w.e.f 2019-2020

**MASTER OF COMPUTER APPLICATIONS - MCA**
**Course Structure and Scheme of Examination w.e.f 2019-20**

**Objectives:**

1. To produce software professionals enriched with knowledge and skill who can be employed in IT
2. Induct knowledge needed for designing and implementing Application Software Systems along with offering support to automated systems.
3. To develop entrepreneurs who can develop customized solutions for small to large Enterprises.
4. To develop academically competent and professionally motivated personnel, equipped with objective, critical thinking, right moral and ethical values that compassionately foster the scientific temper with a sense of social responsibility.
5. To develop students to become globally competent.
6. To inculcate entrepreneurial skills among students

**Outcomes:**

(a) Ability to implement their knowledge of Mathematical Foundations in computing problems.
(b) Ability to conceptualize the programming languages and their applications.
(c) Ability to practice and develop software for interpretation and analysis of data.
(d) Ability to utilize the techniques, skills, and software tools required for software development.
(e) Ability to recognize and analyze problems in multiple aspects including coding, testing and implementation of software applications.
(f) Ability to build operational software for organizations satisfying various constraints like economic, social and ethical.
(g) Ability to use the knowledge of enterprise level application software for design of engineering product or process.
(h) Ability to function as consultant for the development of sustainable software solutions.
(i) Perceiving professional and ethical values.
(j) Ability to convey efficiently in different groups and manifest leadership skills.
(k) To develop an interpretation of global environment and its security.

**FIRST YEAR – FIRST SEMESTER**

| Sub Code | Name of the Subject | Int. Marks | Ext. Marks | Total Marks | No of Credits | Hours/ Week |
|---|---|---|---|---|---|---|
| MCA 1.1 | Programming with C | 30 | 70 | 100 | 5 | 4 |
| MCA1.2 | Computer Organization | 30 | 70 | 100 | 5 | 4 |
| MCA1.3 | Language Processors | 30 | 70 | 100 | 4 | 4 |
| MCA1.4 | Discrete Mathematical Structures | 30 | 70 | 100 | 5 | 4 |
| MCA 1.5 | Accountancy and Financial Management | 30 | 70 | 100 | 4 | 4 |
| MCA 1.6 | C Programming Lab | 30 | 70 | 100 | 3 | 6 |
| MCA 1.7 | Computer Organization Lab | 30 | 70 | 100 | 3 | 6 |
| MCA 1.8 | Seminar | 50 | -- | 50 | 1 | 3 |
| | **TOTAL** | **260** | **490** | **750** | **30** | **35** |

| MCA 1.1 | PROGRAMMING WITH C | |
|---|---|---|
| Instruction: 4 periods / week | | Credits: 5 |
| Internal : 30 marks | University Exam: 70 marks | Total : 100 Marks |

**Objectives:**
The course is designed to meet the objectives of:

1. Teaching and training of different problems in C programming
3. Training the students to write efficient coding,
4. Guiding students to fragment problems into different functions or units.

**Outcomes:**
Students upon completion of this course will be able to:

1. Understand the basics used in computer programming
2. Write, compile and debug programs in C language in different operating systems.
3. Design programs involving decision structures, loops and functions.
4. Skilled to write low level programming by using C language

## SYLLABUS

**Unit-I**

**Introductory Concepts:** Types of Programming Languages, Introduction to C, Desirable Program Characteristics

**Introduction to C Programming:** The C Character Set, Writing First Program of C, Identifiers and Keywords, Data types, Constants, Variables and Arrays, Declarations, Expressions Statements, Symbolic Constants

**Operators and Expressions:** Arithmetic Operators, Unary Operators, Relational and Logical Operators, Assignment Operators, The Conditional Operator, Library Functions.

**Data Input and Output:** Preliminaries, Single Character Input-The Getchar Function, Single Character Output – The Putchar Function, Enter Input Data – The Scanf Function, More About the Scanf Function, Writing Output Data – The Printf Function, More About the Printf Function, The Gets and Puts Functions

**Preparing and Running A Complete C Program**: Planning a C Program, Writing a C Program, Error Diagnostics, Debugging Techniques

**Unit-II**

**Control Statements:** Preliminaries, Branching: The IF-ELSE Statement, Looping: The while Statement, More Looping: The do-while Statement, Still More Looping: The for Statement, Nested Control Structures, The Switch Statement, The break Statement, The continue Statement, The comma Statement, The goto Statement.

**Functions:** A Brief Overview, Defining a Function, Accessing a Function, Function Prototypes, Passing Arguments to a Function, Recursion

**Program Structure:** Storage Classes, Automatic Variables, External (Global) Variables, Static Variables.

**Unit-III**

**Arrays:** Defining an Array, Processing an Array, Passing Arrays to Functions, Multidimensional Arrays, Arrays and Strings

**Pointers:** Fundamentals, Pointer Declarations, Passing Pointers to a Function, Pointers and One-dimensional Arrays, Dynamic Memory Allocation, Operations on Pointers, Pointers and Multidimensional Arrays, Arrays of Pointers, Passing Functions to Other Functions

**Structures and Unions:** Defining a Structure, Processing a Structure, User-defined Data Types (Typedef), Structure and Pointers, Passing Structures to Functions, Self-referential Structures, Unions

**Data Files:** Why Files, Opening and Closing a Data File, Reading and Writing a Data File, Processing a Data File, Unformatted Data Files, Concept of Binary Files

**Unit-IV**

**Low-Level Programming:** Register Variables, Bitwise Operations, Bit Fields

**Some Additional Features of C:** Enumerations, Command Line Parameters, More About Library Functions, Macros, The C Processor

**Prescribed Book:**

Byron S Gottfriend, "Programming with C", Second Edition, Schaum Out Lines, TATA McGraw Hill (2007)

**Reference Book:**


1. Behrouy A. Foreuyan& Richard F. Gilberg, "Computer Science A structured programming Approach using C", Third Edition, Cengage Learning (2008).
2. Herbert Schildt, "The Complete Reference C", Fourth Edition, TMH (2008)

**Model Paper**

**MCA 1.1:Programming with C**

**Time: 3 Hrs** **Max. Marks: 70**

**Answer Question No.1 Compulsory:** **7 x 2 = 14 M**

**Answer ONE Question from each unit:** **4 x 14 = 56 M**

**1.**

(a)Importance of storage class.
(b)What is the purpose of typedef.
(c)Define type casting.
(d)Difference between macro and procedure.
(e)What is the difference between array of characters and a string.
(f)Why 'C' is called middle level language.
(g)How pointers are used to access structure elements.

**Unit – I**

2.(a)Explain with suitable examples different data types in 'C'.
(b)Briefly explain different operators in 'C'.

(or)

3.(a)With suitable examples explain structure of 'C' program.
(b)Explain gets() and puts() with examples.

**Unit –II**

4.(a)Explain loop structures in 'C'.
(b)Write a program for sum of digits of a number and no.of digits in a number.

(or)

5.(a)Write about different storage classes in 'C'.
(b)Write a program to pass n arguments to a function and return average of n values.

**Unit –III**

6.(a)Explain declaration, accessing and processing of two dimensional arrays in 'C'.
(b)Write a program to sort strings using pointers.

(or)

7. What is a pointer ? How pointers are useful in self referential structures ? What are the advantages of pointers?

**Unit – IV**

8.(a)Explain File processing in 'C'.
(b)Write a program to update a record in a file.

(or)

9.(a)With examples explain different pre-processor directives.
(b)Write a program to calculate no.of vowels, words in a given text.

| MCA 1.2 | COMPUTER ORGANIZATION | |
|---|---|---|
| Instruction: 4 periods / week | | Credits: 5 |
| Internal : 30 marks | University Exam: 70 marks | Total : 100 Marks |

**Objectives:**
The course is designed to meet the objectives of:

1. Helping the students to develop an understand the nature and characteristics of the organisation and design of the digital computer systems.
2. Focusing on the organisation and instruction set architecture of the CPU.

**Outcomes:**
Students upon completion of this course will be able to:

1. Understand the concepts that are included in the design of digital computer system
2. Understand and to evaluate the impact that languages, their compilers and underlying operating systems have on the design of computer systems
3. Understand and to evaluate the impact that peripherals, their interconnection and underlying data operations have on the design of computer systems
4. Understand the memory organization of the computer system

## SYLLABUS

**Unit-I**

**Digital Logic Circuits:** Digital Computers, Logic Gates, Boolean Algebra, Map Simplification, Combinational Circuits, Flip-Flops, Sequential Circuits.

**Digital Components:** Integrated Circuits, Decoders, Multiplexers, Registers, Shift Registers, Binary Counters, Memory Unit.

**Data Representation:** Data Types, Complements, Fixed Point Representation, Floating Point Representation, Other Binary Codes, error Detection Codes.

**Unit-II**

**Register Transfer and Microoperations:** Register Transfer Languages, Register Transfer, Bus and Memory Transfer, Arithmetic Micro Operations, Logic Micro Operations, Shift Micro Operations, Arithmetic Logic Shift Unit

**Basic Computer Organization and Design:** Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory Reference Instructions, Input-Output and Interrupt.
(Chapters:

**Unit-III**

**Micro-programmed Control:** Control Memory, Address Sequencing, Micro Program Example, Design of Control Unit.

**Central Processing Unit:** Introduction, General Register Organization, Stack Organization, Instruction Format, Addressing Modes, Data Transfer and Manipulation, Program Control.
(Chapters:

**Unit-IV**

**Computer Arithmetic:** Addition, Subtraction, Multiplication, Division Algorithms, Floating Point Arithmetic Operations.

**Input-Output Organization:** Peripheral Devices, Input-Output Interface, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt.

**Memory Organization**: Memory Hierarchy, Main Memory, Auxiliary memory, Associative Memory, Cache Memory.
(Chapters:

**Prescribed Book:**

M. Morris Mano, "Computer System Architecture", 3rd Edition, Pearson Education (2008).

**Chapters :** 1,2,3, 4, 5.1 to 5.7, 7, 8.1 to 8.7, 10.2 to 10.5,
11.1 to 11.5, 12.1 to 12.5

**Reference Books:**


1. V. Rajaraman, T. Radha Krishnan, "Computer Organization and Architecture", PHI
2. BehroozParhami, "Computer Architecture", Oxford (2007)
3. ISRD group, "Computer Organization", ace series, TMH (2007)
4. William Stallings, "Computer Organization and Architecture – Designing for Performance", Pearson Education (2005)
5. P.Chakraborty, "Computer Architecture and Organization", Jaico Books (2008)

**Model Paper**

**MCA 1.2: Computer Organization**

**Time: 3hours** **Maximum: 70 Marks.**

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**Answer Question No.1 Compulsory:** **7 x 2 = 14 M**

**Answer ONE Question from each unit:** **4 x 14 = 56 M**

1. a) Universal Logic gate.
   b) Tristate Buffer.
   c) Interrupt Cycle.
   d) RISC Characteristics.
   b) Associative Memory.
   c) Perform (67) – (42) in binary using $2^{'s}$ complement method.
   d) Instruction Format.
   e) Floating point representation.

UNIT-I

2. a) Simplify the following Boolean functions using K-maps and draw the relevant logic diagram.

   f (abcd)= Σm (0,3,7,8,9,11,12,13) + Σd (1,4,14,15)

   b) Explain the operation of Full– Adder circuit.

(or)

3. a) Design a 4-bit Synchronous counter using T-Flip Flops.
   b) Explain the Operation of Bidirectional Shift Register.

UNIT-II

4. a) Explain about Instruction cycle in detail.
   b) Explain various Memory reference instructions.

(or)

5. a) Explain any one stage of arithmetic logic shift unit.
   b) What are various logic micro operations and their implementation?

UNIT-III

6.a) Explain different addressing modes with an example.
   b) What is an interrupt ? Explain various types of interrupts.

(or)

7.a) What is Control memory ? Explain address sequencing with suitable diagram.
   b) Prepare 3-address, 2-address, 1-address, 0-address instructions to solve the following statement.

$$X = \frac{(A+B)(C+D)}{(A+C)}$$

UNIT-IV

8.a) Explain Booth multiplication Algorithm with an example.
   b) Explain memory mapped I/O and Isolated I/O.

(or)

9.a) What is Locality of reference? Explain various organizations of Cache memory.
   b) What is an I/O Interface? Explain DMA data transfer in detail.

| MCA 1.3 | LANGUAGE PROCESSORS | |
|---|---|---|
| Instruction: 4 periods / week | | Credits: 4 |
| Internal : 30 marks | University Exam: 70 marks | Total : 100 Marks |

**Objectives:**

The course is designed to meet the objectives of:

1. Describe the steps and algorithms used by language translators.
2.Recognize the underlying formal models such as finite state automata, push-down automata and their connection to language definition through regular expressions and grammars.
3. Discuss the effectiveness of optimization.
4. Explain the impact of a separate compilation facility and the existence of program libraries on the compilation process.
5. To study different language processors and their contribution in language processing system.

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**Outcomes:**

Students upon completion of this course will be able to:

1. Understand the roles of the compiler, assembler, machine code, Linker, Loader, and macro processor.
2. Understand how an assembler works and how to build one.
3. Be exposed to compiler construction and context-free grammars

**SYLLABUS**

**Unit-I**

**Language Processors:** Introduction – Language processing activities – Fundamentals of language processing – Fundamentals of language specification – Language processor development tools.0

**Data Structures for language processing:** Search data structures, Allocation data structures.

**Unit–II**

**Scanning and parsing:** Scanning – Parsing

**Assemblers:** Elements of assembly language programming – A simple assembly scheme – Pass structure of assemblers – Design of a two pass assembler – A single pass assembler for IBM PC.

**Unit–III**

**Macros and Macro processors:** Macro definition and call – Macro expansion – Nested macro calls – Advanced Macro facilities – Design of a macro preprocessor.

**Compliers and Interpreters:** Aspects of compilation – Memory allocation – compilation of expressions – compilation of control structures – code optimization – Interpreters.

**Unit-IV**

**Linkers:** Relocation and linking concepts – Design of a linker, self relocating programs – A linker for MS DOS – Linker for overlays – loaders.

**Software tools:** Software tools for program development – Editors – Debug monitors – Programming environments – User Interfaces.

**Prescribed Book:** D.M. Dhamdhere, "Systems programming and Operating systems", 2nd revised edition, TMH (2008).

Chapters : 1 through 8

**Model Paper**

**MCA 1.3: Language Processor**

**Time: 3 Hrs** **Max. Marks: 70**

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**Answer Question No.1 Compulsory:** **7 x 2 = 14 M**
**Answer ONE Question from each unit:** **4 x 14 = 56 M**

**I.**a) Construct a parse tree for the expression a : = b+i.
b) Define binding.
c) Write generic search procedure to search for an element 'S'.
d) What is reduction ?
e) Write an assembly language problem to find the biggest of 2Nos.
f) Define semantic gap.
g) Pure vs impure interpreters.

**UNIT - I**

2. a) Discuss different passes and phases of a language processor.
b) Explain in brief different allocation data structures.

(or)

3. a)Discuss various collision handling methods.
b)Define language processor development tools. Explain LEX.

**UNIT – II**

4. a) Define DFA. Construct DFA for recogniting identifiers, unsigned integers& real nos with fractions.
b) Explain Pass I of an assembler.

(or)

5. a) Explain the features of assembly language.
b) Write about top down parsing with out back tracking.

**UNIT – III**

6. a) Explain different data structures needed to design a macro preprocessor.
b) Discuss different parameter passing mechanism.

(or)

7. a) Write the procedure to access non-local variables.
b) Discuss expansion time variables.

**UNIT - IV**

8. a) Explain the generation of intermediate codes for expressions.
b) Write an algorithm for performing relocation.

(or)

9. a) Explain : Dead code elimination, frequency reduction and strength reduction.
b) Briefly explain different object record formats.

| MCA 1.4 | DISCRETE MATHEMATICAL STRUCTURES | |
|---|---|---|
| Instruction: 4 periods / week | | Credits: 5 |
| Internal : 30 marks | University Exam: 70 marks | Total : 100 Marks |

**Objectives:**
The course is designed to meet the objectives of:

1. To extend student's Logical and Mathematical maturity and ability to deal with abstraction and to introduce most of the basic terminologies used in computer science courses and application of ideas to solve practical problems.
2. Apply logical reasoning to solve a variety of problems.

**Outcomes:**
Students upon completion of this course will be able to:

1. have acquired greater precision in logical argument and have gained a core mathematical understanding of discrete mathematics.
2. learned and practised basic concepts of mathematical proof (direct proof, proof by contradiction, mathematical induction).
3. handle the standard logical symbols with some confidence.
4. learned elementary combinatorial and counting techniques and how to apply them to simple problems.
5. simplify complex mathematical expressions and apply general formulae to specific contexts.
6. learned how to state precisely and prove elementary mathematical statements and solve problems.

## SYLLABUS

**UNIT-I:**

**The Foundations: Logic and Proofs:** Propositional Logic – Propositional Equivalences – Predicates and Quantifiers – Nested Quantifiers – Rules of Inference – Introduction to Proofs – Proof Methods and Strategy

**Basic Structures:Sets, Functions, Sequences and Sums:** Sets – Set Operations – Functions – Sequences and Summations

**The Fundamentals : Algorithms , The Integers and Matrices:** Algorithms – The Growth of Functions – Complexity of Algorithms – The Integers And Divisions – Primes and Greatest Common Divisors – Integers and Algorithms – Applications of Number Theory – Matrices

**Introduction and Recursion** : Mathematical Induction – Strong Induction and Well-Ordering – Recursive Definitions and Structural Induction – Recursive Algorithms – Program Correctness

**UNIT-II:**

**Counting:** The Basics of Counting – The Pigeon Hole Principle – Permutations and Combinations – Binomial Coefficients – Generalized Permutations and Combinations – Generating Permutations and Combinations

**Advanced Counting Techniques:** Recurrence Relations – Solving Linear Recurrence Relations – Divide and Conquer Algorithms and Recurrence Relations – Generating Functions – Inclusion – Exclusion – Applications of Inclusion & Exclusion

**UNIT-III:**

**Relations :** Relations and Their Properties – n-ary Relations and Their Applications – Representing Relations – Closures of Relations – Equivalence Relations – Partial Orderings

**Graphs:** Graphs and Graph Models – Graph Terminology and Special Types of Graphs – Representing Graphs and Graph Isomorphism's – Connectivity – Euler and Hamilton Paths – Shortest Path Problems – Planar Graphs - Graph Coloring

**UNIT-IV:**

**Trees:** Introduction to Trees – Applications of Trees – Tree Traversal – Spanning Trees – Minimum Spanning Trees

**Boolean Algebra**: Boolean Functions – Representing Boolean Functions – Logic Gates – Minimization of Circuits

**Prescribed Book:**

Kenneth H Rosen, "Discrete Mathematics & its Applications", $6^{th}$ Edition, McGraw-Hill (2007)

**Chapters :** 1 to 10

**Reference Books:**


1. Ralph P. Grimaldi, B.V. Ramana, "Discrete and Combinational Mathematics", $5^{th}$ Edition, Pearson Education (2008).

2. Swapan Kumar Sarkar, "A Text Book of Discrete Mathematics", S.Chand (2008).

3. D.S.Malik and M.K.Sen, "Discrete Mathematical Structures", Thomson (2006).

**Model Paper**

**MCA 1.4: Discrete Mathematical Structures**

**Time: 3hours** **Maximum: 70 M.**

**Answer Question No.1 Compulsory:** **7 x 2 = 14 M**
**Answer ONE Question from each unit:** **4 x 14 = 56 M**

1. (a) Find the truth table of the proposition $(p \rightarrow q) \vee (\sim p \rightarrow r)$ is p and r are true and q is false.

(b) Find the inverse of $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 3 & 0 \\ 0 & 1 & 2 \end{bmatrix}$

(c) Express the integer 325 as a product of powers of primes.

(d) How many ways are there to seat 8 boys and 8 girls around a circular table.

(e) Define equivalence relation with example.

(f) Define an Euler circuit in a graph.

(g) Write Warshalls Algorithm.

UNIT-I

2. (a) Verify whether the following is a tautology by using truth table. $\{(P \vee Q) \wedge (P \rightarrow R) \wedge (Q \rightarrow R)\} \rightarrow R$.

(b) Let $f:A \rightarrow B$ be a function then $f^{-1}$ is a function from B to A iff f is 1 – 1.

(or)

3. (a) Find LCM and GCD of 540 and 504.

(b) Show that if we select 151 distinct computer science courses numbered between 1 and 300 inclusive at least two are consecutively numbered.

UNIT-II

4. (a) Show that if any five numbers from 1 to 8 are choosen then two of them will add to 9.

(b) If n is a +ve integer Prove that

$C(n,0)+C(n,2)+\ldots\ldots=C(n,1)+C(n,3)\ldots\ldots\ldots\ldots = 2^{n-1}$.

(or)

5. (a) Solve the following recurrence relation $a_n=4a_{n-1}+5a_{n-2}$

$a_1=2$, $a_2=6$.

(b) Find a generating function for $a_r$=the no.of ways of distributing r similar balls in to n numbered boxes where each

box is non empty.

UNIT-III

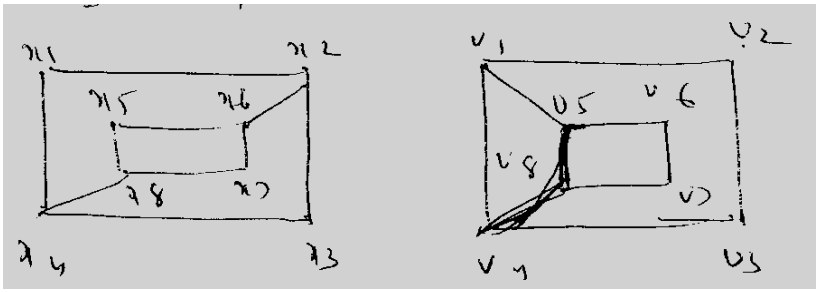
6. (a) i) Define irreflexive relation give an example.

ii) Determine whether the following relation R on a set A is reflexive, irreflexive, symmetric asymmetric, Antisymmetric or transitive $A=Z^+aRb\Leftrightarrow a=b^k$ for some $K\in Z^+$.

(b) Let A = {1,2,3,4}
R={(1,2) (2,3) (3,4) (2,1)} Find the transitive closure of K.

(or)

7. (a) Check whether the following graphs are Isomorphic or not.

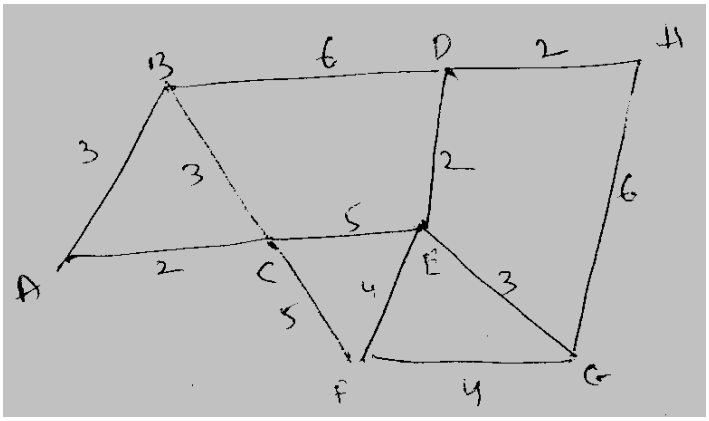


(b) Show that the sum of all vertex degree is equal to twice the number of edges.

UNIT-IV

8. (a) Show a tree with n vertices has exactly n-1 edges.

(b) Use primes algorithm to find minimal spanning tree for a connected graph.




9.(a) Use K-map for the expression to find a minimal sum of products $f(a,b,c) = \Sigma (0,1,4,6)$.

(b) Use Quine – mcclusky to find minimal expression for $f(a,b,c) =\Sigma (0,2,3,7)$

| MCA 1.5 | ACCOUNTING AND FINANCIAL MANAGEMENT | |
|---|---|---|
| Instruction: 4 periods / week | | Credits: 4 |
| Internal : 30 marks | University Exam: 70 marks | Total : 100 Marks |

**Objectives:**
The course is designed to meet the objectives of:

1. Basic understanding of the use, preparation, and interpretation of financial statements.
2. Emphasizes accounting and reporting for users external to a business
3.Financial reporting uses a fairly standard set of financial statements to communicate information

**Outcomes:**
Students upon completion of this course will be able to:

1. Statistical tools necessary to financial management
2. Time value of money
3. Basic concepts of financial management and financial environment
4. Analysis of financial ratios
5. Analysis of cash flows
6. Cost of different types of funding

**SYLLABUS**

**UNIT I:**
Cost Accounting
1.1 Accounting concepts
1.2 Double entry system
1.3 Journal-ledger, trial balance, preparation of final accounts (problems)
1.4 Nature of financial statement-preparation of trading-profit and loss accounts-balance sheet of joint stock companies

**UNIT II:**
Cost Accounting
1.1 cost sheet
1.2 marginal costing (problems)
1.3 budget and budgetary control
1.4 standard costing (Problems)

**UNIT III:**
Financial Management
3.1 nature and scope of finance function-goals of financial management-modern concept of finance function.
3.2 Nature of financial decisions: concept-major financial decision areas-investment decision-financing decision and dividend decision.

3.3 Financial analysis: concept of financial analysis-types of analysis-tables of analysis-ratio analysis-tables of analysis-funds flow and cash flow analysis (Problems)

**UNIT IV:**

Working capital management

4.1 concepts of working capital-importance of working capital-components of working capital-determination of working capital-source of working capital.

4.2 Inventory management-accounts of receivable management-cash management

4.3 Forecasting of working capital management

**Prescribed Book:**

K.Rajeswara Rao &G.Prasad, Accounting and finanace, Jaibharath publishers, 2002 (Chapters 1 to 19)

**Reference Books:**


1. Vanherne& James C, John M.Wachewiez J.R., Fundamentals of Financial management, PHI, 2002

2. Horngren, SundemBlliott, Introduction to financial accounting, pearson education, 2002

3. Ambrish Gupta, "Financial Accounting for Management", Third Edition, Pearson Education (2009)

4. Paresh Shah, "Basic Financial Accounting for Management", Oxford Higher Education (2008)

**Model Paper**

**MCA 1.5: Accounting and Financial Management**

**Time: 3hours** **Maximum: 70 M**

**Answer question No.1 Compulsorily (7 x 2 = 14M)**
**Answer ONE question from each unit. (4 x 14 = 56M)**

1.

a) State the different parties interested in accounting information and briefly mention the uses to them.
b) What is Process Costing ?
c) Net present value.
d) What is B.E.P ?
e) Uses of cash flow analysis.
f) Significance of 'Ratio Analysis'.
g) Funds flow analysis.

## UNIT – I

2. From the following Trial Balance prepare Trading and Profit and Loss Account for the year ended 31st March 2008.

| Particulars | Debit | Credit |
|---|---|---|
| | Rs. | Rs. |
| Opening Stock | 51,000 | --- |
| Capital | --- | 72,000 |
| Purchases | 2,50,000 | --- |
| Sales | --- | 4,00,000 |
| Carriage inwards | 12,000 | |
| Wages | 50,000 | |
| Salaries | 26,000 | |
| Commission | 3,000 | |
| Bad debts | 2,000 | |
| Insurance | 4,000 | |
| Rent, Rates and Taxes | 12,000 | |
| Postage and Telegram | 2,800 | |
| Carriage outwards | 7,700 | |
| Machinery | 40,000 | |
| Furniture | 5,000 | |
| Debtors | 60,000 | |
| Creditors | --- | 53,500 |
| | 5,25,500 | 5,25,500 |

Additional information :

(i) Stock on 31-3-2007 was Rs.60,000.
(ii) Depreciation on furniture is charged at 10%.
(iii) Out standing salaries Rs.4,000.
(iv) Bad debts Rs.1,000.
(v) Reserve for doubtful debts @ 5% on debtors.

(or)

3.How do you classify the accounts. Explain the rules of accounts.

## UNIT – II

4. From the following particulars you are required to Calculate i) P/V Ratio ii) BEP for sales iii) Sales required to earn a profit Rs.40,000. (iv) Margin of safty in second year.

| Year | Sales | Profit |
|---|---|---|
| | Rs. | Rs. |
| 2006 | 2,40,000 | 18,000 |
| 2007 | 2,80,000 | 26,000 |

(or)

5.Define the terms 'Budget and budgetary control'. Write Main objectives of budgetary control system.

## UNIT-III

6. Define Finance function. What are the functions of a financial Manager? Explain.

(or)

7. From the following information prepare a statement of Balance Sheet.
Current Ratio 2.5, Liquidity ratio 1.5
Proprietary ratio 0.75 (Fixed assets / Proprietary fund)
Working Capital Rs.60,000.
Reserves and surplus : Rs.40,000
There is no long term loan.

## UNIT-IV

8. Define working capital concepts. What are the determinantsof working capital of a manufacturing company ?

(or)

9. Explain the concept of working capital. What are the various sources of working capital? Give examples for long term sources and short term sources of working capital.

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| MCA 1.6 | C PROGRAMMING LAB | |
|---|---|---|
| Instruction: 6 periods / week | | Credits: 3 |
| Internal : 30 marks | University Exam: 70 marks | Total : 100 Marks |

## LAB CYCLE

1. Program to calculate compound interest.
2. Program to calculate roots of a quadratic equation.
3. Program to average of 'n' numbers.
4. Program to find wheather the given number is
   (i) Prime number or not (ii) Perfect number or not
   (iii) Armstrong number or not (iv) Palindrome or not
5. Program to demonstrate function calling multiple times.
6. Program to read two integers and print the quotient and remainder of the first number divided by the second number.
7. Program to get the following output.

   Row 1 : 1 2 3 4 5
   Row 2 : 1 2 3 4 5
   Row 3 : 1 2 3 4 5
8. Program for sum of digits of an integer number.
9. Program for following using Recursion
   (i) Factorial of a number
   (ii) Fibonacci series
10. Program to write records in to a file.
11. Program to read records from a file sequentially.
12. Program to search a record in a file.
13. Program to update a record in a file.
14. Program to delete a record in a file.
15. Program to calculate average of n no's in an array.
16. Program for addition of matrix.
17. Program for multiplication of matrix.
18. Program for sorting an array.
19. Program for row and column total of a two dimensional array.
20. Program to sort strings using pointers.
21. Program to calculate
    (i) No.of lines (ii) No.of words
    (iii) No.of special characters.
22. Program to demonstrate string palindrome.
23. Program to demonstrate union in structure.
24. Program for (i) String Comparison (ii) String Copy
25. Program to demonstrate call by value and call by reference.
26. Program to calculate area of a Hall using macros.
27. Program to calculate no.of vowels, words in a text.

| MCA 1.7 | COMPUTER ORGANIZATION LAB | |
|---|---|---|
| Instruction: 6 periods / week | | Credits: 3 |
| Internal : 30 marks | University Exam: 70 marks | Total : 100 Marks |

List of Experiments

1. Realization of NOT, OR, AND, XOR, XNOR gates using universal gates
2. Gray to Binary conversion & vice-versa.
3. Code conversion between BCD and EXCESS-3
4. Design of combinational circuits using multiplexer
5. Adder/Subtractor circuits using Full-Adder using IC and/ or logic gates. B. BCD Adder circuit using IC and/ or logic gates
6. Realization of RS, JK, and D flip flops using Universal logic gates
7. program to find r's and (r-1)'s complement
8. program to demonstrate addition, subtraction, multiplication and division with signed magnitude data
9. program to demonstrate addition, subtraction, multiplication and division with 2's complement data
10. Program to implement floating point addition, , subtraction, multiplication and division
11. Digital to Analog conversion

| MCA 1.8 | SEMINAR |
|---|---|
| Instruction: 3 periods / week | Credits: 1 |
| Marks : 50 | |

## FIRST YEAR – SECOND SEMESTER

| Sub Code | Name of the Subject | Int. Marks | Ext. Marks | Total Marks | No of Credits | Hours/ Week |
|---|---|---|---|---|---|---|
| MCA2.1 | Data Structures Using Python | 30 | 70 | 100 | 5 | 4 |
| MCA 2.2 | Operating System Principles | 30 | 70 | 100 | 5 | 4 |
| MCA2.3 | Data Base Management Systems | 30 | 70 | 100 | 5 | 4 |
| MCA2.4 | Computer Networks | 30 | 70 | 100 | 4 | 4 |
| MCA 2.5 | Probability & Statistics | 30 | 70 | 100 | 4 | 4 |
| MCA2.6 | Data Structures using Python Lab | 30 | 70 | 100 | 3 | 6 |
| MCA2.7 | DBMS Lab | 30 | 70 | 100 | 3 | 6 |
| MCA2.8 | Communication Skills | 50 | -- | 50 | 1 | 3 |
| | **TOTAL** | **260** | **490** | **750** | **30** | **35** |

| MCA 2.1 | DATA STRUCTURES USING PYTHON | |
|---|---|---|
| Instruction: 4 periods / week | | Credits: 5 |
| Internal : 30 marks | University Exam: 70 marks | Total : 100 Marks |

**Objectives**

The course is designed to meet the objectives of:

1. To know the basics of algorithmic problem solving
2. To read and write simple Python programs.
3. To develop Python programs with conditionals and loops.
4. To implement the data structures using python programming

**Outcomes**

Students upon completion of this course will be able to:

1. Develop algorithmic solutions to simple computational problems
2. Structure simple Python programs for solving problems.
3. Decompose a Python program into functions.
4. Represent compound data using Python lists, tuples and dictionaries.
5. Apply object oriented concepts

**Unit - I**

Python Primer: Python Overview - Objects in Python, Expressions, Operators, and Precedence, Control Flow, Functions, Simple Input and Output, Exception Handling, Iterators and Generators, Additional Python Conveniences, Scopes and Namespaces, Modules and the Import Statement

Object-Oriented Programming: Goals, Principles, and Patterns,Software Development, Class Definitions,Inheritance,Namespaces and Object-Orientation,Shallow and Deep Copying.

Array-Based Sequences: Python's Sequence Types , Low-Level Arrays - Dynamic Arrays and Amortization, Efficiency of Python's Sequence Types , Using Array-Based Sequences - Multidimensional Data Sets

**Unit – II**

Linked Lists : Linked List – Properties ,Item Insertion and Deletion , Building a Linked List, Linked List as an ADT , Ordered Linked Lists , Doubly Linked Lists , Linked Lists with header and trailer nodes , Circular Linked Lists.

Search Algorithms: Sequential Search, Binary search – Performance of binary search, Insertion into ordered list;

Hash Tables: Introduction, Hashing, Separate Chaining, Hash functions, The Hash Map Abstract Data Type,Applications: Histograms

Sorting Algorithms: Selection Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort.

**Unit – III**

Stacks:Stack operations, Implementation of stacks as arrays, Linked implementation of stacks, Application of stacks.

Queues: Queue operations – Implementation of Queues as arrays, Linked implementation of Queues, Priority Queue,Application of Queues.

**Unit – IV**

Trees:Binary Trees, Binary Tree Traversal, Binary Search Tree,Nonrecursive Binary Tree Traversal Algorithms, AVL Trees.

Graphs: Graph Definitions and Notations, Graph Representation, Operations on graphs, Graph as ADT,Graph Traversals, Shortest Path Algorithm,Minimal Spanning Tree.

**Prescribed Book**

Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser, "Data Structures and Algorithms in Python", John Wiley & Sons, 2013

Rance D. Necaise "Data Structures and Algorithms Using Python ", John Wiley & Sons, 2011

**Reference Book**

Brad Miller, David Ranum, "Problem Solving with Algorithms and Data Structures", Release 3.0, 2013.

**Model Paper**

**MCA 2.1: Data Structures Using Python**

**Time: 3 Hrs** **Max. Marks: 70**

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**Answer Question No.1 Compulsory:** **7 x 2 = 14 M**

**Answer ONE Question from each unit:** **4 x 14 = 56 M**

1.a) Define Bag Data Abstraction.
b) Write about the features of python.
c) What are the differences between Single and Double Linked List?
d) Write the complexity of binary search algorithm.
e) What are the applications of Stack?
f) Application of AVL Tree.
g) Define Multigraph.

**UNIT - I**

2. a) Explain about the need for learning python programming and its importance.
b) What are the different loop control statements available in python? Explain with suitable examples

(or)

3.a) List different conditional statements in python with appropriate examples.
b) Explain about the features and explain about different Object Oriented features supported by Python.

**UNIT – II**

4.a) Write procedure to insert an element in an ordered list.
b) Explain Back tracking with an example.

(or)

5.a) Write procedures to delete an element & count number of nodes in Double Linked List.
b) Explain different collision resolution techniques.

**UNIT - III**

6.a) Define Stack. Implement operations on Stack using arrays.
b) Write the procedure for selection sort.

(or)

7.a) What is priority Queue. Write the procedure for implementing the operations on Priority Queue.
b) Write a C++ program for sorting ‘n’ elements using Merge Sort technique.

**UNIT - IV**

8.a) Write a procedure to find minimum & maximum element in a binary search tree.
b) Write the non-recursive algorithm for post order.

(or)

9.a) Explain Different Graph traversal techniques.
b) Using Kruskal’s algorithm develop minimum cost spanning tree for the following graph.

| MCA 2.2 | OPERATING SYSTEM PRINCIPLES | |
|---|---|---|
| Instruction: 4 periods / week | | Credits: 5 |
| Internal : 30 marks | University Exam: 70 marks | Total : 100 Marks |

**Objectives:**
The course is designed to meet the objectives of: APPRECIATE
1. understanding the role of an operating system
2. making aware of the issues in management of resources like processor, memory and input-output
3. understanding file management techniques.

**Outcomes:**
Students upon completion of this course will be able to:

1. understands what is an operating system and the role it plays
2. get high level understanding of the structure of operating systems, applications, and the relationship between them
3. gather knowledge of the services provided by operating systems
4. get exposure to some details of major OS concepts.

## SYLLABUS

**UNIT–I:**

**Introduction :** What Operating Systems Do – Computer System Orgranization – Computer system Architecture – Operating System Structure – Operating System Operations – Process Management – Memory Management – Storage Management – Protection and Security – Distributed Systems – Special purpose Systems – Computing Environments.

**System Structure:** Operating System Services – User Operating System Interface – System Calls – Types of System Calls – System Programs – Operating System Design and Implementation – Operating System Structure – Virtual Machine – Operating System Generation – System Boot.

**Process Concept :**Overview – Process Scheduling – Operations on Processes – Interprocess Communication – Examples of IPC Systems – Communication in Client Server Systems.

**UNIT–II:**

**Multithreaded Programming :** Overview – Multithreading Models – Thread Libraries – Threading Issues – Operating System Examples.

**Process Scheduling:** Basic Concepts – Scheduling Criteria – Scheduling Algorithms – Multiple Processor Scheduling – Thread Scheduling.

**Synchronization:** Background – The Critical Section Problem – Peterson's solution – Synchronization Hardware – Semaphores – Classic Problem of Synchronization – Monitors – Synchronization Examples – Atomic Transaction.

**UNIT–III:**

**Deadlocks :** System Model – Deadlock Characterization – Methods for Handling Deadlocks – Deadlock Prevention – Deadlock Avoidance – Deadlock Detection – Recovery from Deadlock.

**Memory Management Strategies:** Background – Swapping – Contiguous Memory Allocation – Paging – Structure of the Page Table – Segmentation – Example: The Intel Pentium.

**Virtual Memory Management:** Background – Demand Paging – Copy on Write – Page Replacement – Allocation of Frames – Thrashing.

**UNIT–IV:**

**File System :** File Concept – Access Methods – Directory Structure – File System Mounting – File Sharing – Protection.

**Implementing File Systems :**File System Structure – File System Implementation – Directory Implementation – Allocation Methods – Free Space Management – Efficiency and Performance – Recovery – Log structured File Systems.

**Secondary Storage Structure :** Overview of Mass – Storage Structure – Disk Structure – Disk Attachment – Disk Scheduling – Disk Management – Swap Space Management – RAID structure.

**I/O Systems:** Overview – I/O Hardware – Application I/O Interface – Kernal I/O Interface – Transforming I/O requests to Hardware Operations – Streams – Performance.

**Prescribed Book:**

Abraham Silberschatz, Peter Baer Galvin, Greg Gagne. "Operating System Principles", Seventh Edition, Wiley.

**Chapters:** 1.1 – 1.12, 2.1 – 2.10, 3.1 – 3.6, 4.1 – 4.5,
5.1 – 5.5, 6.1 – 6.9 , 7.1 – 7.7 , 8.1 – 8.7,
9.1 – 9.6, 10.1 – 10.6, 11.1 – 11.8, 12.1 – 12.7,
13.1 – 13.7

**Reference Book:**

1. William Stallings, "Operating Systems – Internals and Design Principles", Fifth Edition, Pearson Education (2007)

2. Achyut S Godbole, “Operating Systems”, Second Edition, TMH (2007).

3. Flynn/McHoes, “Operating Systems”, Cengage Learning (2008).

4. Deitel&Deitel, “Operating Systems”,Third Edition, Pearson Education (2008).

**Model Paper**

**MCA 2.2: Operating System Principles**

**Time: 3 Hrs** **Max. Marks: 70**

**Answer Question No.1 Compulsory:** **7 x 2 = 14 M**
**Answer ONE Question from each unit:** **4 x 14 = 56 M**

**1.**a) Advantages of Multiprocessor Systems.
b) What is s System Call ?
c) Importance of PCB
d) Difference between Thread and Process.
e) Advantages of Segmentation.
f) Virtual Memory is Logical or Physical, Why ?
g) Why Operating System requires Second Storage Support for its Operation ?

**UNIT – I**

2.a) Explain Traditional computing, Client-Server computing and peer- to-peer computing
b) Describe Storage device Hierarchy

**(or)**

3.a) Discuss different types of Operating System Structures
b) Explain Process Scheduling

**UNIT – II**

4.a) Discuss different threading issues.

b) Explain semaphores with suitable examples.

(or)

5. Compare different types of Process Scheduling Algorithms.

**UNIT – III**

6.a) Explain Deadlock avoidance mechanisms.
b) Describe swapping with diagram.

**(or)**

**7.a**) Explain segmentation.
b)Write about LRU page replacement and Optimal page replacement.

**UNIT - IV**

8.a) Explain different file access metods.
b) Described linked file allocation methods.

**(or)**

**9.a**) Explain different RAID levels.
b)Discuss about interrupt driven I/O cycle.

| 2.3 | DATABASE MANAGEMENT SYSTEMS | |
|---|---|---|
| Instruction: 4 periods / week | | Credits: 5 |
| Internal : 30 marks | University Exam: 70 marks | Total : 100 Marks |

**Objectives:**
The course is designed to meet the objectives of:
1. The need of a database management system (DBMS)
2. what is meant by data ACID properties
3. the concept of entity relationships and data normalization
4. the concept of a client/server database, and
5. the relevant advantages of a client/server database over a non-client/server database

**Outcomes:**
Students upon completion of this course will be able to:

1. design database, different operations, queries performed for a management system problems,
2. understand and design of ER-diagram in DBMS,
3. Implementation of different normalizations for database size reduction and removal of redundancy, and
4. able to implement PL/SQL, SQL injection, procedures etc.

## SYLLABUS

**Unit–I**

**Databases and Database Users**: Introduction, Characteristics of the Database Approach, Actors on the Scene, Workers behind the scene, Advantages of the using the DBMS Approach.

**Database System Concepts and Architecture**: Data Models, Schemas and Instances, Three Schema architecture and Data Independence, Database Languages and Interfaces, Centralized and Client/Server Architecture for DBMS, Classification of Database Management Systems.

**Disk Storage, Basic File Structures and Hashing**: Introduction, Secondary Storage Devices, Buffering of Blocks, Placing file Records on Disk, Operations on Files, Files of Unordered Records, Files of Ordered Records, Hashing Techniques, Other Primary File Organizations, Parallelizing Disk Access using RAID Technology.

**Indexing Structures for Files**: Types of Single-Level Ordered Indexes, Multilevel Indexes, Dynamic Multilevel Indexes Using B-Trees and $B^+$ Trees, Indexes on Multiple Keys, Other Types of Indexes.

**Data Modeling Using the ER Model**: Conceptual Data models, Entity Types, Entity Sets, Attributes and Keys, Relationship types, Relationship sets, roles and structural Constraints, Weak Entity types, Relationship Types of Degree Higher than Two, Refining the ER Design for the COMPANY Database.

**The Enhanced Entity-Relationship Model**: Sub classes, Super classes and Inheritance, Specialization and Generalization, Constraints and Characteristics of Specialization and Generalization Hierarchies, Modeling of Union Types using Categories, An Example University ERR Schema, Design Choices and Formal Definitions.

**Unit-II**

**The Relational Data Model and Relational Database Constraints:** Relational Model Concepts, Relational Model Constraints and Relational Database Schemas, Update Operations, Transactions and Dealing with Constraint Violations.

**The Relational Algebra and Relational Calculus:** Unary Relational Operations: SELECT and PROJECT, Relational Algebra Operations from set Theory, Binary Relational Operations: JOIN and DIVISION, Additional Relational Operations, Examples, The Tuple Calculus and Domain Calculus.

**SQL-99: Schema Definition, Constraints, Queries and Views:** SQL Data Definitions and Data Types, Specifying Constraints in SQL, Schema Change Statements on SQL, Basic Queries in SQL, More Complex SQL Queries, INSERT, DELETE and UPDATE statements in SQL, Triggers and Views.

**Unit-III**

**Functional Dependencies and Normalization for Relational Databases:** Informal Design Guidelines for Relation Schemas, Functional dependencies, Normal Forms Based in Primary Keys, General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Form.

**Relational Database Design Algorithms and Further Dependencies:** Properties of Relational Decompositions, Algorithms fro Relational Database Schema Design, Multivalued Dependencies and Fourth Normal Form, Join Dependencies and Fifth Normal Form, Inclusion Dependencies, Other Dependencies and Normal Forms.

**Unit-IV**

**Introduction to Transaction Processing Concepts and Theory:** Introduction to Transaction Processing, Transaction and System Concepts, Desirable Properties of Transactions, Characterizing Schedules Based on Recoverability, Characterizing schedules Based on Serializability.

**Concurrency Control Techniques:** Two Phase Locking Techniques for Concurrency Control, Concurrency Control Based on Timestamp Ordering, Multiversion Concurrency control techniques, Validation concurrency control Techniques, Granularity of Data Items and multiple Granularity Locking.

**Distributed Databases and Client Server Architectures:** Distributed Database Concepts, Data Fragmentation, Replication, and allocation Techniques for Distributed Database Design, Types of Distributed Database Systems, An Overview if 3 Tier Client Server Architecture.

**Prescribed Textbook :**

RamezElmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", Fifth Edition, Pearson Education (2007)

**Chapters:** 1.1 to 1.6, 2, 13.1 to 13.10, 14, 3.1 to 3.6, 3.9, 4.1 to 4.5, 5, 6, 8, 10, 11, 17, 18.1 to 18.5, 25.1 to 25.3, 25.6

**Reference Books :**


1. Peter Rob, Carlos Coronel, "Database Systems" – Design, Implementation and Management, Eigth Edition, Thomson (2008).

2. C.J. Date, A.Kannan, S. Swamynathan, "An Introduction to Database Systems", VII Edition Pearson Education (2006).

3. Raman A Mata – Toledo, Panline K. Cushman, "Database Management Systems", Schaum's Outlines, TMH (2007).

4. Steven Feuerstein, "Oracle PL/SQL – Programming", $10^{th}$ Anniversary Edition, OREILLY (2008).

**Model Paper**

**MCA 2.3: Database Management Systems**

**Time: 3 Hrs** **Max. Marks: 70**

**Answer Question No.1 Compulsory: 7 x 2 = 14 M**
**Answer ONE Question from each unit: 4 x 14 = 56 M**

1.a) Discuss about Security Management in DBMS.
b) What is failure? Mention different causes for failure of a transaction?
c) What is Entity? Give Examples for Entity types.
d) What is closure set of functional dependencies?
e) What is the use for Trigger? Give any two advantages of Triggers.
f) What are the pros and cons of distributed database over centralized databases?
g) What is Data Fragmentation?

**Unit-I**

2.a) Discuss about three level architecture with representation of data in each level.
b) Discuss about levels of RAID.

(or)

3.a) Compare and Construct the indexing of data by using B and $B^+$ Trees.
b) Discuss about Data Independency with an example.

Unit-II

4.a) Discuss about Arithmetic functions in SQL with example?
b) Express the following statements in terms of Relational Algebra

i. Fetch the Department Numbers consisting of more than three employees.
ii. Fetch the Employee aggregated salary for a department.

(or)

5.a) Discuss about Views and its Limitations?
b) What is Index? Create an index for the employees belongs to the Accounts and Sales departments.

Unit-III

6.a) What is Functional Dependency? Explain the role of FD's in construction of Relational Schema.
b) Can I say that BCNF is equivalent Normal Form for III NF, Justify?

(or)

7.a) What is Non-Loss Dependency? Explain with an example.
b) Discuss the following

i. II NF
ii. Multi-valued Dependency.

Unit-IV

8.a) What is Lock? Discuss about Shared and Exclusive Locking Process
b) Discuss about
i. Two-Phase Locking
ii. Time-Stamping Algorithm

(or)

9.a) What is Dirty-Read Problem? Explain with an Example.
b) What is serializability? Discuss with aid of an example to test the conflicts in serializability?

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| MCA 2.4 | COMPUTER NETWORKS | |
|---|---|---|
| Instruction: 4 periods / week | | Credits: 4 |
| Internal : 30 marks | University Exam: 70 marks | Total : 100 Marks |

**Objectives:**
The course is designed to meet the objectives of:

1. understanding the state-of-the-art in network protocols, architectures, and applications
2. Examining and studying of different protocols in OSI and TCP/IP.
3. Understanding of network addressing, mapping etc
4. understanding error control, flow control, packet recovery etc.
5. understanding the structure of LAN, WAN and MAN, and
6. understanding internetworking of devices

**Outcomes:**
Students upon completion of this course will be able to:

1. learn components and rules of communications
2. configuration and design of a small network.
3. learn about research areas and future internets research fields

## SYLLABUS

### UNIT – I

**Introduction :**Uses of Computer Networks: Business Application, Home Applications, Mobile Users – Social Issues. Network Hardware : Local Area Networks – Metropolitan Area Networks – Wide Area Networks – Wireless Networks – Home Networks – Internetworks. Network Software: Protocol Hierarchies – Design Issues for the Layers – Connection Oriented and Connectionless Services – Service Primitives – The relationship of Services to Protocols. Reference Models: The OSI Reference Model – The TCP/IP Reference Model – A Comparison of OSI and TCP/IP reference Model – A Critique of the OSI Model and Protocols – A Critique of the TCP/IP reference model. Example Networks: The Internet – Connection Oriented Networks:x.25, Frame Relay, and ATM – Ethernet – Wireless LANs Network Standardization: Who's who in the Telecommunication World – Who's who in the International Standards World – Who's who in the Internet Standards World.

**Physical Layer:** Guided Transmission Media: Magnetic Media – Twisted Pair – Coaxial Cable – Fiber Optics

**Data Link Layer:** Data Link Layer Design Issues: Services Provided to the Network Layer – Framing – Error Control – Flow Control. Error Detection and Correction: Error correcting Codes – Error Detecting Codes. Elementary Data Link Protocols : An unrestricted Simplex Protocol – A simplex Stop- and – wait Protocol – A simplex Protocol for a Noisy channel. Sliding Window Protocols: A one-bit sliding Window Protocol – A Protocol using Go Back N – A Protocol using selective Repeat. Example Data Link Protocols: HDLC – The Data Link Layer in the Internet.

**UNIT – II**

**The Medium Access Control Sublayer :** Ethernet : Ethernet Cabling – Manchester Encoding – The Ethernet MAC sublayer Protocol – The Binary Exponential Backoff Algorithm – Ethernet Performance – Switched Ethernet – Fast Ethernet – Gigabit Ethernet – IEEE 802.2: Logical Link Control – Retrospective on Ethernet. Wireless Lans: The 802.11 Protocol Stack - The 802.11 Physical Layer - The 802.11 MAC sublayer Protocol - The 802.11 Frame Structure. Bluetooth: Bluetooth Architecture – Bluetooth Applications – The Bluetooth Protocol Stack – The Bluetooth Radio Layer – The Bluetooth Baseband Layer – The Bluetooth L2CAP layer – The Bluetooth Frame Structure. Data Link Layer Switching: Bridges from 802.x to 802.y – Local Internetworking – Spanning Tree Bridges – Remote Bridges – Repeaters, Hubs, Bridges, Switches, Routers and Gateways – Virtual LANs.

**UNIT – III**

**The Network Layer:** Network Layer Design Issues : Store – and Forward Packet Switching – Services Provided to the Transport Layer – Implementation of Connectionless Services – Implementation of Connection Oriented Services – Comparison Of Virtual Circuit and Datagram subnets. Routing Algorithms : The Optimality Principle – Shortest Path Routing – Flooding – Distance Vector Routing – Link State Routing – Hierarchical Routing – Broadcast Routing – Multicast Routing – Routing for Mobile Hosts. Internet Working : How Networks Differ – How Networks can be connected – Concatenated Virtual Circuits – Connectionless Internetworking – Tunneling – Internet work Routing – Fragmentation. The Network Layer in the Internet: The IP Protocol – IP address – Internet Control Protocols – OSPF – The Internet Gateway Routing Protocol – BGP – The Exterior Gateway Routing Protocol.

**The Transport Layer:** The Transport Service: Services provided to the Upper Layers – Transport Services Primitives – Berkeley Sockets. Elements of Transport Protocols : Addressing – Connection Establishment – Connection Release – Flow Control and Buffering – Multiplexing – Crash Recovery. The Internet Transport Protocols :UDP
Introduction to UDP – Remote Procedure Call – The Real Time Transport Protocol. The Internet Transport Protocols: TCP Introduction to TCP – The TCP Service Model – the TCP Protocol – The TCP segment header – TCP connection establishment – TCP connection release – Modeling TCP connection management- TCP Transmission Policy – TCP congestion Control – TCP Timer Management – Wireless TCP and UDP – Transactional TCP.

**UNIT – IV:**

**The Application Layer:** DNS : The Domain Name System : The DNS Name Space – Resource Records – Name Servers. Electronic Mail : Architecture and Services – The User Agent – Message Formats – Message Transfer – Final Delivery. The World Wide Web: Architecture Overview – Static Web Documents – Dynamic Web Documents – HTTP – The Hyper Text Transfer Protocol – Performance Enhancements – The Wireless Web. Multimedia: Introduction to Digital Audio – Audio Compression – Streaming Audio – Internet Radio – Voice Over IP – Introduction to Video – Video Compression – Video on Demand.

**Prescribed Book:**

Andrew S. Tanenbaum, “Computer Networks”, Fourth Edition, PHI.

**Chapters:** 1.1 to 1.6, 2.2, 3.1 to 3.4, 3.6, 4.3, 4.4, 4.6, 4.7,
5.1, 5.2.1 to 5.2.9, 5.5, 5.6.1 to 5.6.5, 6.1.1 to 6.1.3,
6.2, 6.4, 6.5, 7.1 to 7.4

**Reference Books:**


1. James F.Kurose, Keith W.Ross, “Computer Networking”,
   Third Edition, Pearson Education

2. Behrouz A Forouzan, “Data Communications and Networking”, Fourth Edition, TMH (2007)

3. Michael A. Gallo, William M. Hancock, “Computer Communications and Networking Technologies”, Cengage Learning (2008)

**MODEL PAPER**

**MCA 2.4 :Computer Networks**

**Time : 3 hrs** **Max Marks : 70**

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**Answer Question No.1 Compulsory:** **7 x 2 = 14 M**
**Answer ONE Question from each unit:** **4 x 14 = 56 M**

1. a) Difference between Protocol and Service.
   b) Describe Ethernet.
   c) Why Repeaters are required.
   d) Give any two applications of Bluetooth.
   e) What are the problems with Flooding.
   f) Where UDP protocol is used.
   g) Define HTTP.

UNIT – I

2. a) Compare OSI and TCP/IP reference models.
   b) Describe Go Back N protocol.

(or)

3. a) Explain the architecture of the Internet
   b) Write about design issues of a Data Link layer.

UNIT – II

4. a) Explain Spanning tree Bridges.
   b) Give and explain 802.11 frame structure, services

(or)

5. a) Describe architecture,applications, protocol stack of Bluetooth
   b) Explain Switched Ethernet

UNIT – III

6. a) Explain IP Header Format and IP addresses
   b) Discuss about Tunneling and Fragmentation

(or)

7. a) Explain Distance Vector Routing Algorithm
   b) write about TCP Congestion Control

UNIT – IV

8. a) Explain about DNS
   b) Write about URL's (or)

9. a) Explain Electronic Mail concept
b)Discuss JPEG Compression mechanism

| MCA 2.5 | PROBABILITY AND STATISTICS | |
|---|---|---|
| Instruction: 4 periods / week | | Credits: 4 |
| Internal : 30 marks | University Exam: 70 marks | Total : 100 Marks |

**Objectives:**
The course is designed to meet the objectives of:
1. introducing the basic notions of probability theory and develops them to the stage where one can begin to use probabilistic ideas in statistical inference and modeling, and the study of stochastic processes,
2. providing confidence to students in manipulating and drawing conclusions from data and provide them with a critical framework for evaluating study designs and results,

**Outcomes:**
Students upon completion of this course will be able to:

1. students will add new interactive activities to fill gaps that we have identified by analyzing student log data and by gathering input from other college professors on where students typically have difficulties
2. students will add new simulation-style activities to the course in Inference and Probability

## SYLLABUS

**Unit I:**

**Some probability laws:**Axioms of Probability, Conditional Probability, Independence of the Multiplication Rule, Bayes' theorem

**Discrete Distributions:** Random Variables , Discrete Probability Densities, Expectation and distribution parameters, Binomial distribution, Poisson distribution, simulating a Discrete distribution,

**Continuous distributions:** continuous Densities, Expectation and distribution parameters, exponential distribution , Normal distribution, Weibull distribution and Reliability.

**UNIT II:**

**Estimation:** Point estimation, interval estimation and central limit theorem.

**Inferences on the mean and the Variance of a distribution:** Hypothesis Testing, significance testing, Hypothesis and significance test on the mean, Hypothesis tests on the Variance

**Inferences on proportions:** estimating proportions, testing hypothesis on a proportion, Comparing two proportions: estimation, comparing two proportions: hypothesis testing.

**UNIT III:**

**Comparing two means and two variances:** point estimation: independent samples, Comparing variances: the F-distribution,Comparing means: variances equal,

**Analysis of Variance**: One-way classification fixed effects model, comparing variances, pair wise comparisons, randomized complete block design

**UNIT IV:**

**Simple linear regression and correlation :**model and parameter estimation, inferences about slope, inferences about intercept, Co-efficient of determination

**Multiple linear regression models:** least square procedures for model fitting, a matrix approach to least squares, interval estimation.

**Prescribed book:**

J Susan Milton and Jesse C. Arnold: "Introduction to Probability and Statistics", Fourth edition, TMH,(2007).

**Chapters:** 2, 3.1 to 3.3, 3.5,3.8,3.9,4.1,4.2,4.4,4.7.1,7.4,
8.3 to 8.6,9,10.1 to 10.3, 11.1, 11.3, 11.6, 12.1, 12.2,
12.4, 13.1 to 13.3,13.5.

**Reference book:**

William Mendenhall, Robert J Beaver, Barbara M Beaver: Introduction to Probability and Statistics, Twelth edition, Thomson.

**Model paper**

**MCA 2.5: Probability and Statistics**

**Time: 3hours** **Maximum: 70 M.**

Answer Question No.1 Compulsory: 8 x 2 = 14 M
Answer ONE Question from each unit : 4 x 14 = 56 M

1. (a) If BCA then Prove that P(B) □ P(A).
(b) If two unbiased die are thrown then find the expected values of the sum of numbers of points on them.
(c) Conditional Expectations.
(d) Estimator and Estimation.
(e) Mathematical model of the Randomized complete block design.
(f) Properties of F-distribution.
(g) Covariance.

UNIT-I

2. (a) State and Prove the addition theorem for n events.

(b) In a certain town, Males and Females form 50 percent of the population. It is known that 20 percent of the males and 5 percent of the females are unemployed. A research student studying the employment situation selects unemployed persons at random. What is the probability that the person selected is (a) Male
(b) Female.

(or)

3.(a) Out of 800 families with 5 children each how many would you expect you have (i) 3 boys (ii) 5 girls
(iii) Either 2 or 3 girls Assume equal probabilities for boys and girls.

(b) The distribution function of a random variate X is given by the following function.

f(x) = 0 ; if x < -2
1/2 ; if –2 □ x < 0
3/4 ; if 0 □ x < 21 ; x □ 2

(i) Sketch the group h of F(x)
(ii) Obtain P.D.F of f(x)
(iii) Compute the probabilities
P(X □ 1); P(X □ 2); P(1 □ X □ 2)

## UNIT-II

4. (a) Derive the 100 (1-□)% confidence interval limits of the mean in Normal distribution.

(b) Define the following terms :

(i) Critical region; Composite hypothesis;
level of Significance; Power of the test;

(ii) How can you derive the test statistic on
significance test on the Mean

(or)

5. (a) How can you derive the test statistic on significance of Difference of Proportions.

(b) Random samples of 400 men and 600 women were asked whether they would like to have a flyover near their residence. 200 men 325 women were in favour of the proposal. Test the hypothesis,that proportions of menand women in favour of the proposal are same against that they are not, at 5% level.

## UNIT-III

6. (a) Derive the test statistic on F test.

(b) Two random samples drawn from two normal populations are

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Sample I : | 20 | 16 | 26 | 27 | 23 | 22 | 18 | 24 | 25 | 19 |
| Sample II : | 27 | 33 | 42 | 35 | 32 | 34 | 38 | 28 | 41 | 43 | 37 |

Obtain estimates of the variances of the populations and test whether the populations have same variances.

(or)

7.(a) Explain the statistical analysis of one way classification.

(b) The following data represent the number of units of production per day turned out by 5 different workmen using different types of machines.

| Work Men | Machine Types | | | |
|---|---|---|---|---|
| | **A** | **B** | **C** | **D** |
| 1 | 46 | 40 | 49 | 38 |
| 2 | 48 | 42 | 54 | 45 |
| 3 | 36 | 38 | 46 | 34 |
| 4 | 35 | 40 | 48 | 35 |
| 5 | 40 | 44 | 51 | 41 |

(i) Test whether the mean productivity is the same for the four brands of machine type.

(ii) Test whether 5 different workmen differ with respect to productivity.

UNIT-IV

8. (a) Derive the Normal equations of curve of Regression Y on X.

(b) The relationship between energy consumption and household income was studied, yielding the following data on household income X (in units of $ 1000/Year) and energy consumption Y (in Units of 108 Btu/Year).

| Energy Consumption (Y) | Household income (X) |
|---|---|
| 1.8 | 20.0 |
| 3.0 | 30.5 |
| 4.8 | 40.0 |
| 5.0 | 55.1 |
| 6.5 | 60.3 |
| 7.0 | 74.9 |
| 9.0 | 88.4 |
| 9.1 | 95.2 |

(a) Plot a scatter diagram of these data.

(b) Estimate the linear regression equation $\square_{y/x} = \square 0 + \square_1 X$

(c) If x=50 (household income of $ 50,000), estimate the average energy consumed households of this income. What would your estimate be for a single house hold.

(or)

9. (a) Derive the Normal equations for Multiple linear regression model.

(b) A Study is conducted to develop an equation by which the unit cost of producing a new drug (y) can bepredicted based on the number of units produced (X).

The proposed model is $\square_{y/x} = \square 0 + \square_1 X + \square_2 X^2$

| Number of Units (X) | Cost in hundreds of dollars (Y) |
|---|---|
| 5 | 14.0 |
| 5 | 12.5 |
| 10 | 7.0 |
| 10 | 5.0 |
| 11 | 2.1 |
| 12 | 1.8 |
| 12 | 6.2 |
| 13 | 4.9 |
| 14 | 13.2 |
| 15 | 14.6 |

(a) Draw the Scatter diagram.

(b) Estimate the constants of given model.

| MCA 2.6 | DATA STRUCTURES USING PYTHON LAB | |
|---|---|---|
| Instruction: 6 periods / week | | Credits: 3 |
| Internal : 30 marks | University Exam: 70 marks | Total : 100 Marks |

## LAB CYCLE

1. Create a class RATIONAL and perform various operations on two Rational numbers using operator overloading.
2. Create a Multidimensional Vector Class and Perform possible operations on Vectors.
3. Program for Sorting 'n' elements Using bubble sort technique.
4. Sort given elements using Selection Sort.
5. Sort given elements using Insertion Sort.
6. Sort given elements using Merge Sort.
7. Sort given elements using Quick Sort.
8. Implement the following operations on single linked list.
   (i) Creation (ii) Insertion (iii) Deletion (iv) Display
9. Implement the following operations on double linked list.
   (i) Creation (ii) Insertion (iii) Deletion (iv) Display
10. Implement the following operations on circular linked list.
    (i) Creation (ii) Insertion (iii) Deletion (iv) Display
11. Program for traversing the given linked list in reverse order.
12. Merge two given linked lists.
13. Implement Stack Operations Using Arrays.
14. Implement Stack Operations Using Linked List.
15. Implement Queue Operations Using Arrays.
16. Implement Queue Operations Using Linked List.
17. Implement Operations on Circular Queue.

18. Converting infix expression to postfix expression by usingstack.

19. Write program to evaluate post fix expression.

20. Construct BST and implement traversing techniques recursively.

| MCA 2.7 | DBMS LAB | |
|---|---|---|
| Instruction: 6 periods / week | | Credits: 3 |
| Internal : 30 marks | University Exam: 70 marks | Total : 100 Marks |

## LAB CYCLE

Cycle-I: Aim: Marketing Company wishes to computerize their operations by using following tables.

Table Name: Client_Master
Description: This table stores the information about the clients.

| Column Name | Data Type | Size | Attribute |
|---|---|---|---|
| Client_no | Varchar2 | 6 | Primary Key and first letter should starts with 'C' |
| Name | Varchar2 | 10 | Not null |
| Address1 | Varchar2 | 10 | |
| Address2 | Varchar2 | 10 | |
| City | Varchar2 | 10 | |
| State | Varchar2 | 10 | |
| Pincode | Number | 6 | Not null |
| Bal_due | Number | 10,2 | |

Table Name:Product_master
Description: This table stores the information about products.

| Column Name | Data Type | Size | Attribute |
|---|---|---|---|
| Product_no | Varchar2 | 6 | Primary Key and first letter should starts with 'P' |
| Description | Varchar2 | 10 | Not null |
| Profit_percent | Number | 2,2 | Not null |
| Unit_measure | Varchar2 | 10 | |
| Qty_on_hand | Number | 8 | |
| Record_lvl | Number | 8 | |
| Sell_price | Number | 8,2 | Not null, can't be 0 |
| Cost_price | Number | 8,2 | Not null, can't be 0 |

Table Name: salesman_master
Description: This table stores the salesmen working in the company

| Column Name | Data Type | Size | Attribute |
|---|---|---|---|
| Salesman_id | Varchar2 | 6 | Primary Key and first letter should starts with 'S' |
| Name | Varchar2 | 10 | Not null |
| Address1 | Varchar2 | 10 | |
| Address2 | Varchar2 | 10 | |

| | | | |
|---|---|---|---|
| City | Varchar2 | 10 | |
| State | Varchar2 | 10 | |
| Pincode | Number | 6 | Not null |
| Sal_amt | Number | 8,2 | Should not null and zero |
| Target_amt | Number | 6,2 | Should not null and zero |
| Remarks | Varchar2 | 10 | |

Table Name: sales_order

Description: This table stores the information about orders

| Column Name | Data Type | Size | Attribute |
|---|---|---|---|
| S_order_no | Varchar2 | 6 | Primary Key and fisrt char is 'O' |
| S_order_date | Date | | |
| Client_no | Varchar2 | 6 | Foreign key |
| Delve_address | Varchar2 | 20 | |
| Salesman_no | Varchar2 | 6 | Foreign key |
| Delve_type | Varchar2 | 1 | Delivery: part(P)/Full(F) and default 'F' |
| Billed_yn | Char | 1 | |
| Delve_date | Date | | Can't be less than the s_order_date |
| Order_status | Varchar2 | 10 | Values in 'IN PROCESS', FULFILLED', 'BACK ORDER, 'CANCELLED' |

Table Name: sales_order_details

Description: This table stores the information about products ordered

| Column Name | Data Type | Size | Attribute |
|---|---|---|---|
| S_order_no | Varchar2 | 6 | Primary key, foreign key references sales_order table |
| Product_no | Varchar2 | 6 | Primary key, foreign key references product_master table |
| Qty_ordered | Number | 8 | |
| Qty_disp | Number | 8 | |
| Product_rate | Number | 10,2 | |

Table Name: challan_master

Description: This table stores the information about challans made for orders.

| Column Name | Data Type | Size | Attribute |
|---|---|---|---|
| Challan_no | Varchar2 | 6 | Primary key, first two letters must start with 'CH' |
| S_order_no | Varchar2 | 6 | Foreign key references sales_order |
| Challan_date | Date | | |
| Billed_yn | Char | 1 | Values in 'Y', 'N' default 'N' |

Table Name: Challan_Details
Description: This table stores the information about challan details.

| Column Name | Data Type | Size | Attribute |
|---|---|---|---|
| Challan_no | Varchar2 | 6 | Primary key, foreign key references challan_master table |
| Product_no | Varchar2 | 6 | Primary key, foreign key references product_master table |
| Qty_disp | Number | 4,2 | Not null |

Solve the following queries by using above tables.

1. Retrieve the list of names and cities of all the clients.
2. List the various products available from product_master.
3. Find out the clients who stay in a city whose second letter is ‘a’.
4. Find the list of all clients who stay in the city ‘ CHENNAI’ or ‘DELHI’.
5. List all the clients located at ‘CHENNAI’.
6. Print the information from sales order as the order the places in the month of January.
7. Find the products with description as ‘Floppy Drive’ and ‘Pen drive’.
8. Find the products whose selling price is grater than 2000 and less than or equal to 5000.
9. Find the products whose selling price is more than 1500 and also find the new selling price as original selling price *15.
10. Find the products in the sorted order of their description.
11. Divide the cost of product ‘540 HDD’ by difference between its price and 100.
12. List the product number, description, sell price of products whose description begin with letter ‘M’.
13. List all the orders that were cancelled in the month of March.
14. Count the total number of orders.
15. Calculate the average price of all the products.
16. Determine the maximum and minimum product prices.
17. Count the number of products having price grater than or equal to 1500.
18. Find all the products whose quantity on hand is less than reorder level.
19. Find out the challan details whose quantity dispatch is high.
20. Find out the order status of the sales order, whose order delivery is maximum in the month of March.
21. Find out the total sales made by the each salesman.
22. Find the total revenue gained by the each product sales in the period of Q1 and Q2 of year 2006.
23. Print the description and total qty sold for each product.
24. Find the value of each product sold.
25. Calculate the average qty sold for each client that has a maximum order value of 1,50,000.
26. List the products which has highest sales.
27. Find out the products and their quantities that will have to deliver in the current month.
28. Find the product number and descriptions of moving products.
29. Find the names of clients who have purchased ‘CD DRIVE’.

30. List the product numbers and sales order numbers of customers having quantity ordered less than 5 from the order details for the product '1.44 Floppies'.
31. Find the product numbers and descriptions of non-moving products.
32. Find the customer names and address for the clients, who placed the order '019001'.
33. Find the client names who have placed orders before the month of May, 2006.
34. Find the names of clients who have placed orders worth of 10000 or more.
35. Find out if the product is '1.44 drive' is ordered by any client and print the client number, name to whom it is sold.

Cycle-II

Aim: A Manufacturing Company deals with various parts and various suppliers supply these parts. It consists of three tables to record its entire information. Those are as follows

S(SNO,SNAME,CITY,STATUS)
P(PNO,PNAME,COLOR,WEIGTH,CITY,COST)
SP(SNO,PNO,QTY)
J(JNO,JNAME,CITY)
SPJ(SNO,PNO,JNO,QTY)

33. Get Suppliers Names for Suppliers who supply at least one red part.
34. Get Suppliers Names for Suppliers who do not supply part 'P2'
35. Using Group by with Having Clause, Get the part numbers for all the parts supplied by more than one supplier.
36. Get supplier numbers for suppliers with status value less the current max status value.
37. Get the total quantity of the part 'P2' supplied.
38. Get the part color, supplied by the supplier 'S1'
39. Get the names of the parts supplied by the supplier 'Smith' and "Black"
40. Get the Project numbers, whose parts are not in Red Color, from London.
41. Get the suppliers located from the same city.
42. Get the suppliers, who does not supply any part.
43. Find the pnames of parts supplied by London Supplier and by no one else.
45. Find the sno's of suppliers who charge more for some part than the average cost of that part.
46. Find the sid's of suppliers who supply only red parts.
47. Find the sid's of suppliers who supply a red and a green part.
48. Find the sid's of suppliers who supply a red or green part.

Cycle: III

An Airline System would like to keep track their information by using the following relations.

Flights (flno: integer, from: string, to: string, distance: integer,
Price: integer)
Aircraft (aid: integer, aname: string, cruising_range: integer)
Certified (eid: integer, aid: integer)

Employees (eid: integer, ename: string, salary: real)

Note that the employees relation describes pilots and other kinds of employees as well; every pilot is certified for aircraft and only pilots are certified to fly. Resolve the following queries:

1. For each pilot who is certified for more than three aircraft, find the eid's and the maximum cruising range of the aircraft that he (or She) certified for.
2. Find the names of pilots whose salary is less than the price of the cheapest route from Los Angeles to Honolulu.
3. Find the name of the pilots certified from some Boeing aircraft.
4. For all aircraft with cruising range over 1,000 miles, find the name of the aircraft and the average salary of all pilots certified for this aircraft.
5. Find the aid's of all aircraft than can be used from Los Angels to Chicago.
6. Print the enames of pilots who can operate planes with cruising range greater than 3,000 miles, but are not certified by Boeing aircraft.
7. Find the total amount paid to employees as salaries.
8. Find the eid's of employees who are certified for exactly three aircrafts.
9. Find the eid's of employee who make second highest salary.
10. Find the aid's of all than can be used on non-stop flights from Bonn to Chennai.

Cycle: IV : Employee Database

Aim: An enterprise wishes to maintain a database to automate its operations. Enterprise divided into to certain departments and each department consists of employees. The following two tables describes the automation schemas

DEPT (DEPTNO, DNAME, LOC)
EMP (EMPNO,ENAME,JOB,MGR,HIREDATE,SAL,COMM,DEPTNO)

1. Create a view, which contain employee names and their manager names working in sales department.
2. Determine the names of employee, who earn more than there managers.
3. Determine the names of employees, who take highest salary in their departments.
4. Determine the employees, who located at the same place.
5. Determine the employees, whose total salary is like the minimum salary of any department.
6. Update the employee salary by 25%, whose experience is greater than 10 years.
7. Delete the employees, who completed 32 years of service.
8. Determine the minimum salary of an employee and his details, who join on the same date.
9. Determine the count of employees, who are taking commission and not taking commission.
10. Determine the department does not contain any employees.
11. Find out the details of top 5 earners of company. (Note: Employee Salaries should not be duplicate like 5k,4k,4k,3k,2k)
12. Display those managers name whose salary is more than an average salary of his employees.

13. Display the names of the managers who is having maximum number of employees working under him?
14. In which year did most people join the company? Display the year and number of employees.
15. Display ename, dname even if there no employees working in a particular department(use outer join).

PL/SQL PROGRAMS

1. WRITE A PL/SQL PROGRAM TO CHECK THE GIVEN NUMBER IS STRONG OR NOT.

2. WRITE A PL/SQL PROGRAM TO CHECK THE GIVEN STRING IS PALINDROME OR NOT.

3. WRITE A PL/SQL PROGRAM TO SWAP TWO NUMBERS WITHOUT USING THIRD VARIABLE.

4. WRITE A PL/SQL PROGRAM TO GENERATE MULTIPLICATION TABLES FOR 2,4,6

5. WRITE A PL/SQL PROGRAM TO DISPLAY SUM OF EVEN NUMBERS AND SUM OF ODD NUMBERS IN THE GIVEN RANGE.

6. WRITE A PL/SQL PROGRAM TO CHECK THE GIVEN NUMBER IS PALLINDROME OR NOT.

7. THE HRD MANAGER HAS DECIDED TO RAISE THE EMPLOYEE SALARY BY 15%.
WRITE A PL/SQL BLOCK TO ACCEPT THE EMPLOYEE NUMBER AND UPDATE THE SALARY OF THAT EMPLOYEE. DISPLAY APPROPRIATE MESSAGE BASED ON THE EXISTENCE OF THE RECORD IN EMP TABLE.

8. WRITE A PL/SQL PROGRAM TO DISPLAY TOP 10 ROWS IN EMP TABLE BASED ON THEIR JOB AND SALARY.

9. WRITE A PL/SQL PROGRAM TO RAISE THE EMPLOYEE SALARAY BY 10%, FOR DEPARTMENT NUMBER 30 PEOPLE AND ALSO MAINTAIN THE RAISED DETAILS IN THE RAISE TABLE.

10. WRITE A PROCEDURE TO UPDATE THE SALARY OF EMPLOYEE, WHO ARE NOT GETTING COMMISSION BY 10%

11.WRITE A PL/SQL PROCEDURE TO PREPARE AN ELECTRICITY BILL BY USING FOLLOWING TABLE
TABLE USED: ELECT

| NAME | NULL? | TYPE |
|---|---|---|
| MNO | NOT NULL | NUMBER(3) |
| CNAME | | VARCHAR2(20) |
| CUR_READ | | NUMBER(5) |
| PREV_READ | | NUMBER(5) |
| NO_UNITS | | NUMBER(5) |
| AMOUNT | | NUMBER(8,2) |
| SER_TAX | | NUMBER(8,2) |
| NET_AMT | | NUMBER(9,2) |

12. WRITE A PL/SQL PROCEDURE TO PREPARE AN TELEPHONE BILL BY USING FOLLOWING TABLE. AND PRINT THE MOTHLY BILLS FOR EACH CUSTOMER
TABLE USED : PHONE.

| NAME | NULL? | TYPE |
|---|---|---|
| TEL_NO | NOT NULL | NUMBER(6) |
| CNAME | | VARCHAR2(20) |
| CITY | | VARCHAR2(10) |
| PR_READ | | NUMBER(5) |
| CUR_READ | | NUMBER(5) |
| NET_UNITS | | NUMBER(5) |
| TOT_AMT | | NUMBER(8,2) |

13. WRITE A PL/SQL PROGRAM TO RAISE THE EMPLOYEE SALARY BY 10%, WHO
ARE COMPLETED THERE 25 YEARS OF SERVICE AND STORE THE DETAILS AT PPROPRIATE TABLES (DEFINE THE RETAIR_EMP TABLE).

14. WRITE A PL/SQL PROCEDURE TO EVALUATE THE GRADE OF A STUDENT WITH
FOLLOWING CONDITIONS:

FOR PASS: ALL MARKS > 40
FOR I CLASS: TOTAL%>59
FOR II CLASS: TOTAL% BETWEEN >40 AND <60
FOR III CLASS: TOTAL% =40
AND ALSO MAINTAIN THE DETAILS IN ABSTRACT TABLE.

TABLES USED
1. TABLE STD

| NAME | NULL? | TYPE |
|---|---|---|
| NO | NOT NULL | NUMBER |
| NAME | | VARCHAR2(10) |

| | |
|---|---|
| INTNO | NUMBER |
| CLASS | NOT NULL VARCHAR2(10) |
| M1 | NUMBER |
| M2 | NUMBER |
| M3 | NUMBER |
| M4 | NUMBER |
| M5 | NUMBER |

2. TABLE ABSTRACT

| NAME | NULL? | TYPE |
|---|---|---|
| STDNO | | NUMBER |
| STDNAME | | VARCHAR2(10) |
| CLASS | | VARCHAR2(10) |
| MONTH | | VARCHAR2(10) |
| INTNO (INTERNAL NUMBER) | | NUMBER |
| TOT | | NUMBER |
| GRADE | | VARCHAR2(10) |
| PERCENT | | NUMBER |
| DAT_ENTER | | DATE |

15. CREATE AN VARRAY, WHICH HOLDS THE EMPLOYEE PHONE NUMBERS (AT LEAST THREE NUMBERS)
16. CREATE AN OBJECT TO DESCRIBE THE DETAILS OF ADDRESS TYPE DATA.
17. WRITE A PL/SQL PROCEDURE TO READ THE DATA INTO THE TABLE AS PER THE FOLLOWING DESCRIPTION

| Attribute Name | Data Type | DETAILS |
|---|---|---|
| EMPLOYEE NUMBER | NUMBER | |
| EMPLOYEE NAME | CHARACTER | |
| | | |
| ADDRESS | OBJECT | STREET NUMBER |
| | | STREET NAME |
| | | TOWN |
| | | DIST AND STATE |
| | | |
| QUALIFICATION | CHARACTER | |
| | | |
| | | |
| PHONE NUMBER | OBJECT-VARRAY | HOLDS THREE PHONE NUMBER |

| MCA 2.8 | COMMUNICATION SKILLS | |
|---|---|---|
| Instruction: 3 periods / week | | Credits: 1 |
| Internal : 30 marks | University Exam: 70 marks | Total : 100 Marks |

**Prescribed Books :**

1. Raymond Murphy, "Essential English Grammar", Second Edition, Cambridge University Press (2008)

2. LeenaSen, "Communication Skills", Second Edition, PHI (2008)

**Reference Books :**

1. AyshaViswamohan, "English for Technical Communication", TMH (2008)

2. P. KiranmaiDutt, GeethaRajeevan, "Basic Communication Skills", Foundation Books (2007)

3. T.M. Farhathullah, "Communication Skills for Technical Students", Orient Longman (2002)

4. E.Suresh Kumar, P. Sreehari, "Communicative English", Orient Longman (2007)

**SECOND YEAR – THIRD SEMESTER**

| Sub Code | Name of the Subject | Int. Marks | Ext. Marks | Total Marks | No of Credits | Hours / Week |
|---|---|---|---|---|---|---|
| MCA3.1 | JAVAProgramming | 30 | 70 | 100 | 5 | 4 |
| MCA3.2 | Object Oriented Modeling and Design using UML | 30 | 70 | 100 | 5 | 4 |
| MCA3.3 | Operations Research | 30 | 70 | 100 | 4 | 4 |
| MCA3.4 | Computer Graphics | 30 | 70 | 100 | 5 | 4 |
| MCA3.5 | Artificial Intelligence | 30 | 70 | 100 | 4 | 4 |
| MCA3.6 | UML Lab | 30 | 70 | 100 | 3 | 6 |
| MCA3.7 | Java Programming Lab | 30 | 70 | 100 | 3 | 6 |
| MCA3.8 | Seminar | 50 | --- | 50 | 1 | 3 |
| | **TOTAL** | **260** | **490** | **750** | **30** | **35** |
| | MOOCS | --- | --- | --- | 4 | --- |

| MCA 3.1 | JAVA Programming | |
|---|---|---|
| Instruction: 4 periods / week | | Credits: 5 |
| Internal : 30 marks | University Exam: 70 marks | Total : 100 Marks |

**Objectives:**
The course is designed to meet the objectives of:

1. learning to program in an object-oriented programming language
2. focusing those who already have some experience with another programming language, and who now wish to move on to an object-oriented one
3. learning object-oriented programming language by using Java.

**Outcomes:**
Students upon completion of this course will be able to:

1. explain the principles of the object oriented programming paradigm specifically including abstraction, encapsulation, inheritance and polymorphism using Java
2. use an object oriented programming language, and associated class libraries, to develop object oriented programs using Java
3. design, develop, test, and debug programs using object oriented principles in conjuncture with an integrated development environment using Java.

## SYLLABUS

### UNIT I

**Java Basics -** History of Java, Java buzzwords, comments, data types, variables, constants, scope and life time of variables, operators, operator hierarchy, expressions, type conversion and casting, enumerated types, control flow-block scope, conditional statements, loops, break and continue statements, simple java program, arrays, input and output, formatting output, Review of OOP concepts, encapsulation, inheritance, polymorphism, classes, objects, constructors, methods, parameter passing, static fields and methods, access control, this reference, overloading methods and constructors, recursion, garbage collection, building strings, exploring string class, Enumerations, autoboxing and unboxing, Generics.

**Inheritance** –Inheritance concept, benefits of inheritance, Super classes and Sub classes, Member access rules, Inheritance hierarchies, super uses, preventing inheritance: final classes and methods, casting, polymorphism- dynamic binding, method overriding, abstract classes and methods, the Object class and its methods.

**UNIT II**

**interfaces** – Interfaces vs. Abstract classes, defining an interface, implementing interfaces, accessing implementations through interface references, extending interface.

**Packages-**Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages.

**Files** – **streams**- byte streams, character streams, **text** Input/output, **binary** input/output, **random access file** operations, **File** management using File class, Using java.io.

**UNIT III**

**Exception handling** – Dealing with errors, benefits of exception handling, the classification of exceptions- exception hierarchy, checked exceptions and unchecked exceptions, usage of try, catch, throw, throws and finally, rethrowing exceptions, exception specification, built in exceptions, creating own exception sub classes, Guide lines for proper use of exceptions.

**Multithreading -** Differences between multiple processes and multiple threads, thread states, creating threads, interrupting threads, thread priorities, synchronizing threads, interthread communication, thread groups, daemon threads.

**UNIT IV :**

**Event Handling -** Events, Event sources, Event classes, Event Listeners, Relationship between Event sources and Listeners, Delegation event model, Semantic and Low-level events, Examples: handling a button click, handling mouse and keyboard events, Adapter classes.

**Applets** – Inheritance hierarchy for applets, differences between applets and applications, life cycle of an applet - Four methods of an applet, Developing applets and testing, passing parameters to applets, applet security issues.

**GUI Programming with Java** - The AWT class hierarchy, Introduction to Swing, Swing vs. AWT,MVC architecture, Hierarchy for Swing components, Containers – Top-level containers – JFrame, JApplet, JWindow, JDialog, Light weight containers – JPanel, A simple swing application, Overview of several swing components- Jbutton, JToggleButton, JCheckBox, JRadioButton, JLabel, JTextField, JTextArea, JList, JComboBox, JMenu, Java's Graphics capabilities – Introduction, Graphics contexts and Graphics objects, color control, Font control, Drawing lines, rectangles and ovals, Drawing arcs, Layout management - Layout manager types – border, grid, flow, box.

**Prescribed Text Books:**

1. Java: the complete reference, 7$^{th}$editon, Herbert Schildt, TMH.
2. Java for Programmers, P.J.Deitel and H.M.Deitel, Pearson education / Java: How to Program P.J.Deitel and H.M.Deitel ,8$^{th}$ edition, PHI.

**Reference Text Books:**

1. Core Java, Volume 1-Fundamentals, eighth edition, Cay S.Horstmann and Gary Cornell, Pearson education.
2. Thinking in Java, Bruce Eckel, PHP
3. Object Oriented Programming through Java, P.Radha Krishna, Universities Press.

**MODEL PAPER**
**MCA 3.1: JAVA programming**

**Time : 3 hrs** **Max Marks : 70**

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**Answer Question No.1 Compulsory:** **7 x 2 = 14 M**
**Answer ONE Question from each unit:** **4 x 14 = 56 M**

1. a) Inheritance vs polymorphism
   b) Define abstract class.
   c) Explain bytesteam
   d) explain java.io package
   e) Differences between multiple processes and multiple threads
   f) life cycle of an applet
   g) explain layout manager

UNIT – I

2. a) Explain about final classes, final methods and final variables?
   b) Explain about the abstract class with example program

OR

3. What are the basic principles of Object Oriented Programming? Explain with examples, how they are implemented in C++

UNIT – II

4. Is there any alternative solution for Inheritance. If so explain the advantages and disadvantages of it.

OR

5. (a) What is a package? How do we design a package?
   (b) How do we add a class or interface to a package?

UNIT – III

6. In JAVA, is exception handling implicit or explicit or both. Explain with the help of example java programs.

OR

7. (a) With the help of an example, explain multithreading by extending thread class.
   (b) Implementing Runnable interface and extending thread, which method you prefer for multithreading and why

UNIT – IV

8. Differentiate following with suitable examples:
   (a) Frame, JFrame (b) Applet, JApplet (c) Menu, Jmenu

OR

9. Explain the following:
   (a) Creating an applet (b) Passing parameters to applets
   (c) Adding graphics and colors to applets

| MCA 3.2 | OBJECT ORIENTED MODELLING AND DESIGN USING UML | |
|---|---|---|
| Instruction: 4 periods / week | | Credits: 5 |
| Internal : 30 marks | University Exam: 70 marks | Total : 100 Marks |

**Objectives:**
The course is designed to meet the objectives of:

1. To understand the object oriented concepts for designing object oriented models.
2. To understand the use of UML (Unified Modeling Language) for object oriented analysis and design.
3. To describe the step by step object oriented methodology of software development from problem statement through analysis, system design, and class design.
4. To understand the concept of different patterns for constructing software architectures through object oriented models.
5. To understand the problems, communicating with application experts, modeling enterprises, preparing documentation, and designing programs by using object oriented models.

**Outcomes:**
Students upon completion of this course will be able to:

1. Demonstrate the ability to apply the knowledge of object oriented concepts for solving system modeling and design problems.
2. Design and implement object oriented models using UML appropriate notations.
3. Ability to apply the concepts of object oriented methodologies to design cleaner softwares from the problem statement.
4. Apply the concept of domain and application analysis for designing UML Diagrams.
5. Comprehend the concept of architectural design approaches for system design and implementation issues for object oriented models.
6. Illustrate the concept of patterns for constructing software architecture

## SYLLABUS

***Unit-I***

**Introduction:** what is Object Orientation, What is OO Development, OO Themes, Evidence for Usefulness of OO Development.

**Modeling as Design Technique:** Modeling, Abstraction, Three Models

**Class Modeling:** Object and Class Concepts, Link and Association concepts, Generalization and Inheritance, A Sample Class Model.

**Advanced Class Modeling:** Advanced Object and Class Concepts, Association Ends, N-Ary Association, Aggregation, abstract Classes, Multiple Inheritance, Metadata, Reification, Constraints, Derived data, Packages.

***Unit-II***

**State Modeling:** Events, States, Transitions and Conditions, state diagrams, state diagram behavior.

**Advanced State Modeling:** Nested State Diagrams, Nested states, signal generalization, concurrency, A Sample State Model.

**Interaction Modeling:** Use Case Models, Sequence Models, Activity Models.

**Advanced Interaction Modeling:** Use Case Relationships, Procedural Sequence Models, Special Constructs for Activity Models.

***Unit-III***

**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.

**Application Analysis:** Application Interaction Model, Application Class Model, Application State Model, Adding Operations.

***Unit-IV***

**System Design:** Overview of system Design, Estimating Performance, Making a Reuse Plan, Breaking a System into Subsystem, Identifying Concurrency, Allocation of Subsystems, Management of data storage, Handling Global Resources, Choosing a Software Control Strategy, Handling Boundary Conditions, Setting Trade-off priorities, Common Architecture of ATM System.

**Class Design**: Overview of Class Design, Realizing Use Cases, Designing Algorithms, Recursing Downward, Refactoring, Design Optimization, Reification of Behavior, Adjustment of Inheritance, Organizing a class design.

**Implementation Modeling: Overview of Implementation, Fine Tuning classes, fine tuning Generalization, Realizing Associations,**Testing.

Programming Style: Object Oriented Style, Reusability, Robustness, Extensibility, Programming-in the Large.

**Prescribed Book:**

Michael Blaha, James Rumbaugh, "Object Oriented Modeling and Design with UML", Second Edition, PHI.

**Reference Books:**


1. Meilir Page-Jones, "Fundamentals of Object Oriented Design in UML", Pearson Education (2008).

1. Hans-Erik Eriksson, "UMLZ Took Kit", Wiley (2008).

2. Pascal Roques, "Modeling Software Systems Using UML2", Wiley (2008).

3. Simon Benett, Steve Mc Robb, "Object Oriented Systems Analysis and Design using UML", Second Edition, TMH (2007).

4. Mark Priestley, "Practical Object Oriented Design with UML", Second Edition, TMH (2008).

5. Grady Booch, James Rumbaugh "The Unified Modeling Language User Guide", Pearson (2008).

## Model Paper

### MCA 3.2: Object Oriented Modeling and Design with UML

**Time: 3 Hrs** **Max. Marks: 70**

**Answer Question No.1 Compulsory: 7 x 2 = 14 M**
**Answer ONE Question from each unit: 4 x 14 = 56 M**

1.a) Distinguish between object diagram and ER-diagram.
b) Define Meta class.
c) Distinguish between Aggregations versus generalization.
d) Explain Constraints.
e) What is analysis document?
f) Need for State-transition diagram?
g) Define modeling?

***Unit-I***

2.a) What is Modeling? What are different Object Modeling Techniques.
b) Discuss how was object oriented development methodology is different from Traditional approach.

(or)

3. Explain the following terms:
   i. Association.
   ii. Aggregation.
   iii. Generalization.
   iv. Composition.

***Unit-II***

4.a) What is State modeling? How does dynamic behavior of a system Represented ?
b) What is an Event? Discuss about types of Events with example?

(or)

5.a) What is Use Case? How was Use Case diagrams were helpful in Analysis of a System.
b) What is Concurrency? Discuss the concurrency with the help of an example.

**Unit-III**

6. Discuss about the steps involved in Analysis of a System.

(or)

7. a) Define state diagram for ATM Model.
b) Discuss about nested state diagram.

***Unit-IV***

8.a) What is the task of a design? How would you differentiate a good design from bad design?
b) Discuss about System Testing?

(or)

9.a) Discuss the programming style in the large complex systems.
b) Discuss about good programming style.

| MCA 3.3 | OPERATION RESEARCH | |
|---|---|---|
| Instruction: 4 periods / week | | Credits: 4 |
| Internal : 30 marks | University Exam: 70 marks | Total : 100 Marks |

**Objectives:**
The course is designed to meet the objectives of:

1. to make the students introduction of the methods of Operations Research,
2. emphasize the mathematical procedures of nonlinear programming search techniques,

**Outcomes:**
Students upon completion of this course will be able to:

1. identify and develop operational research models from the verbal description of the real system & use mathematical software to solve the proposed models,
2. understand the mathematical tools that are needed to solve optimisation problems

## SYLLABUS

**UNIT I:**

**Linear Programming**: Introduction, formulation of Linear Programming Models, Graphic solution of Linear programming Models, Maximization with Less-than-or-equal to constraints, equalities and Greater than or equal to constraints, Minimization of the objective function, the simplex Method, properties of simplex Method, transportation problem, Assignment Problem.

**UNIT II:**

**Deterministic inventory Models:** Introduction, Infinite Delivery Rate with No Backordering, Finite delivery Rate with no Backordering, Infinite Delivery Rate with Backordering, finite Delivery rate with Backordering.

**UNIT III:**

**Game Theory:** Introduction, Minimax -Maxmini pure strategies, Mixed Strategies and Expected Payoff, solution of 2x2 games, dominance, solution of 2xn games, solution of mx2 games, Brown's algorithm

**UNIT IV:**

**PERT:** Introduction, PERT Network, Time Estimates for Activities(ET), Earliest Expected completion of events(TE), Latest Allowable Event Completion time(TL), Event Slack Times(SE),Critical path

**Prescribed book:**

Belly E. Gillett, "Introduction to Operations Research - A computer-oriented algorithmic approach", TMH (2008).

**Chapters:** 3.2 to 3.7, 3.10 to 3.12, 6.1 to 6.5, 11.1 to 11.4,
11.6 to 11.9, 12.1 to 12.7

**Reference Book:**

J K Sharma, "Operation Research theory and applications",
Third edition, MACMILLAN

## Model Paper

## MCA 3.3 :Operations Research

**Time: 3 Hrs** **Max. Marks: 70**

**Answer Question No.1 Compulsory: 7 x 2 = 14 M**
**Answer ONE Question from each unit: 4 x 14 = 56 M**

1. a. Standard form of L.P.P.
   b. Degeneracy in Simplex Method.
   c. North-West Corner Rule.
   d. Unbalanced transportation problem.
   e. Dominance Property.
   f. Pay-Off matrix.
   g. Three time estimates of PERT.
   h. Total float and Free float.

Unit-I

2. a. Solve the following L.P.P by using Graphical Method.

Minimize $Z = 3x_1+5x_2$

Subject to constraints

$-3x_1+4x_2 \leq 12$;

$2x_1-x_2 \geq -2$;

$2x_1+3x_2 \geq 12$ and $x_1 \geq 0$; $x_2 \geq 0$;

b. Solve the following L.P.P by using simplex method.

Max $Z = 3x_1+2x_2$

Subject to the constraints

$4x_1+2x_2 \leq 12$;

$4x_1+x_2 \leq 8$;

$4x_1-x_2 \leq 8$; and $x_1, x_2 \geq 0$

(or)

3. a. Explain the procedure for Hungarian Method.

b. Given below is a table taken from the solution process for a transportation problem.

| | | Distribution centre | | | | |
|---|---|---|---|---|---|---|
| | | Cost per unit(in rupees) | | | | Availability |
| | | 1 | 2 | 3 | 4 | |
| Factory | A | 10 | 8 | 7 | 12 | 5000 |
| | B | 12 | 13 | 6 | 10 | 6000 |
| | C | 8 | 10 | 12 | 14 | 9000 |
| Demand (in Units) | | 7000 | 5500 | 4500 | 3000 | |

Answer the following Questions :

(i) Is this solution feasible.

(ii) Is this solution degenerate.

(iii) Is this solution optimum ? If not find the Optimum Solution.

## Unit-II

4.a. Explain the Finite delivery rate with No BACKORDERING.

b. Suppose a retailer has the following information

Available :

D = 350 Units/Year

$C_0$ = \$50 per order

$C_1$ = \$13.75 per unit

$C_2$ = \$25 per unit

LT = 5 days.

To minimize the total annual inventory cost when back ordering is allowed, how many units should be ordered each time an order is placed, and how many backorders should be allowed ?

(or)

5. a. Explain infinite delivery rate with NOBACKORDERING.

b. Explain with Finite delivery rate with BACKORDERING.

## Unit-III

6. a. Explain briefly how can you solve the 2x2 game.

b. Solve the following game by using graphical method.

Player – B

| | | I | II | III | IV | V |
|---|---|---|---|---|---|---|
| Player-A | 1 | 7 | | | | |
| | 3 | -1 | 5 | -2 | -2 | 1 |
| | 0 | | | | | |
| | 6 | | | | | |
| | –1 | | | | | |
| | 2 | | | | | |

(or)

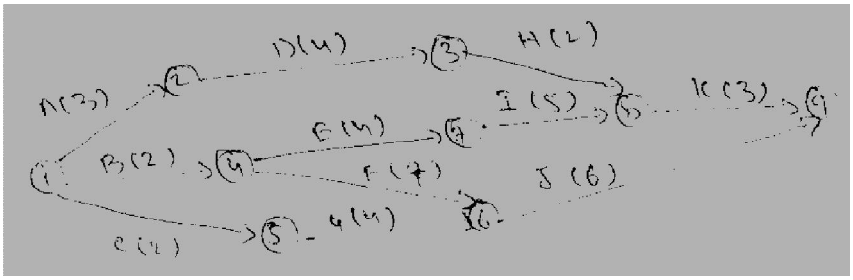
7. a. Explain the procedure for mx2 game in the case of graphical method.

b. Explain the Brown's algorithm.

## Unit-IV

8. a. Explain the Time calculations in Critical path method.

b. For the following Network diagram, Identify the Critical path and find the total project duration.




(or)

9. The three time estimates of PERT Network are as follows :

| Activity | | Estimated duration (weeks) | | |
|---|---|---|---|---|
| i | j | Optimistic time | Most likely time | Pessimistic time |
| 1 | 2 | 1 | 1 | 7 |
| 1 | 3 | 1 | 4 | 7 |
| 1 | 4 | 2 | 2 | 8 |
| 2 | 5 | 1 | 1 | 1 |
| 3 | 5 | 2 | 5 | 14 |
| 4 | 6 | 2 | 5 | 8 |
| 5 | 6 | 3 | 6 | 15 |

(i) Draw the Project network
(ii) Find the expected duration and variance of each activity
(iii) Find the expected project length
(iv) Calculate the variance and standard deviation of the project length
**(v)** What is the probability that the project will be **completed at least 4 weeks earlier than expected.**

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| MCA 3.4 | COMPUTER GRAPHICS | |
|---|---|---|
| Instruction: 4 periods / week | | Credits: 5 |
| Internal : 30 marks | University Exam: 70 marks | Total : 100 Marks |

**Objectives:**
The course is designed to meet the objectives of:
1. Introducing graphical techniques such as modelling, representation, illumination, shadowing, rendering and texturing,
2. To learn two dimensional and three dimensional computer graphics with comprehend advanced software tools of computer graphics.

**Outcomes:**
Students upon completion of this course will be able to:

1. Comprehend mathematical basics which are used in computer graphics and also learnhow to use them in designing computer graphics programs.
2. Describe basic graphics principles which are used in games, animations and film making

## SYLLABUS

**Unit-I**

**Overview of Computer Graphics:** Video Display Devices, Raster Scan Displays, Random Scan Displays, Color CRT Monitors, Direct View Storage Tubes, Flat Panel Displays, Raster Scan Systems, Random Scan Systems, Input Devices.

**Graphical User Interfaces and Interactive Input Methods:** The User Dialogue, Windows and Icons, Input of Graphical Data, Input Functions

**Unit-II**

**Output Primitives:** Points and Lines, Line-Drawing Algorithms: DDA Algorithm, Bresenham's Line Algorithm, Line Function, Circle Generation Algorithms, Ellipse Generation Algorithms

**Attributes of output Primitives:** Line Attributes, Color and GrayScale levels, Area Fill Attributes, Character Attributes, Bundled Attributes, Antialiasing.

**Unit-III**

**Two Dimensional Geometric Transformations:** Basic Transformations, Matrix Representation and Homogenous Coordinates, Composite Transformations, Other Transformations.

**Two Dimensional Viewing:** The Viewing pipeline, Viewing Coordinates Reference Frame, Window to Viewport Coordinate Transformations, Two Dimensional Viewing Functions, Clipping Operations, Point Clipping, Line Clipping: Cohen-Sutherland Line Clipping,

Polygon Clipping: Sutherland-Hodgeman Polygon Clipping, Curve Clipping, Text Clipping, Exterior Clipping.

**Unit-IV**

**Three Dimensional Concepts:** Three Dimensional Display Methods.

**Three Dimensional Object Representations:** Polygon Surfaces, Quadric Surfaces, Superquadrics.

**Three Dimensional Geometric and Modeling Transformations:** Translation, Rotation, Scaling, Other Transformations, Composite Transformations, Three Dimensional Transformation Functions.

**Three Dimensional Viewing:** Viewing pipeline, Viewing Coordinates, Projections, Clipping

**Prescribed Book:**

Donald Hearn, M. Pauline Baker, "Computer Graphics", Second Edition, Pearson Education (2004)

**Chapters :**2.1 to 2.5, 8.1 to 8.3, 3.1, 3.2, 3.4 to 3.6, 4, 5.1 to 5.4, 6, 9.1, 10.1, 10.3, 10.4, 11, 12.1, 12.2, 12.3, 12.5

**Reference Book:**


1. ShaliniGovil-Pai, "Principles of Computer Graphics – Theory and Practice using open GL and Maya", Springer (2007)

2. ISRD group, "Computer Graphics", ace series, TMH (2006)

3. Amarendra N. Sinha, Arun D Udai, "Computer Graphics", TMH (2008)

4. William M. Newman, Robert F. Sproull, "Principles of Interactive Computer Graphics "

**Model Paper**

**MCA 3.4: Computer Graphics**

**Time: 3 Hrs** **Max. Marks: 70**

**Answer Question No.1 Compulsory: 7 x 2 = 14 M**

**Answer ONE Question from each unit: 4 x 14 = 56 M**

1.a) What is the difference between Passive and Interactive Graphics?
b) What is Frame Buffer?
c) What are the drawbacks of DDA Algorithm?
d) What is world coordinate system?
e) Define typeface.
f) What are the attributes of a Line?
g) What is projection?

UNIT-I

2.a) Discuss about Color Monitor?
b) What is Computer Graphics? What are the major considerations in the study of computer graphics?

(Or)

3.a) Discuss about various positioning devices.
b) Describe the difference between Random Scan Display devices and Raster scan display devices.

UNIT-II

4.a) Describe the generation of ellipse.
b) Illustrate the Bresenham's line algorithm with end points (10,10) and (10,20).

(Or)

5.a) What is an output primitive? Discuss about attributes of character.
b) Discuss about area filling styles.

UNIT-III

6.a) What are two-dimensional transformations? Explain.
b) Perform a $45^o$ rotation of a triangle A(0,0), B(1,1) and c(5,2)
i. About the origin ii. About the point(-1,2)

(Or)

7. a) Write about Window-to-view port coordinate transformation.
b) Discuss about polygon clipping Algorithm

UNIT-IV

8. Discuss about 3D Projection.

(Or)

9. Derive the combined transformation matrix of the following:
A 3D Translation with 3 units along X-axis, 4 units along Y-axis, 5 units along Z-axis followed by a #D rotation by $30^o$ on XY Plane followed by 3D rotation of $45^o$ around Y-axis.

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| MCA 3.5 | ARTIFICIAL INTELLIGENCE | |
|---|---|---|
| Instruction: 4 periods / week | | Credits: 4 |
| Internal : 30 marks | University Exam: 70 marks | Total : 100 Marks |

**Objectives:**

The course is designed to meet the objectives of:
1. To introduce the fundamental concepts of artificial intelligence;
2. To equip students with the knowledge and skills in logic programming using Prolog;
3. To explore the different paradigms in knowledge representation and reasoning

**Outcomes:**
Students upon completion of this course will be able to:

1. Understand the history, development and various applications of artificial intelligence
2. Familiarize with propositional and predicate logic and their roles in logic programming;
3. Understand the programming language Prolog and write programs in declarative programming style;
4. Learn the knowledge representation and reasoning techniques in rule-based systems, case-based systems, and model-based systems;
5. Appreciate how uncertainty is being tackled in the knowledge representation and reasoning process.

## SYLLABUS

**Unit-I :**

**What is AI? :** The AI Problems, The Underlying Assumption, What is AI Technique?, The level of the Model, Criteria for Success.

**Problems, Problem spaces & Search:** Defining the Problem as a State Space Search, Production Systems, Problem Characteristics, Production System Characteristics, Issues in the design of Search Programs, Additional Problems.

**Heuristic search techniques:** Generate and Test, Hill Climbing, Best First Search, Problem Reduction, Constraint Satisfaction, Means Ends Analysis.

**Unit-II :**

**Knowledge Representation Issues**: Representations and Mappings, Approaches to Knowledge Representation, Issues in Knowledge Representation, The Frame Problem

**Using Predicate Logic:** Representing Simple Facts in Logic, Representing Instance and Isa Relationships, Computable Functions and Predicates, Resolution, Natural Deduction

**Representing knowledge using Rules:** Procedural versus Declarative Knowledge, Logic Programming, Forward versus Backward Reasoning, Matching, Control Knowledge

**Unit-III :**

**Symbolic Reasoning under Uncertainity:** Introduction to Nonmonotonic Reasoning, Logics for Nonmonotonic Reasoning, Implementation Issues, Augmenting a Problem Solver, Implementation: Depth-First Search, Implementation: Breadth-First Search

**Weak slot & filler Structures:** Semantic Nets, Frames

**Planning :** Overview, An Example Domain : The Blocks World, Components of a Planning System, Goal Stack Planning, Nonlinear Planning Using Constraint Posting, Hierarchical Planning, Reactive Systems, Other Planning Techniques

**Unit-IV :**

**Natural Language Processing:** Introduction, Syntactic Processing, Semantic Analysis, Discourse and Pragmatic Processing

**Commonsense:** Qualitative Physics, Commonsense Ontologies, Memory Organisation, Case-Based Reasoning

**Expert Systems:** Representing and Using Domain Knowledge, Expert System Shells, Explanation, Knowledge Acquisition

**Prescribed Book:**

Knight K, "Artificial Intelligence", TMH (1991)

**Chapters :** 1 through 7, 9, 13, 15, 10 and 20

**Reference Book :**


1. Michael Negnevitsky, "Artificial Intelligence – A Guide to Intelligent Systems", Second Edition, Pearson Education (2008)

2. Winston P.H, "Artificial Intelligence", Addision Wesley (1993)

**Model Paper**

**MCA 3.5: Artificial Intelligence**

**Time: 3 Hrs** **Max. Marks: 70**

**Answer Question No.1 Compulsory: 7 x 2 = 14 M**
**Answer ONE Question from each unit: 4 x 14 = 56 M**

1. a. What is Abduction in Reasoning ?
   a) What is meant by Turing Test?
   b) Advantages of Depth-First Search.
   c) Write about production system types and explain.
   d) Define and explain Inheritable knowledge.
   e) Define inferential Adequacy and Acquisional efficiency.
   f) What is meant by pragmatic Analysis?
   g) Discuss the importance of knowledge representation in A.I. system development.

Unit-I

2. a. When you call a technique is a A.I technique ? What is meant by A.I problem explain in detail.
   b. Discuss about problem Reduction Algorithm.

( or )

3. a. Explain Depth-First search and Breadth –First search in Reasoning.
   b. Explain Non linear planning using constraint posting.

Unit-II

4.a. Advantages and disadvantages of Forward chaining. When compared to backward chaining.
   b. Explain Issues in knowledge Representation.

(or)

5. Write principles of resolution with example.

Unit-III

6. Explain conversion of Clause from with the help of Example.

(or)

7. Write Unification algorithm with the help of example.

Unit-IV

8. a. i) Define and explain below terms
   Morphological Analysis
   Syntactic Analysis
   Semantic Analysis
   Discourse Analysis
   Pragmatic Analysis
   ii) Explain Goal Stack planning.

( or )

9. Explain about Expert systems in detailed.

| MCA 3.6 | UML LAB | |
|---|---|---|
| Instruction: 6 periods / week | | Credits: 3 |
| Internal : 30 marks | University Exam: 70 marks | Total : 100 Marks |

1. The student should take up the case study of Unified Library application which is mentioned in the theory, and Model it in different views i.e. Use case view, logical view, component view, Deployment view, Database design, forward and Reverse Engineering, and Generation of documentation of the project.

2. Student has to take up another case study of his/her own interest and do the same whatever mentioned in first problem. Some of the ideas regarding case studies are given in reference books which were mentioned in theory syllabus can be referred for some idea.

3. Design the UML diagrams for the Library management System

4. Design the UML diagram for the Student Marks management System

5. Case Study: Design the UML diagrams for your own project.

| MCA 3.7 | JAVA PROGRAMMING LAB | |
|---|---|---|
| Instruction: 6 periods / week | | Credits: 3 |
| Internal : 30 marks | University Exam: 70 marks | Total : 100 Marks |

## LAB CYCLE

1. Write a Java Program to define a class, describe its constructor, overload the constructors and instantiate its object.

2. Write a Java Program to define a class, define instance methods for setting and retrieving values of instance variables and instantiate its object

3. Write a java program to practice using String class and its methods

4. Write a java program to implement inheritance and demonstrate use of method overriding

5. Write a java program to implement multilevel inheritance by applying various access controls to its data members and methods.

6. Write a program to demonstrate use of implementing interfaces

7. Design a Java interface for ADT Stack. Develop two different
classes that implement this interface, one using array and the other using linked-list. Provide necessary exception handling in both the implementations.

8. Write a Java program to implement the concept of importing classes from user defined package and creating packages

9. Write a program to implement the concept of threading by implementing Runnable Interface

10. write a java program to store and read objects from a file

11. Write a Java program that displays the number of characters, lines and words in a text file.

12. write a java program to illustrate object serialization

13. Create a java program to illustrate user defined exception

14. Write a java program to create a thread using runnable interface

15. Write a Java program that creates three threads. First thread displays “Good Morning” every one second, the second thread displays “Hello” every two seconds and the third thread displays “Welcome” every three seconds

16. Write an applet To create multiple threads that correctly implements producer consumer problem using the concept of Inter thread communication

17. Write an applet To handling the mouse events

18. Write a Program That works as a simple calculator using Grid layout to arrange buttons for the digits and +,-,* % operations. Add a text field to print the result.

19. Build and run "CelsiusConverter" sample application using swings

20. Develop an applet that receives an integer in one text field, and computes its factorial Value and returns it in another text field, when the button named “Compute” is clicked

| MCA 3.8 | SEMINAR |
|---|---|
| **Instruction: 3 periods / week** | **Credits: 1** |
| **TOTAL MARKS : 50** | |

## SECOND YEAR – FOURTH SEMESTER

| Sub Code | Name of the Subject | Int. Marks | Ext. Marks | Total Marks | No of Credits | Hours/ Week |
|---|---|---|---|---|---|---|
| MCA4.1 | Data Mining Techniques | 30 | 70 | 100 | 4 | 4 |
| MCA4.2 | Machine Learning | 30 | 70 | 100 | 5 | 4 |
| MCA4.3 | Web Technologies | 30 | 70 | 100 | 4 | 4 |
| MCA4.4 | Software Engineering | 30 | 70 | 100 | 4 | 4 |
| MCA4.5.1<br>MCA 4.5.2<br><br>MCA 4.5.3 | Grid and Cluster Computing<br>Cryptography and Network Security<br>Simulation Modeling and Analysis | 30 | 70 | 100 | 4 | 4 |
| MCA4.6 | Web Technologies Lab | 30 | 70 | 100 | 3 | 6 |
| MCA4.7 | Mini Project | 30 | 70 | 100 | 5 | 6 |
| MCA4.8 | Soft skills | 50 | -- | 50 | 1 | 3 |
| | **TOTAL** | **260** | **490** | **750** | **30** | **35** |
| | MOOCS | --- | --- | --- | 4 | --- |

| MCA 4.1 | DATA MINING TECHNIQUES | |
|---|---|---|
| Instruction: 4 periods / week | | Credits: 5 |
| Internal : 30 marks | University Exam: 70 marks | Total : 100 Marks |

**Objectives:**
The course is designed to meet the objectives of:

1. understand classical models and algorithms in data warehousing and data mining,
2. enable students to analyse the data, identify the problems, and choose the relevant models and algorithms to apply,
3. assess the strengths and weaknesses of various methods and algorithms and to analyse their behaviour.

**Outcomes:**
Students upon completion of this course will be able to:

1. learn implementation of classical algorithms in data mining and data warehousing
2. learn to identify the application area of algorithms, and apply them
3. learn clustering application and resent works in data mining

## SYLLABUS

**UNIT – I**

**Introducing to Data Mining :** Introduction, What is Data Mining, Definition, KDD, Challenges, Data Mining Tasks, Data Preprocessing, Data Cleaning, Missing data, Dimensionality Reduction, Feature Subset Selection, Discretization and Binaryzation, Data Transformation; Measures of Similarity and Dissimilarity – Basics.

**UNIT – II**

**Association Rules :** Problems Definition, Frequent Item Set Generation, The APRIORI Principle, Support and Confidence Measures, Association Rule Generation; APRIOIRI Algorithm,The Partition Algorithms, FP- Growth Algorithms, Compact Representation of Frequent Ittem set- Maximal Frequent Item Set, Closed Frequent Item Sets.

**UNIT – III**

**Classification :** Problem Definition, General Approaches to solving a classification problem, Evaluation of classifiers, Classification Techniques, Decision Tree – Decision tree Construction, Methods for Expressing attribute test conditions, Measures for Selecting the Best Split, Algorithm for Decision tree Induction; Naive Bayes Classifier, Bayesaian Belief Networks; K – N earnest neighbour classification – Algorithm and Characteristics.

**UNIT – IV**

**Clustering :** Problem Definition, Clustering Overview, Evaluation of Clustering Algorithms, Partitioning Clustering -K-Means Algorithm, K-Means Additional issues, PAM Algorithm;

Hierarchical Clustering – Agglomerative Methods and divisive methods, Basic Agglomerative Hierarchical Clustering, Strengths ans Weakness; Outlier Detection.

**Prescribed Textbooks:**

- Data Mining – Concepts and Techniques – Jiawei Han, MichelinenKamber, Morgan Kaufmann Publishers, Elsevier, 2 Edition, 2006.
- Introduction to Data Mining, Pang – Ning Tan, Vipin Kumar, Michael Steinbanch, Pearson Education.

**Reference Books:**

- Data Mining Techniques, Arun K Pujari, 3rd Edition, Universities Press.
- Data Warehouse Fundamentals, PualrajPonnaiah, Wiley Student Edition.
- Data Mining, VikaramPudi, P Radha Krishna, Oxford University Press

Model Paper

**MCA 4.1: Data Mining Techniques**

Time: 3 Hrs Max. Marks: 70

Answer the following questions. Each Question Carries 14 Marks.

1.(a) What is OLAP? Discuss about OLAP operations.
(b) What is Multidimensional Model?
(c) What is Generalized Rule?
(d) Explain about different cluster categories.
(e) How can the root of the decision tree was initialised?
(f) What kinds of data used in Data Mining?
(g) What is Meta data? Describe the types of Metadata.

Unit-I

2.(a) What is Data Mining? Discuss the difference between Warehouse and Database.
(b) What is Warehouse Schema? Discuss about Star Schema.

(or)

(c) Discuss about the phases of data mining Architecture.

(d) Discuss about Indexing Techniques used to organize the data in the Data mining.

Unit-II

3.(a) Discuss and Compare
i. Priori Algorithm.
ii. PAM Algorithm
(b) What is Association Rule? Is every subset of any itemset must contain either a frequent set or a border set. Justify.

(OR)

(b) Discuss about FP-Tree Growth Algorithm.
(c) Discus about various categories of Association Rules

Unit-III

4.(a) What is Decision Tree? Discuss about Decision Tree Construction Algorithms.
(b) Discuss about Bayesian Classification.

(OR)

(c) What is the purpose of Neural Network? Discuss about types of Neural Networks?
(d) Discuss about salient features of the generic algorithm? How can a data mining problem can be an optimization problem? How can do you use generic algorithms for such a cases?

## Unit-IV

5.(a) What is clustering? Discuss about various categories of clustering.

(b) Discuss about DBSCAN Algorithm.

(or)

(c) Discuss about BIRCH clustering

(d) Discuss about STING Algorithm with example.

| MCA 4.2 | MACHINE LEARNING | |
|---|---|---|
| Instruction: 4 periods / week | | Credits: 5 |
| Internal : 30 marks | University Exam: 70 marks | Total : 100 Marks |

**Objectives:**

The course is designed to meet the objectives of:

1. To introduce to the students the basic concepts and fundamentals of machine learning
2. To develop skills of implementing machine learning techniques
3. To familiarize the students with latest technologies
4. To implement machine learning solutions to classification, regression and clusteing

**Outcomes:**

Students upon completion of this course will be able to:

1. Students possess ability to select and implement machine learning techniques
2. To recognize and implement various ways of selecting suitable model parameters for different machine learning techniques
3. Ability to integrate machine learning libraries and mathematical and statistical tools with modern technologies.
4. Ability to select and implement machine learning techniques and computing environment that are suitable for the applications under consideration.

**SYLLABUS**

**UNIT - I**

Introduction - Well-posed learning problems, Designing a learning system, Perspectives and issuesin machine learning

Concept learning and the General to Specific Ordering – Introduction, A concept learning task, Concept learning as search, Find-S: finding a maximally specific hypothesis, Version spaces and the Candidate-Elimination algorithm, Remarks on version spaces and Candidate-Elimination, Inductive Bias

**UNIT - II**

Decision Tree learning – Introduction, Decision tree representation, Appropriate problems for decision tree learning, The basic decision tree learning algorithm, Hypothesis space search in decision tree learning, Inductive bias in decision tree learning, Issues in decision tree learning Evaluation Hypotheses – Motivation, Estimation hypothesis accuracy, Basics of sampling theory, A general approach for deriving confidence intervals, Difference in error of two hypotheses, Comparing learning algorithms

Bayesian learning – Introduction, Bayes theorem, Bayes theorem and concept learning, Maximum likelihood and least squared error hypotheses, Maximum likelihood hypotheses for predicting probabilities, Minimum description length principle, Bayes optimal classifier, Gibbs algorithm, Naïve Bayes classifier, An example learning to classify text, Bayesian belief networks The EM algorithm

## UNIT - III

Bayesian learning – Introduction, Bayes theorem, Bayes theorem and concept learning, Maximum likelihood and least squared error hypotheses, Maximum likelihood hypotheses for predicting probabilities, Minimum description length principle, Bayes optimal classifier, Gibbs algorithm, Naïve Bayes classifier, An Example: learning to classify text, Bayesian belief networks, The EM algorithm

Computational learning theory – Introduction, Probability Learning an Approximately Correct Hypothesis, Sample Complexity for Finite Hypothesis Space, Sample Complexity for infinite Hypothesis Spaces, The Mistake Bound Model of Learning

Instance-Based Learning- Introduction, k -Nearest Neighbour Learning, Locally Weighted Regression, Radial Basis Functions, Case-Based Reasoning, Remarks on Lazy and Eager Learning

## Unit- IV

Genetic Algorithms – Motivation, Genetic Algorithms, An illustrative Example, Hypothesis SpaceSearch, Genetic Programming, Models of Evolution and Learning, Parallelizing Genetic Algorithms

Combining Inductive and Analytical Learning – Motivation, Inductive-Analytical Approaches to Learning, Using Prior Knowledge to Initialize the Hypothesis, Using Prior Knowledge to Alter the Search Objective, Using Prior Knowledge to Augment Search Operators

Reinforcement Learning – Introduction, The Learning Task, Q Learning, Non-Deterministic, Rewards and Actions, Temporal Difference Learning, Generalizing from Examples, Relationship to Dynamic Programming

TEXT BOOKS:

Machine Learning – Tom M. Mitchell, - MGH

REFERENCE BOOKS:

1. Introduction to Machine Learning,- EthemAlpaydin, - PHI

2. Machine Learning: An Algorithmic Perspective, Stephen Marsland, Taylor & Francis

Model Paper

**MCA 4.2: MACHINE LEARNING**

**Time: 3 Hrs** **Max. Marks: 70**

**Answer Question No.1 Compulsory: 7 x 2 = 14 M**
**Answer ONE Question from each unit: 4 x 14 = 56 M**

1. a) Write the issues of machine learning.
b) What is an unbiased learner?
c) Define Hypothesis space search
d) What is sampling theory?
e) Write about Bayes optimal classifier
f) What is regression?
g) What is the use of genetic algorithm?

**Unit-I**

2 a. What is Machine Learning? Explain different perspective and issues in machine learning.
b. Describe the Find-s algorithm. Explain how to find a maximally specific hypothesis.

OR

3 a. List and explain the steps to design a learning systems in detail.
b. Illustrate the candidate elimination algorithm with suitable example.

**UNIT-II**

4 a. Describe the Inductive Bias in decision tree learning.
b. Write about handling training examples with missing attribute values.

OR

5 a. Explain about estimating hypothesis accuracy.
b. Write a note on practical considerations in comparing learning algorithms

**UNIT - III**

6 a. Write Bayes theorem. What is the relationship between Bayes theorem and the problem of concept learning?
b. Explain Maximum Likelihood Hypothesis for predicting probabilities.

**OR**

7 a. Explain Naïve Bayes Classifier with an Example.
b. Explain the EM Algorithm in detail. (08 Marks.)

**UNIT-IV**

8 a. Define the following terms
i) Error of a Hypothesis. ii) Optimal Mistake Bounds iii) Weighted-Majority Algorithm
b. Explain about sample complexity for finite hypothesis spaces

**OR**

9.a. Explain the K – nearest neighbour algorithm for approximating a discrete – valued function with pseudo code
b. Write about locally weighted regression.

| MCA 4.3 | WEB TECHNOLOGIES | |
|---|---|---|
| Instruction: 4 periods / week | | Credits: 4 |
| Internal : 30 marks | University Exam: 70 marks | Total : 100 Marks |

**Objectives:**
The course is designed to meet the objectives of:

1. to complete an in-depth knowledge of web technology
2. to know and to have the idea for different web application that most web developers are likely to use
3. to be aware of, and to have used, the enhancements of the web applications
4. to know the different types of web application software.

**Outcomes:**
Students upon completing of enough this will be able to:
1. develop client/server applications
2. update and retrieve the data from the databases using SQL
3. develop server side programs in the form of servlets

**SYLLABUS**

**UNIT I**

**HTML: Common Tags:** List, Tables, images, forms, Frames, Cascading Style Sheets;
**Java Script:** Introduction to Java Scripts, Objects in Java Script, Dynamic HTML with Java Script.

**UNIT II**

**XML:**Document type definition, XML Schemas, Document Object model, Presenting XML, Using XML Processors: DOM and SAX
**CGI Scripting:** What is CGI? – Developing CGI applications – Processing CGI – Returning a Basic HTML page – Introduction to CGI.pm – CGI.pm methods – Creating HTML pages dynamically.

**UNIT III**

**JDBC:** Introduction to JDBC – Connections – Internal Database Connections – Statements – Results Sets - Prepared Statements - Callable Statements.

**Network Programming and RMI:** why networked Java – Basic Network Concepts – looking up Internet Addresses – URLs and URIs – UDP Datagrams and Sockets – Remote Method Invocation.

**Unit –IV**

**Web Servers and Servlets:** Tomcat web server, Introduction to Servlets: Lifecycle of a Servlet, JSDK, The Servlet API, The javax.servlet Package, Reading Servlet parameters, Reading Initialization parameters. The javax.servlet HTTP package, Handling Http Request & Responses, Using Cookies-Session Tracking, Security Issues.

**Introduction to JSP**: The Problem with Servlet. The Anatomy of a JSP Page, JSP Processing. JSP Application Design with MVC Setting Up and JSP Environment: Installing the Java Software Development Kit, Tomcat Server & Testing Tomcat

Prescribed Textbooks

1. Web Programming, building internet applications, Chris Bates 2nd edition, WILEY Dreamtech (units I, II)
2. Java Programming with JDBC ;Donald Bales, O'Reilly (Unit III)
3. Java Network Programming, elliotte Rusty Harold, 3rd Edition, O'Reilly (Unit III)
4. Java Server Pages – Hans Bergsten, SPD O'Reilly (Unit IV)

Reference Textbooks


1. Robert W. Sebesta, "Programming the World Wide Web", Third Edition, Pearson Education (2007).
2. Anders Moller and Michael schwartzbach, "An Introduction to XML and Web Technologies", Addison Wesley (2006)
3. Chris Bates, "Web Programming–Building Internet Applications", Second Edition, Wiley (2007).
4. Jeffrey C. Jackson, "Web Technologies – A Computer Science Perspective", Pearson Education (2008).
5. H.M.Deitel, P.J.Deitel, "Java How to Program", Sixth Edition, Pearson Education (2007)
6. DebasishJana,"Java and Object Oriented Programming Paradigm", PHI (2005).
7. ISRD Group, "Introduction to Object Oriented Programming through Java", TMH (2007).

*Model Paper*

**MCA 4.3: web technologies**

**Time: 3 Hrs** **Max. Marks: 70**

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**Answer Question No.1 Compulsory:** **7 x 2 = 14 M**

**Answer ONE Question from each unit:** **4 x 14 = 56 M**

1. (a) What are HTML tags?

(b) What are the features of JavaScript?

(c) What is XML? How is it different from HTML?

(d) What is DTD?

(e) What is meant by Session?

(f) List the JSP implicit objects?

(g) Define Servlet

2. (a) Create a simple HTML page which demonstrates the use of the various types of lists. Try adding a definition list which uses an unordered list to define terms.

(b) Develop a javascript to determine whether a given number is an 'ARMSTRONG NUMBER' or not.

OR

3. (a) How how group and alignment of tables rows and columns is achieved using HTML.

(b) Describe the various Date Objects with suitable examples.

4. (a) Explain the five possible keywords in a DTD declaration with suitable examples.

(b) Define an XML schema. Show how an XML schema can be created.

OR

5. (a) explain CGI.pm module

(b) explain clearly the steps involved in executing a CGI program

6. (a) Discuss the four types of JDBC drivers.

(b) Give a note on javax.sql package.

OR

7. What is the RMI layer model. What are the steps involved in writing an RMI Application?

8. (a) What are the limitations of Servlets? How JSP over comes these Problems.

(b) Discuss about Tomcat Server.

OR

9. Explain the components of JSP and how application data can be shared in JSP? Explain

| MCA 4.4 | SOFTWARE ENGINEERING | |
|---|---|---|
| Instruction: 4 periods / week | | Credits: 4 |
| Internal : 30 marks | University Exam: 70 marks | Total : 100 Marks |

**Objectives:**
The course is designed to meet the objectives of:

1. The need of software engineering, its different life cycles and different phases,
2. To measure cost, efforts, time and team management etc,
3. Testing and maintenance techniques of big projects and
4. Different risks and its management systems

**Outcomes:**
Students upon completion of this course will be able to:
1. The scope and necessity of software engineering
2. The causes solutions for software crisis
3. Fragment problems into small units, code reusability, efficient coding and software development management
5. Different ways of software life cycles and their phases.
6. Knowledge of testing
7. Eveners about compliance to different stands

## SYLLABUS

### Unit-I:

**Introduction to Software Engineering:** The Evolving Role of Software, Software, The Changing Nature of Software, Legacy Software: The Quality of legacy software, Software Evolution, Software Myths.

**A Generic View of Process:** Software Engineering-A Layered Technology, A Process Frame Work, The capability Maturity Model Integration (CMMI), Process Patterns, Process Assessment, Personal and Team Process Models: Personal Software Process (PSP), Team Software Process (TSP), Process Technology, Product and Process.

**Process Models:** Prescriptive Models, The Waterfall Model, Incremental Process Models: The Incremental Model, The RAD Model, Evolutionary Process Model: Prototyping, The Spiral Model, The Concurrent Development Model, Specialized Process Models: Component Based Development, The formal Methods Model, The Unified Process.

**An Agile View of Process:** What is Agility? What is Agile Process? Agile Process Models: Extreme Programming, Adaptive Software Development, Dynamic Systems Development Method, Scrum, Crystal, Feature Driven Development, Agile Modeling.

**Unit-II**

**Software Engineering Practice:** Software Engineering Practice, communication practices, Planning Practices, Modeling Practices, Construction Practices, Deployment.

**System Engineering**: Computer Based Systems, The System Engineering Hierarchy, Business Process Engineering: An Overview, System Modeling.

**Building the Analysis Model:** Requirement Analysis, Analysis Modeling Approaches, Data Modeling Concepts, Object Oriented Analysis, Scenario Based Modeling, Flow Oriented Modeling, Class Based Modeling, Creating a Behavioral Model.

**Design Engineering:** Design within the contextof Software Engineering, Design Process and Design Quality, Design Concepts, The Design Model, Pattern Based Software Design.

**Unit-III**

**Testing Strategies:** A strategic Approach to Software Testing, Strategic Issues, Test Strategies for conventional Software, Testing Strategies for Object Oriented Software, Validation Testing, System Testing, the Art of Debugging.

**Testing Tactics:** Software Testing Fundamentals, Black Box and White Box Testing, White Box Testing, Basis Path Testing, Control Structure Testing, Black Box Testing, Object Oriented Testing Methods, Testing Methods Applicable at the class level, InterClass Test Case Design, Testing for Specialized Environments, Architectures and Applications, Testing Patterns.

**Project Management:** The Management Spectrum, The People, The Product, The Process, The Project, The W5HH Principles.

**Metrics for Process and Projects:** Metrics in the Process and Project Domains, Software Measurement¸ Metrics for Software Quality, Integrating Metrics within Software Process, Metrics for Small Organizations, Establishing a Software Metrics Program.

**Unit-IV**

**Estimation:** Observations on Estimations, The project planning process, Software Scope and Feasibility, Resources, Software Project Estimation, Decomposition Techniques, Empirical Estimation Models, Estimations for Object Oriented Projects, Specialized Estimation Techniques, The Make/Buy Decision

**Quality Management:** Quality Concepts, Software Quality Assurance, Software Reviews, Formal Technical Reviews, Formal Approaches to SQA, Statistical Software Quality Assurance, Software Reliability, The ISO 9000 Quality Standards, the SQA Plan

**Formal Methods:** Basic Concepts, Object Constraint Language (OCL), The Z specification language, The Ten Commandments for Formal Methods.

**Cleanroom Software Engineering:** The Cleanroom Approach, Functional Specification, Cleanroom Design, Cleanroom Testing.

**Prescribed Book:**
Roger S Pressman, "Software Engineering–A Practitioner's Approach", Sixth Edition, TMH International.

**Chapters :** 1,2,3,4,5,6,8,9,13,14,21,22,23,26,28,29

**Reference Books:**


1. Sommerville, "Software Engineering", Seventh Edition Pearson Education (2007)
2. S.A.Kelkar, "Software Engineering – A Concise Study", PHI.
3. WamanS.Jawadekar, "Software Engineering", TMH.
4. Ali Behforooz and Frederick J.Hudson, "Software Engineering Fundamentals", Oxford (2008).

**Model Paper**

**MCA 4.4: Software Engineering**

**Time: 3 Hr** **Max. Marks: 70**

**Answer Question No.1 Compulsory: 7 x 2 = 14 M**
**Answer ONE Question from each unit: 4 x 14 = 56 M**

1.a) Define is Software Crisis?
b) List the advantages of Formal Methods?
c) What is meant by "Product is Right"?
d) Give the characteristics of a good design?
e) Explain top-down integration?
f) Goals of Software Engineering?
g) Difference between Error and Bug?

**Unit-I**

2.a) Describe Software Characteristics.
b) Explain agile software process.

(or)

3.a) Explain Spiral Model and its suitability
b) Why Software Myths becomes constraints to software process.

**Unit-II**

4.a) What is Use Case? Discuss about the importance of Use Cases in Software Engineering.
b) What is Class? Explain Class Responsibility Collaborator Modeling.

(or)

5. Discuss different Levels of Data Flow Diagrams with the help of an example.

**Unit-III**

6.a) What is the role of Basis Path Testing in software testing?
b) What is Test Case? Prepare a Test Case for Factorial of a number.

(or)

7.a) Discuss about Function Oriented Metrics.
b) What is Debugging? Explain about Debugging Strategies.

**Unit-IV**

8.a) What are the attributes of the Quality?
b) Explain Clean room software engineering approach.

(or)

9.a) Describe the COCOMO Model?
b) Why software Quality Assurance is important?

| MCA 4.5.1 | GRID AND CLUSTER COMPUTING | |
|---|---|---|
| Instruction: 4 periods / week | | Credits: 4 |
| Internal : 30 marks | University Exam: 70 marks | Total : 100 Marks |

**Objectives:**
The course is designed to meet the objectives of:

1. To understand the genesis of grid and cluster computing
2. To know the application of grid and cluster computing
3. To understand the technology and tool kits for facilitating grid computing and cluster computing.

**Outcomes:**
Students upon completing of enough this will be able to:

1. appreciate the necessity of grid and cluster computing and thus its evaluation
2. understand where the grid computing could be effectively utilized by illustrations of applications of grid and cluster computing
3. select a proper technology and toolkit for using grid computing

## SYLLABUS

### Unit-I

**Introduction :** The Data Centre, 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

**World Wide Grid Computing Activities, Organizations and Projects :** Standard Origanizations, Organizations Developing Grid Computing Tool Kits, Framework, and Middleware, Grid Projects and Organizations Building and Using Grid Based Solutions, Commercial Organizations Building and Using Grid Based Solutions.

### Unit-II

**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.

**OGSA and WSRF:** OGSA for Resource Distribution, Stateful Web Services in OGSA, WSRF (Web Services Resource Framework), Resource Approach to Stateful Services, WSRF Specification.

**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

**The Grid and the Databases :** Issues in Database Integration with the Grid, The Requirements of a Grid-enabled Database, Storage Request Broker (SRB), How to Integrate the Databases with the Grid?, The Architecture of OGSA-DAI for Offering Grid Database Services

## Unit-III

**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 : An Introduction :** 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

**Networking, Protocols & I/O for Clusters :** Networks and Inter-connection/Switching Devices, Design Issues in Interconnection Networking/Switching, Design Architecture-General Principles and Trade-offs, HiPPI, ATM (Asynchronous Transmission Mode), Myrinet, Memory Channel (MC), Gigabit Ethernet

## Unit-IV

**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

**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

**Load Sharing and Load Balancing :** Load Sharing and Load Balancing, Strategies for Load Balancing, Modelling Parameters

**Distributed Shared Memory :** Issues in DSM, Write Synchroni- zation for Data Consistency, Double Faulting, Application/Type Specific Consistency, Issues in Network Performance in DSM

**Prescribed Book:**

C.S.R.Prabhu – "Grid and Cluster Computing"-PHI(2008)

**Chapters:** 1 to 13, 16, 17.

**Reference Book:**

Jankiram, "Grid Computing Models : A Research Monograph", TMH (2005)

**Model Paper**

**MCA 4.5.1 :Grid and Cluster Computing**

**Time: 3Hrs.** **Max. Marks: 70**

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**Answer Question No.1 Compulsory:** **7 x 2 = 14 M**
**Answer ONE Question from each unit:** **4 x 14 = 56 M**

**1.**a) What is e-science?
b) Compare Globus and Legion.
c) What is a Web Service?
d) Write different categories of Clusters.
e) Define Cluster middleware.
f) Compare Gigabit Ethernet with ATM.
g) What is a Watchdog timer?

**UNIT – I**

2. a) What is metacomputing? What is its relationship with thegrid?
b) What is datagram architecture? Explain its main features.

(or)

3.a) Compare and contrast Condor, CondorG, Nimrod, NimrodGand NMI.
b)What are the objectives, functions and achievements of Global Grid Forum (GGF)?

**UNIT - II**

4. a) Explain what is SOA and how it functions?
b) What is WSRF? What are its benefits? Where is it available?

(or)

5.a)Explain the architecture and functionality modules of Globus Toolkit (GT4).
b)How does grid enable a DBMS?

**UNIT - III**

6. a) What is Cluster computing ? Why is it needed?
b) Explain Cluster middleware design objectives.

(or)

7. a)Explain Condor architecture.
b)What are the different design issues in interconnection Networking/Switching?

**UNIT - IV**

8. a) How to setup a simple cluster? What are the design considerations for the front end of a cluster?
b) Explain the various cluster architectures and configuration for high availability.

(or)

9. a) Explain static and dynamic load sharing approach.
b) What is DSM? Why is it required in cluster and what are the various issues in DSM?

| MCA 4.5.2 | CRYPTOGRAPHY AND NETWORK SECURITY | |
|---|---|---|
| Instruction: 4 periods / week | | Credits: 4 |
| Internal : 30 marks | University Exam: 70 marks | Total : 100 Marks |

**Objectives:**

The course is designed to meet the objectives of:

1. security breaches can be very expensive in terms of business disruption and the financial losses that may result,
2. increasing volumes of sensitive information are transferred across the internet or intranets connected to it,
3. networking that make use of internet links are becoming more popular because they are cheaper than dedicated leased lines. This, however, involves different users sharing internet links to transport their data,
4. directors of business organizations are increasingly required to provide effective information security.

**Outcomes:**
Students upon completing of enough this will be able to:

1. identify some of the factors driving the need for network security,
2. identify and classify particular examples of attacks,
3. compare and contrast symmetric and asymmetric encryption systems and their vulnerability to attack, and explain the characteristics of hybrid systems,
4. describe the use of hash functions and explain the characteristics of one-way and collision-free functions,
5. describe and distinguish between different mechanisms to assure the freshness of a message,
6. explain the role of third-party agents in the provision of authentication services,
7. discuss the effectiveness of passwords in access control and the influence of human behaviour,
8. identify types of firewall implementation suitable for differing security requirements,
9. distinguish between firewalls based on packet-filtering routers, application level gateways and circuit level gateways.

## SYLLABUS

**Unit-I**

**Introduction:** Security trends, the OSI security architecture, security attacks, security services, security mechanisms, a model for network security.

Classical encryption techniques: Symmetric cipher model,Substitution techniques, Transposition techniques, Rotor machines, Steganography.

**Block cipher and the data encryption standard:**Blockcipher principles, the strength of DES, Differential and linear cryptanalysis, Block cipher design principles.

**Confidentiality using Symmetric Encryption:** Placement of encryption function, Traffic confidentiality, key distribution, random number generator.

**UNIT-II**

**Public key cryptography and RSA:** Principles of public key crypto systems, The RSA algorithm

**Key management:Other public-key crypto systems:** Key management, Diffie-Hellman key exchange.

**Message authentication and hash functions:** Authentication requirements, Authentication functions, message authentication codes, Hash functions, security of hash functions and MACs.

**Digital signatures and authentication protocols:** Digital signatures, Authentication protocols, Digital Signature standard.

**UNIT-III**

**Authentication Applications:** Kerberos, X.509 authentication service

**Email Security:** Pretty good privacy, S/MIME

**IP security:** IP security overview, IP security architecture, Authentication header, Encapsulating security payload, combining security associations, key management.

**Web security:** Web security considerations, Secure Socket Layer and transport layer security, Secure electronic transaction.

UNIT-IV

**Intruders:** Intruders, Intrusion detection, password management

**Malicious Software:** Viruses and related threads, virus counter measures, distributed denial of service attacks.
**Firewalls:** Firewall Design principles, trusted systems, common criteria for information technology, security evaluation.

**Prescribed Book:**

William Stallings, "Cryptography and Network Security",
Fourth edition, PHI.

**Chapters :** 1,2,3,7,9,10,11,13,14,15,16,17,18,19,20

**Reference Books:**


1. William Stallings, “Network Security Essentials – Applications and Standards”, Third Edition, Pearson Education (2007).

2. Chris McNab, “Network Security Assessment”, 2nd Edition, OReilly (2007).

3. Jon Erickson, “Hacking – The Art of Exploitation”, SPD, NOSTARCH Press (2006).

4. Neal Krawety, “Introduction to Network Security”, Thomson (2007).

5. AnkitFadia, “Network Security – A Hackers Perspective”, Macmillan (2008)

**Model Paper**

**MCA 4.5.2: Cryptography and Network Security**

**Time: 3 Hrs** **Max. Marks: 70**

**Answer Question No.1 Compulsory: 7 x 2 = 14 M**
**Answer ONE Question from each unit: 4 x 14 = 56 M**

## Section-A

**1.**a) Abbreviate VIRUS.
b) What is meant by interception?
c) What are the various places where the data can get hacked?
d) What is the difference between authentication and authorization?
e) Explain the role played by the certificate management authority in providing security for the data.

f) SEPP architecture.
g) What are the different elements involved in cryptography?

## Section-B

### Unit- I

2.a) Discuss various ways of hacking the data.
b) Discuss the way to encrypt data using substitution techniques. Explain it with suitable example.

(or)

**3.a**) Write the structure of stream cipher.
b) Discuss the process of encryption using triple DES method.

### Unit- II

4.a) Explain Diffie-Hellman key exchange algorithm.
b) What is hashing? Write the procedure to calculate the hash value in brief.

(or)

5. Discuss different authentication protocols.

### Unit-III

6.a)Discuss S-MIME functionality. Explain how it differs from MIME?
b) What is dual signature? Explain the process of calculating it.

(or)

7. Discuss in detail about the IP security.

### Unit-IV

8. a) Write the rules for selecting passwords. Also explain how a password can be managed?
b) Discuss various virus prevention measures.

(or)

9. Describe firewall design principles.

| MCA 4.5.3 | SIMULATION MODELING AND ANALYSIS | |
|---|---|---|
| Instruction: 4 periods / week | | Credits: 4 |
| Internal : 30 marks | University Exam: 70 marks | Total : 100 Marks |

**Objectives:**
The course is designed to meet the objectives of:

1. Define the basics of simulation modeling and replicating the practical situations in organizations
2. Generate random numbers and random variates using different techniques.
3. Develop simulation model using heuristic methods.
4. Analysis of Simulation models using input analyzer, and output analyzer
5. Explain Verification and Validation of simulation model

**Outcomes:**
Students upon completing of enough this will be able to:

1. Describe the role of important elements of discrete event simulation and modeling paradigm.
2. Conceptualize real world situations related to systems development decisions, originating from source requirements and goals.
3. Develop skills to apply simulation software to construct and execute goal-driven system models.
4. Interpret the model and apply the results to resolve critical issues in a real world environment

## SYLLABUS

**UNIT I:**

Basic simulation Modeling: Systems , models and simulation, Discrete-Event simulation , Simulation of an inventory system, Problem statements, program organization and Logic, C program, simulation output and discussion, Steps in a Sound Simulation Study
Other types of simulation: Continuous simulation, Combined Discrete continuous simulations, Monte Carlo Simulation, Spreadsheet simulation, Advantages , disadvantages and Pitfalls of Simulation

**UNIT II:**

Modeling Complex Systems: Introduction, List Processing in Simulation, A simple Simulation Language: simlib, Single Server Queueing Simulation with simlib, Time-Shared Computer Model, Multiteller Bank with Jockeying, Job-Shop Model, Efficient Event List Manipulation.

**UNIT III:**
Simulation Software: Introduction, Comparison of simulation packages with Programming languages , Classification of Simulation Software. General purpose versus Application Oriented Simulation Packages, Modeling Approaches, Common Modeling Elements,

Desirable Software features, General Capabilities, Statistical capabilities, Customer support and documentation, Object-Oriented Simulation.

**UNIT IV:**

Random-Number Generators: Introduction, Linear Congruentialgenerators , Mixed generators, Multiplicative generators, Composite generators, Empirical Tests, Theoretical tests,
Generating random variates: General approaches to generating random variates, Inverse Transform, Acceptance –Rejection , Generating continuous Random variates, Uniform , Exponential, weibull and normal.

**Prescribed Book:**

1. Averill M Law, "Simulation Modeling and Analysis",
   Fourth Edition, TMH (2008)

**Chapters:** 1, 2, 3, 7, 8

**Reference Book :**

Jerry Banks, John S.CarsonAnd Berry L. Nelson & David M. Nicol, "Discrete Event System Simulation", 3rd Edition, Pearson Education

**Model Paper**

**MCA 4.5.3: Simulation Modeling And Analysis**

**Time: 3 Hrs** **Max. Marks:70**

**Answer Question No.1 Compulsory: 7 x 2 = 14 M**

**Answer ONE Question from each unit: 4 x 14 = 56 M**

1.a) Give any four applications of Simulation?
b) Define System State.
c) Compare the Simulation Packages with Programming Languages.
d) What is the difference between verification and validation?
e) What is Random Variable?
f) Describe the candidate generation in queuing system?
g) Define Bernouli Principle for Random Variate.

Unit-I

2.a) Discuss about steps involved in simulation study?
b) Explain the simulation of Inventory System?

(or)

3.a) What is Discrete Event Simulation? Discuss about simulation process of any real world system.
b) What are the advantages and disadvantages of simulation.

Unit-II

4. Discuss about the simulation of single server queueing process.

(or)

5. Ships arrive at a harbor with interarrival times that are IID exponential random variables with a mean of 1.25days. The harbor has a dock with two berths and two cranes for unloading the ships; ships arriving when both berths are occupied join a FIFO queue. The time for one crane to unload a ship is distributed uniformly between 0.5 and 1.5 days. If only one ship is in the harbor, both cranes unload the ship and the (remaining) unloading time is cut in half. When two ships are in the harbor, one crane works on each ship. If both cranes are unloading one ship when a second ship arrives, one of the cranes immediately begins serving the second ship and the remaining service time of the first ship is doubled. Assuming that no ships are in the harbor at time 0, run the simulation for 90 days and compute the minimum, maximum, and average time that ships are in the harbor (which includes their time in berth). Also estimate the expected utilization of each berth and of the cranes. Use stream I for the interarrival times and stream 2 for the unloading times.

UNIT III

6. Describe about different classifications of Simulation Software.

(or)

7. Give the features of System Simulation Software?

Unit-IV

8. Discuss about different kinds of testing methods to check the Random Number Generators.

(or)

9. Explain the following distributions
   i. Normal Distribution.
   ii. Poisson Distribution.

| MCA 4.6 | WEB TECHNOLOGIES LAB | |
|---|---|---|
| Instruction: 6 periods / week | | Credits: 3 |
| Internal : 30 marks | University Exam: 70 marks | Total : 100 Marks |

## LAB CYCLE

1. Develop and demonstrate a HTML document that illustrates the use external style sheet, ordered list, table, borders, padding, color, and the  tag.

2. Write HTML code to provide intra document linking.

3. Create a form with the following specifications:

   a) Our form uses frames, one to hold the links bar at the top of the browser window.
   b) Other is a larger frame that provides the main view.
   c) The links bar should contain 5 links, which when clicked, should display the appropriate HTML file in the larger frame.

4. to create a webpage with the following using html

   a. to embed an image in web page

   b. to fix the hot spots

   c. show all the related information when a hot spot is clicked in the map

5. Develop a HTML Form, which accepts any Mathematical expression. Write JavaScript code to Evaluates the expression and Displays the result.

6. Create a HTML form that has number of Textboxes. When the form runs in the Browser fill the textboxes with data. Write JavaScript code that verifies that all textboxes has been filled. If a textboxes has been left empty, popup an alert indicating which textbox has been left empty.

7. Write a JavaScript code to find the sum of N natural Numbers. (Use user-defined function)

8. Write a JavaScript code to find factorial of N. (Use recursive function)

9. Write a JavaScript code block using arrays and generate the current date in words, this should include the day, month and year.

10. Create a web page using two image files, which switch between one another as the mouse pointer moves over the images. Use the onMouseOver and onMouseOut event handlers.

11. Design an XML document to store information about a student in an engineering college affiliated to ANU. The information must include college id, 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.

12. Create an XML document, which contains 10 users information. Implement a program, which takes User Id as an input and returns the user details by taking the user information from the XML document

13. write a program for implementing student information using XML

14. write a java program to illustrate java to database connectivity using JDBC

15. Write a program to print the Fibonacci numbers using RMI.

16. Write a program using RMI to access the database using the primary key value and return the data to the client.

17. Write a html program for invoking servlet from applet

18. write a java servlet program to conduct online examination and to display student mark list available in a database

19. Create a java program to create an airline reservation service and a travel agent and the travel agent is searching for an airline using web services and database.

20. Write a JSP program to calculate income tax, login and data capture.

| MCA 4.7 | MINI PROJECT | |
|---|---|---|
| Instruction: 6 periods / week | | Credits: 3 |
| Internal :<br>30 marks | University Exam:<br>70 marks | Total :<br>100 Marks |

| MCA 4.8 | SOFT SKILLS | |
|---|---|---|
| Instruction: 6 periods / week | | Credits: 3 |
| Internal : 30 marks | University Exam: 70 marks | Total : 100 Marks |

**Prescribed Books :**

1. Wallace, Masters, “Personality Development”, Cengage Learning (2008)
2. Edgar Thorpe, Showick Thorpe, “Winning at Interviews”, Second Edition, Pearson Education (2007)

**Reference Books :**

1. Peter Urs Bender, Dr. Robert A. Tracz, “Secrets of Face to Face Communication”, Macmillan (2007)
2. Deepika Nelson, “Essential Key for Corporate Threshold”, BS Publications (2008)

## THIRD YEAR – FIFTH SEMESTER

| Sub Code | Name of the Subject | Int. Marks | Ext. Marks | Total Marks | No of Credits | Hours/ Week |
|---|---|---|---|---|---|---|
| MCA5.1 | Essentials of Big Data Analytics | 30 | 70 | 100 | 5 | 4 |
| MCA5.2 | .Net Programming | 30 | 70 | 100 | 5 | 4 |
| MCA5.3 | Design and Analysis of Algorithms | 30 | 70 | 100 | 5 | 4 |
| MCA5.4.1<br>MCA5.4.2<br><br>MCA5.4.3 | Internet of Things<br>Mobile Computing with Android<br>Cloud Computing | 30 | 70 | 100 | 4 | 4 |
| MCA5.5.1<br>MCA 5.5.2<br>MCA5.5.3 | Image Processing<br>Open Source Technologies<br>Block chain technology. | 30 | 70 | 100 | 4 | 4 |
| MCA 5.6 | .Net Programming Lab | 30 | 70 | 100 | 3 | 6 |
| MCA 5.7 | Big Data Analytics Lab | 30 | 70 | 100 | 3 | 6 |
| MCA 5.8 | Seminar | 50 | -- | 50 | 1 | 3 |
| | **TOTAL** | **260** | **490** | **750** | **30** | **35** |
| | | | | | | |

| MCA 5.1 | Essentials of Big Data Analytics | |
|---|---|---|
| Instruction: 4 periods / week | | Credits: 4 |
| Internal : 30 marks | University Exam: 70 marks | Total : 100 Marks |

## Objectives

The course is designed to meet the objectives of:

1. The main goal of this course is to help students learn, understand, and practice big data analytics

2. The study of modern computing big data technologies and scaling up machine learning techniques focusing on industry applications

3. conceptualization and summarization of big data and machine learning, trivial data versus big data, big data computing technologies, machine learning techniques, and scaling up machine learning approaches

## Outcomes

Students upon completion of this course will be able to:

1. Ability to identify the characteristics of datasets and compare the trivial data and big data for various applications.

2. Ability to select and implement machine learning techniques and computing environment that are suitable for the applications under consideration.

3. Ability to integrate machine learning libraries and mathematical and statistical tools with modern technologies like hadoop and mapreduce.

### Syllabus

**UNIT – I**: Getting an overview of Big Data: Introduction to Big Data, Structuring Big Data, Types of Data, Elements of Big Data, Big Data Analytics, Advantages of Big Data Analytics. Introducing Technologies for Handling Big Data: Distributed and Parallel Computing for Big Data, Cloud Computing and Big Data, Features of Cloud Computing, Cloud Deployment Models, Cloud Services for Big Data, Cloud Providers in Big Data Market.

**UNIT – II:** Understanding Hadoop Ecosystem: Introducing Hadoop, HDFS and MapReduce, Hadoop functions, Hadoop Ecosystem. Hadoop Distributed File System- HDFS Architecture, Concept of Blocks in HDFS Architecture, Namenodes and Datanodes, Features of HDFS. MapReduce. Introducing HBase - HBase Architecture, Regions, Storing Big Data with HBase, Combining HBase and HDFS, Features of HBase, Hive, Pig and Pig Latin, Sqoop, ZooKeeper, Flume, Oozie.

**UNIT- III:** Understanding MapReduce Fundamentals and HBase: The MapReduce Framework ,Exploring the features of MapReduce, Working of MapReduce, Techniques to optimize MapReduce Jobs, Hardware/Network Topology, Synchronization, File system, Uses of MapReduce, Role of HBase in Big Data Processing- Characteristics of HBase. Understanding Big Data Technology Foundations: Exploring the Big Data Stack, Data Sources Layer, Ingestion Layer, Storage Layer, Physical Infrastructure Layer, Platform Management Layer, Security Layer, Monitoring Layer, Visualization Layer

**UNIT – IV:** Storing Data in Databases and Data Warehouses: RDBMS and Big Data, Issues with Relational Model, Non – Relational Database, Issues with Non Relational Database, Polyglot Persistence, Integrating Big Data with Traditional Data Warehouse, Big Data Analysis and Data Warehouse.

**Prescribed TextBooks:**

1. BIG DATA, Black Book TM, DreamTech Press, 2016 Edition.
2. Seema Acharya, SubhasniChellappan , “BIG DATA and ANALYTICS”, Wiley publications, 2016

**Reference Book:**

1. Nathan Marz and James Warren, “BIG DATA- Principles and Best Practices of Scalable RealTime Systems”, 2010

**Model Paper**

**MCA 5.1 : Essentials of Big Data Analytics**

**Time: 3 Hrs** **Max. Marks: 70**

**Answer Question No.1 Compulsory: 7 x 2 = 14 M**

**Answer ONE Question from each unit: 4 x 14 = 56 M**

1.a) list out types of Data
b) What is distributed computing
c) Write Hadoop functions
d) write short notes on HDFS
e) what is the need of platform management layer
f) What is role of HBase in Big data
g) What are the issues with relational model.

**UNIT – I**

2. a) What is Big Data? Explain how big data processing differs from distributed processing
b) Explain features of cloud computing

OR

3. Explain various technologies for handling Big Data

**UNIT – II**

4. Explain Hadoop Distributed File System in detail.

OR

5. a) Explain how Combining HBase and HDFS.
b) Write Features of HDFS

**UNIT – III**

6. Explain the map reduce framework with an example.

OR

7. Explain the big data stack in detail.

**UNIT – IV**

8. a) what are the issues with relational model and with non relational models.
b) write short notes on polygot persistence.

OR

9. Explain how Integrating Big Data with Traditional Data Warehouse with an example.

| MCA 5.2 | .NET PROGRAMMING | |
|---|---|---|
| Instruction: 4 periods / week | | Credits: 5 |
| Internal : 30 marks | University Exam: 70 marks | Total : 100 Marks |

**Objectives:**

The course is designed to meet the objectives of:

1. Set up a programming environment and Configure ASP.net programs.
2. Creating ASP.Net applications using standard .net controls.
3. Develop a data driven web application.
4. Connecting to data sources and managing them.
5. Maintain session and controls related information for user used in multi-user web applications
6. Understand the fundamentals of developing modular application by using object oriented methodologies

**Outcomes:**

Students upon completing of enough this will be able to:

1. design web applications using ASP.NET
2. ASP.NET controls in web applications.
3. debug and deploy ASP.NET web applications
4. create database driven ASP.NET web applications and web services

## SYLLABUS

**UNIT-I: Visual basic 2005:**

**Getting started with Visual Basic 2005:** Arithmetic Operators, Data type, Statements, Control Statements, Loops, Arrays, Structures,Val and Structure functions, Creating Visual studio Applications, Saving Visual Basic 2005 Application.

**Object Oriented Programming:** Basic Principles of Object Oriented Programming, Member Access Modifiers, Define Class, creating Objects, Constructors, Inheritance, Abstract Classes, Interfaces, Polymorphism

**Windows Forms:** Introduction to the windows forms, Setting the title Bar Text, Minimizing and Maximizing a form, Setting initial position of a form, Working with multiple forms, Creating adding controls to a form, Setting controls Tab order, Naming Controls, Setting Properties at design time, Setting properties at run time, Creating a message box, Creating a Input box, Creating MDI Applications, Creating Dialog box, Commenting the code

**Label, TextBox, Button, ComboBox and ListBox Controls:** Label Control, Button Control, ComboBox Control, ListBox Control, Project

**Panel, PictureBox, Progress Bar and Timer Controls:** Panel Control, Picture box Control, Progress Bar Control, Timer Control, Project

**Checkbox, radio button, and group box controls :**Checkbox control, Radio button control, Progress bar control, Timer control, Project.

**Menus, built-in dialog box, printing and tree view controls:** Menus, Folder Browser Dialog Control, Open File Dialog Control Save File Dialog Control, Font File Dialog Control, Color File Dialog Control, Print Document Control, Tree View Control, Project

**Mouse Events and Keyboard Events:** Mouse Events, Keyboard Events

**Handling Errors and Exceptions:** Errors, Exceptions

**UNIT-II : ASP.NET 2.0**

**ASP.NET 2.0 Essentials:** Introduction to Asp.NET, Benefits of Asp.NET, What's new Asp.NET?, Introduction Asp.NET 2.0 IDE

**Developing a Web Application :**HTML, DHTML, PHP, JSP, PERL, ASP.NET 2.0 Provider Model, ASP.NET 2.0 Coding Model, Code Sharing, Compilation in ASP.NET

**Standard Controls:** Introduction to standard controls, Label Control, TextBox Control, Button Control, Image Button Control ListBox Control, Radio Button Control

**Navigation Controls:** Introduction to Navigation Controls, Site Map Path Controls, Menu Controls, Tree View Controls

**Validation Controls:** Introduction to validation control, Base validator class, Required field validator control, Range validator control, Regular Expression validator control, Compare validator control, Custom validator control, Validation summary control

**Login controls:** Introduction to login controls, Login control Login view control, Login name control, Login status control Password recovery control

**Master pages and Themes:** Need for Master Pages and Themes, Creating a Simple Master Page, Creating a Nested Master Page Themes, Creating Themes, Applying Themes on controls at Run time

**UNIT-III: C# 2005**

**Introduction to Visual C# 2005:**Introduction, Features of Visual C# 2005, Creating Visual C# 2005, Key words, Identifiers, Data Types, Variables, Scope of Variables, Constants, Operators Operator Precedence and Associativity, Expressions, Punctuators Control Statements, Loops, Interrupting Loops using Jump Statements, Creating Arrays, Creating Enumerations, Creating Structures, Methods

**Object Oriented Programming :** Basic Principles of Object Oriented Programming, Member Access Modifiers, Defining a Class, Creating Objects, Constructors, Static Members, Inheritance, Abstract Class,Interfaces, Polymorphism, Operator Overloading

**Windows Forms :** Introduction to Windows form, Setting the title bar Text, Minimizing or Maximizing a forms, Working with multiple Forms, Setting the startup form, Adding controls to a form, Setting controls Tab order, Setting properties at Design time, Setting properties at Run time, Showing and Hiding controls and Forms, Creating a message box, Commenting the code, Handling Events.

**Label, TextBox, Button, ComboBox and ListBoxControls:**Label Control, TextBox Control, Button Control, ComboBox Control ListBox Control, Project

**Panel, PictureBox, Progress Bar and Timer Controls:** Panel Control, Picture box Control, Progress bar Control, Timer Control Project

**Checkbox, Radio button and Group box controls :**Checkbox control, Radio button control,GroupBox Control, Project

**Menus, built-in dialog box, printing and tree view controls:** Menus, Folder Browser Dialog Control, Open File Dialog Control Save File Dialog Control, Font File Dialog Control, Color File Dialog Control, Print Document Control, Tree View Control, Project

**Mouse Events and Keyboard Events:** Mouse Events, Keyboard Events

**Handling Errors and Exceptions:** Errors, Exceptions

**UNIT-IV : ADO.Net & Data Binding :**

**Accessing Data using ADO.NET (C# 2005):** What are Databases? Basic SQL Statements, Working with ADO.NET, Overview of ADO.NET Objects Data Grid View Control, Accessing Data using Server Explorer, Creating a new data connection, Accessing data using data adaptors and data sets, Previewing data from data adaptors Connecting to an MS Jet database

**Data Binding(C# 2005):** Introduction, Simple Data Binding, Complex Data Binding, Implementing Data Binding, Project

**Working with Databases (ASP.NET 2.0):** What are Databases? Working with ADO.NET, Overview of ADO.NET Objects, Basic SQL statements, ASP.NET 2.0 data display controls, ASP.NET 2.0 data source controls, Accessing data with server explorer, Creating a web applications using data display controls

**Accessing data using ADO.NET (Visual Basic 2005):** What are Databases?, Basic SQL statements, Working with ADO.NET, Overview of ADO.NET objects, Data Grid View Control, Accessing data using server explorer, Creating a new data connection, Accessing data using Data Adapters and Datasets, Previewing data from Data Adapters, Connecting to an MS Jet database

**Data Binding (Visual Basic 2005):** Introduction, Simple Data Binding, Complex Data Binding, Implementing Data Binding, Project

**Prescribed Book:**

Vikas Gupta, ".Net Programming", Dream Tech (2008).
**Chapters :**

UNIT – I - 1 to 8, 11 chapters in Visual Basic 2005
UNIT – II – 1 to 7, 9 chapters in ASP.NET 2.0
UNIT – III – 1 to 8, 11 chapters in C# 2005
UNIT – IV – 9, 10 chapters in Visual Basic 2005, 8 chapter in ASP.NET 2.0, 9, 10 chapters in C# 2005

**Reference Books**:


1. XueBai, Michael Ekedah, "The Web Warrior Guide to Web Programming", Thomson (2006).

2. Kogent Solutions Inc.,".Net Programming", Black Book, Dream Tech (2008).

3. Joe Duffy, "Professional.Net Programming 2.0", Wiley.

4. George Stepherd, "ASP.NET 3.5 Microsoft", PHI (2008).

**Model Paper**

**MCA 5.2: .Net Programming**

**Time: 3 Hrs** **Max. Marks: 70**

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**Answer Question No.1 Compulsory:** **7 x 2 = 14 M**
**Answer ONE Question from each unit:** **4 x 14 = 56 M**

1.a) Define data binding
b) Explain login controls
c) What is master page
d) Describe Data Adapter
e) Explain docking and anchoring controls
f) Give the difference between check box radio button and group box controls
g) Define event and write different types of event
h) What are the characteristics of interface

**Unit-I**

2.a) Briefly explain about data types and keywords.
b) Write the procedure for an application which checks whether the entered user is valid or not.

(or)

3. a) Explain the following controls
i. Menus
ii. Timer
iii. PictureBox
iv. Tree view
b) Explain mouse events and key board events.

**Unit-II**

4. a) Explain all the validation controls.
b) Write the procedure to design the application which allows the valid user to enter into it.

(or)

5. a)Briefly explain about master pager and themes
b) With suitable example explain the navigation controls.

**Unit-III**

6.a) What are the concepts of object oriented programming.
b) Explain the following controls
i. ComboBox
ii. ListBox
iii. Panel
iv. BuiltindialogBox

(or)

7.a) Explain the steps involved in windows form design and interface

b) Write the procedure for coffee shop billing application (use checkbox)

**Unit-IV**

8.a) What is data binding? Explain the types of data binding how data binding can be implemented.

b) What are the ADO.NET objects.

(or)

9. Develop an application for student details which

i. Can access database

ii. Can bound to the controls

iii. Can display the details in a form

| MCA 5.3 | DESIGN AND ANALYSIS OF ALGORITMS | |
|---|---|---|
| Instruction: 4 periods / week | | Credits: 5 |
| Internal : 30 marks | University Exam: 70 marks | Total : 100 Marks |

**Objectives:**
The course is designed to meet the objectives of:

1. learning specification of the concept of algorithm and analysis of its computational complexity
2. learning design principles of algorithms and their application to computing problems
3. making analysis accessible to all levels of readers.

**Outcomes:**
Students upon completing of enough this will be able to:
:
1. design algorithms for difficult problems
2. analyze and understand their complexity
3. implement the algorithms in practice.

## SYLLABUS

### Unit-I

**Introduction :** What is Algorithm – Algorithm Specification : Pseudocode Conventions – Recursive Algorithms ; Performance Analysis: Space Complexity – Time Complexity – Asymptotic notation – Performance Measurement; Randomized Algorithms : Basics of probability theory – Randomized algorithms – Identifying the repeated element, Primality Testing – Advantages and Disadvantages.

**Elementary Data Structures:** Stacks and Queues ; Trees : Terminology – Binary Trees ; Dictionaries : Binary Search Trees ; Priority Queues : Heaps – Heapsort ; Sets and disjoint set Union : Introduction – union and find operations. ; Graphs: Introduction – Definitions – Graph Representations.

**Divide – and – conquer:** General Method – Defective Chess Board – Binary Search – Finding Maximum and Minimum – Merge Sort – Quick sort – Selection Problem ; Strassen's Matrix Multiplication, Convex Hull: some geometric Primitives – The Quick Hull Algorithm – Graham's scan – An 0(nlogn) divide – and – conquer algorithm.

### Unit–II

**The Greedy Method :** The general Method – Container loading – Knapsack Problem – Tree Vertex Splitting – Job sequencing with deadlines ; Minimum cost spanning trees : Prim's Algorithm – Kruskal's Algorithm – Optimal Storage on tapes – Optimal Merge patterns – Single Source shortest paths.

**Dynamic Programming :** The general method – Multi-stage graphs – All pairs shortest paths – Single source shortest paths – Optimal Binary Search Trees – String editing – 0/1 Knapsack – Reliability design – The traveling sales person problem – Flow shop Scheduling

**Unit–III**

**Basic Traversal and Search Techniques:** Techniques for Binary Trees – Techniques for graphs : Breadth First Search and Traversal – Depth First Search ; Connected Components and Spanning Trees – Bi-connected components and DFS

**Back Tracking :** The general method – The 8-queens problem – sum of subsets – Graph coloring – Hamiltonian Cycles – Knapsack Problem .

**Unit–IV**

**Branch and Bound** : The Method: Least Cost search – The 15 puzzle – control abstractions for LC search – Bounding – FIFO Branch – and –Bound – LC Branch and Bound; 0/1 knapsack problem: LC Branch and Bound solution – FIFO Branch and Bound solution; Traveling Sales person.

**NP-Hard and NP – complex problems :** Basic concepts : Non deter- ministic algorithms – The classes NP hard and NP complex ; Cook's theorem – NP hard graph problems : Clique Decision Problem – Node cover decision problem – chromatic number decision problem – Directed Hamiltonian cycle – Traveling sales person decision problem – and/or graph decision problem; NP-hard scheduling Problems: scheduling identical processors – flow shop scheduling – jop shop scheduling; NP-hard code generation problems:code generation with common subexpressions – Implementing parallel assignment instructions; Some simplified NP-hard problems.

**Prescribed Book:**

SartajSahni,"Fundamentals of Computer Algorithms", Second Edition, Universities Press (2008)

**Chapters :**1 to 8 and 11

**Reference Books :**


1. AnanyLevitin, "Introduction to the Design & Analysis of Algorithms", Second Edition, Pearson Education (2007).

2. I.Chandra Mohan, "Design and Analysis of Algorithms", PHI.

3. Prabhakar Gupta, VineetAgrawarl, "Design and Analysis of Algorithms", PHI.

4. ParagHimanshu Dave, "Design and Analysis of Algorithms", Pearson Education (2008)

**Model Paper**

**MCA 5.3: Design And Analysis Of Algorithms**

**Time : 3 hrs** **Max Marks : 70**

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**Answer Question No.1 Compulsory: 7 x 2 = 14 M**
**Answer ONE Question from each unit: 4 x 14 = 56 M**

1. a) What are Huffman codes ?
   b) Explain dominance rule.
   c) State the general method for dynamic programming.
   d) Write the difference between divide-and-conquer and the greedy method.
   e) State the principle of optimality ?
   f) Write the formulae developed by strassen to multiply matrices ?
   g) What is the average time complexity for constructing a heap tree ?

**UNIT – I**

2. a) Explain control abstraction for divide – and – conquer strategy. (7M)
   b) Explain the process of constructing convex hull. Also write its algorithm and complexity . (7M)

(or)

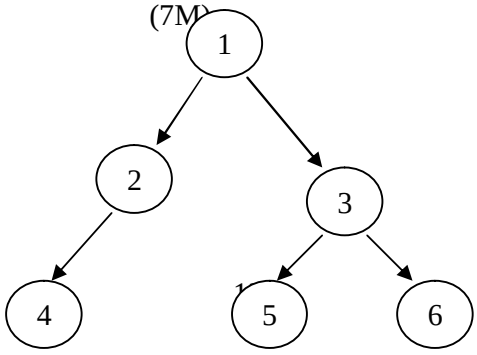
3.a) Derive the average time complexity for quick sort. (7M)
b) Write a randomized algorithm to perform primality testing. (7M)

**UNIT – II**

4. a) State the problem of "optimal storage on tapes". If three programs of length (l1,l2,l3 )= (5,10,3).Find the optimal way to store those programs on tapes using greedy method. (7M)
   b) Find optimal binary search tree for the identifiers (do, if, while). Let p(1:3) = (3,3,1) and q(0:3)=(2,3,1,1). Solve it using dynamic programming (7M)

(or)

5. a) Write the problem of tree vertex splitting. Find the places where boosters are needed for the following tree, for $\delta$=5 (7M)

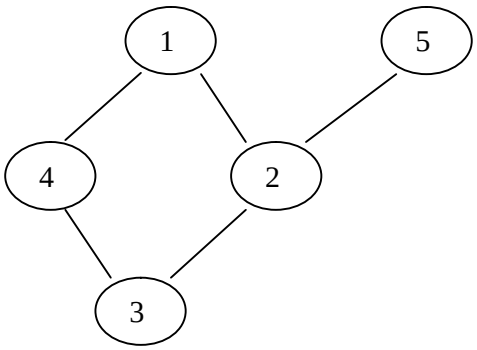


b) Solve O/I Knapsack, If the Knapsack instance n=3 (w1,w2,w3)=(2,3,4) & (p1,p2,p3)=(1,2,5) and m=6. (7M)

## UNIT – III

6. a) Solve sum of subsets problem for n=6,m=30, w[1:6]={5,10,12,13,15,18}. (7M)

b) Find connected components & spanning tree for : (7M)




(or)

7. a) Solve 8-queues problem. (7M)

b) Write different traversal techniques for graphs. (7M)

## UNIT – IV

8. a) Write a complete LC branch and bound algorithm for Knapsack problem (7M)

b) Write an non-deterministic algorithm to sort array elements. (7M)

(or)

9. a) Explain the principles of (7M)

i) control abstraction for LC search

ii) Bounding

iii) FIFO branch & bound

iv) LC branch and bound

b) Write the relationship between P,NP and NP-complete, NP-hard problems. (7M)

* * * * *

| MCA 5.4.1 | INTERNET OF THINGS | |
|---|---|---|
| Instruction: 4 periods / week | | Credits: 4 |
| Internal : 30 marks | University Exam: 70 marks | Total : 100 Marks |

**Objectives:**

The course is designed to meet the objectives of:

1. To introduce the concept of IoT
2. To introduce the concept of M2M
3. To understand the logical design
4. To make them familiar with IoT devices, endpoints and designing

**Outcomes:**

Students upon completing of enough this will be able to:

:

1. Familiarized with IoT Terminology.
2. Understand the concept of IoT
3. Understand various IoT protocols
4. Gain knowledge about the domain of IoT in real time

.

**SYLLABUS**

**Unit – I**

Introduction to Internet of Things, Introduction, physical design, logical design, IoT enabled technologies, IoT levels & deployment templates. Domain specific IoTs, Introduction, home automation, cities, environment, energy, retial, logistics, agriculture, Industry and health & lifestyle.

**Unit – II**

IoT and M2M, Introduction, M2M, difference between IoT and M2M, SDN and NFV for IoT, IoT system management with NETCONF-YANG, need for IoT systems management, SNMP, network operator requirements, NETCONF,YANG .

**Unit – III**

IoT platforms design methodology, Introduction, IoT design methodology, case study, motivation fir using Python. IoT Systems – Logical design using python, introduction, phython data types and strucutes, control flow, functions, modules, packages, file handling, date/time operations, classes and packages.

**Unit – IV**

IoT physical Devices and endpoints, IoT devices, Rasberry Pi, Raspberry Pi interfaces, programming Raspberry Pi with Python. Case Studies Illustrating IoT Design, home automation, cities, environment, agriculture and productivity applications.

**Prescribe Book**

Internet of Things – A Hands-On Approach, ArsdeepBahga& VijayMadisetti, Universities Press

**Reference Books**

The Internet of Things: Enabling Technologies, Platforms, and Use Cases, Pethuru Raj and Anupama C. Raman, CRC Press.

IotFundamentals : Networking Technologies, Protocols and Use Cases for the Internet of Things , David, Hanes &Salgueiro Gonzalo, Pearson

**Model Paper**

**MCA 5.4.1 Internet of Things**

**Time : 3 Hrs** **Max. Marks: 70**

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**Answer Question No.1 Compulsory:** **7 x 2 = 14 M**
**Answer ONE Question from each unit:** **4 x 14 = 56 M**

1. Define these terms
   a) Internet of Things
   b) IoT Levels
   c) SDN
   d) M2M
   e) Python Functions
   f) IoT Devices
   g) Applications of IoT
   h) Process specification

**UNIT – I**

2. a. Explain physical design of Internet of Things?
   b. Describe communication models of IoT

**(OR)**

3. Discuss about three major application area of IoT.

**UNIT – II**

4. a. Differentiate IoTamd M2M.
   b. Explain IoT system management with NETCONF-YANG.

**(OR)**

5. a. Explain SMNP?
   b. Discuss about network operator requirements.

**UNIT - III**

6. a. Explain domain model specification?
   b. Discuss about operational view specificaton?

**(OR)**

7. Explain python data types, classes and packages.

**UNIT – IV**

8. a. Explain Raspberry Pi board.
   b. Explain Raspberry Pi Interfaces.

**(OR)**

9. Design an IoT for Home automation and agriculture.

| MCA 5.4.2 | MOBILE COMPUTING WITH ANDROID | |
|---|---|---|
| Instruction: 4 periods / week | | Credits: 4 |
| Internal : 30 marks | University Exam: 70 marks | Total : 100 Marks |

**Objectives:**
The course is designed to meet the objectives of:

1. To introduce the concept of mobile android
2. To introduce the concept of different views of android.
3. To understand the designing aspects of android mobiles
4. To make them familiar with SMS, email, service, binding and deploying APks

**Outcomes:**
Students upon completing of enough this will be able to:

1. Familiarized with mobile android Terminology.
2. Understand and building interfaces
3. Understand and creating menus
4. Gain knowledge about the publishing, deploying APK files and Eclipse.

## SYLLABUS

**Unit – I**
What is Android? Features of Android, Architecture of Android, Eclipse, Android SDK, ADT, Creating Android virtual devices, Creating Application and Anatomy application. Understanding Activities – Applying styles and themes to activity, hiding the activity title, displaying a dialog window, displaying a progress dialog. Linking Activities using intents. Calling built-in applications using intents.

**Unit – II**
Understand the components of a screen, Adapting to display orientation, managing changes to screen orientation, creating the user interface programmatically, listening for UI notifications. Basic views, pickers views, list views. Using images views to display pictures, using menus with views and some additional views.

**Unit – III**
User preferences, persisting data to files, creating and using databases, sharing data in android, using a content provider, creating your own content provider, SMS messaging, e-mails and networking.

**Unit – IV**
Creating own services, communicating between a service and an activity, binding activities to services, publishing, deploying APF files and eclipse.

**Prescribe Book**
Beginning Android 4 Application Development, Wei-MengLee, Wiley

**Reference Books**
Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox).

**Model Paper**

**MCA 5.4.2 Mobile Computing with Android**

**Time : 3 Hrs** **Max. Marks: 70**

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**Answer Question No.1 Compulsory:** **7 x 2 = 14 M**
**Answer ONE Question from each unit:** **4 x 14 = 56 M**

1. Define the terms
   a. Android
   b. Intent Filter
   c. Persist Activity State
   d. Import
   e. Options menu
   f. Sharing data in android
   g. Service
   h. Package Explorer

**Unit – I**

2. a. Explain features of android?
   b. What are the tools for android application development? Explain them.

**(OR)**

3. a. What are the languages used to develop android applications?
   b. Discuss about passing data to an activity.

**Unit –II**

4. a. Describe linear, table and frame layouts.
   b. Explain different orientations?

**(OR)**

5. Explain the working of radio button and checkbox?

**Unit – III**

6. Create a DBA helper class. Explain it with an example.

**(OR)**

7. a. Discuss about projections, filtering and sorting in content provider?
   b. Explain how to insert and delete records into and from a content provider.

**Unit –IV**

8. Explain how to create a service in the background?

**(OR)**

9. a. Write about the feature of eclipse.
   b. How to publish an android application.

| MCA 5.4.3 | CLOUD COMPUTING | |
|---|---|---|
| Instruction: 4 periods / week | | Credits: 4 |
| Internal : 30 marks | University Exam: 70 marks | Total : 100 Marks |

**Objectives:**
The course is designed to meet the objectives of:

1. The student will learn about the cloud environment, building software systems and components that scale to millions of users in modern internet
2. cloud concepts capabilities across the various cloud service models including Iaas,Paas,Saas,
3. developing cloud based software applications on top of cloud platforms.

**Outcomes:**
Students upon completion of this course will be able to:

1.Understand the concepts of Parallel and Distributed Computing.
2.Knowledge of different Cloud delivery and deployment models.
3.Thoruogh understanding of Virtualization and its significance.
4.Aneka as an example Cloud.
5. Assessment of the economics , financial, and technological implications for selecting cloud computing for own organization

## SYLLABUS

### UNIT-I

**Introduction:** Cloud computing at a glance, Historical Developments, Building Cloud Computing Environments, Computing Platforms and Technologies.

**Principles of Parallel and Distributed Computing:** Eras of Computing, Parallel Vs Distributed computing, Elements of Parallel Computing, Elements of Distributed Computing, Technologies for Distributed Computing.

**Virtualization:** Introduction, Characteristics of Virtualized Environments, Taxonomy of Virtualization Techniques, Virtualization and Cloud Computing, Pros and Cons of Virtualization, Technology Examples.

### UNIT-II

**Cloud Computing Architecture:** Introduction, Cloud reference model, Types of clouds, Economics of the cloud, open challenges.

**Aneka: Cloud Application Platform:** Framework Overview, Anatomy of the Aneka Container, Building Aneka Clouds, Cloud programming and Management.

**Concurrent Computing: Thread Programming :** Introducing Parallelism for Single machine Computation, Programming Application with Threads, Multithreading with Aneka, Programming Applications with Aneka Threads.

**UNIT-III**

**High- Throughput Computing: Task Programming:** Task Computing, Task-based Application Models, Aneka Task-Based Programming.

**Data Intensive Computing: Map-Reduce Programming:** What is Data-Intensive Computing, Technologies for Data-Intensive Computing, Aneka MapReduce Programming.

**UNIT-IV**

**Cloud Platforms in Industry:** Amazon Web Services, Google AppEngine, Microsoft Azure, Observations.

**Cloud Applications:** Scientific Applications, Business and Consumer Applications.

**Advanced Topics in Cloud Computing:** Energy Efficiency in Clouds, Market Based Management of Clouds , Federated Clouds/ InterCloud, Third Party Cloud Services.

**Prescribed Book:**

RajkumarBuyya, Christian Vecchiola, S.ThamaraiSelvi, "Mastering Cloud Computing", McGraw Hill Education.

**REFERENCES:**


1. Michael Miller, “Cloud Computing”, Pearson Education, New
2. Haley Beard, Cloud Computing Best Practices for Managing and Measuring Processes for On-demand Computing, Applications and Data Centers in the Cloud with SLAs, Emereo Pty Limited, July 2008.
3. Cloud Application Architectures, George Reese, ISBN: 8184047142,Shroff/O' Reilly, 2009.

## Model Paper

## MCA 5.4.3: Cloud Computing

**Time: 3 Hrs** **Max. Marks: 70**

**Answer Question No.1 Compulsory: 7 x 2 = 14 M**
**Answer ONE Question from each unit: 4 x 14 = 56 M**

1.

a) What is Service-Oriented Computing?
b) Define a Distributed System?
c) Give an example for full virtualization and brief about it.
d) What is a hybrid cloud?
e) Scalability
f) Give two examples of cloud applications in CRM and ERP.
g) What is a MOCC?

### UNIT – I

2. Discuss about the historic developments from early computing to the contemporary cloud computing.

(or)

3. a) What are characteristics of Virtualization?
b) Discuss about Machine Reference Model.

### UNIT – II

4. a)Discuss about the cloud architecture.
b) What are different types of clouds? Explain.

(or)

5. a) Explain about Aneka Framework overview.
b) Discuss about Aneka SDK.

### UNIT - III

6. a)What is Task computing and what are its frame works?
b)Discuss about Task based application models.

(or)

7. a) What is Data Intensive Computing? Explain about its characteristics.
b) What are the technologies required for Data Intensive computing? Explain about them.

### UNIT – IV

8. Discuss about Amazon Web Services.

(or)

9.Give a reference model for MOCC. What are the technologies for MOCC?

| MCA 5.5.1 | IMAGE PROCESSING | |
|---|---|---|
| Instruction: 4 periods / week | | Credits: 4 |
| Internal : 30 marks | University Exam: 70 marks | Total : 100 Marks |

**Objectives:**
The course is designed to meet the objectives of:

1. The fundamentals of image processing
2. Image transform used in image processing
3. Image enhancement techniques used in image processing
4. Image restoration techniques and methods used in image processing
5. Image compression and Segmentation used in image processing

**Outcomes:**
Students upon completing of enough this will be able to:

1. Describe the basic issues and the scope (or principal applications) of image processing, and the roles of image processing and systems in a variety of applications;
2. Demonstrate a good understanding of the history and the current state-of-the-art image processing systems and applications which constantly push the boundaries and raise challenges in other fields of studies such as mathematics, physics, and computer systems engineering;

**SYLLABUS**

**UNIT I:**

Introduction, Image Shape, Human Vision System, Image Acquisition – Intensity Images, Real Time Capture, Colour Images, Video Camera, Capture, Analogue To Digital Conversion, Scanners, Character Recognitions Devices, Satellite Imaginary, Ranging Devices, Calibration, Image Presentation-Raster Screen, Printers (Matrix, Laser, Ink-Jet, Wax Thermal),Patterns, Dithering, Three-Dimensional Image.

**UNIT II:**

Statistical Operations-Introduction, Gray-Level Transformations, Histogram Equalization, Multi-Image Operations, Spatial Operations And Transformations-Introduction, Spatial Dependent Transformations, Templates And Convolution, Edge Detection, Other Window Operations, Two-Dimensional Geometric Transformations, Segmentation And Edge Detection-Introduction, Region Operations, Basic Edge Detection, Second-Order Edge Detection, Pyramid Edge Detection, Crack Edge Relaxation.

**UNIT III:**

Morphological And Other Area Operations-Introduction, Basic Morphological Operations, Opening And Closing Operations, Finding Basic Shapes-Combining Edges, Hough

Transforms, Bresenhams Algorithms; Labeling Lines And Regions-Flat Surface And Straight Line Labeling, Dealing With Curves, Labeling Regions.

**UNIT IV:**

Frequency Domain-Introduction, Hartley Transform, Fourier Transform, Optical Transformation, Power And Autocorrelation Functions; Image Compression-Introduction, Types And Requirements, Statistical Compression, Spatial Compression, Contour Coding, Quantizing Compression , Real-Tme Image Transmission, Quadtrees; Texture-Introduction, Identifying Textures, Texture Gradient, Texture Segmentation.

**Prescribed Book**

Introductory Computer Vision And Image Processing – Adrian Low:, MC Graw Hill International Editions

**Reference Book**

Digital Image Processing – Gojelez – Addison Wesley.

1. B.Chanda, D.DuttaMajunder, “Digital Image Processing”, PHI (2008).

**Model Paper**

**MCA 5.5.1: IMAGE PROCESSING**

**Time: 3 Hrs** **Max. Marks: 70**

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**Answer Question No.1 Compulsory:** **7 x 2 = 14 M**

**Answer ONE Question from each unit:** **4 x 14 = 56 M**

1. a) What is meant by pixel depth? Explain.
   b) What is image compression? Why it is needed? Explain
   c) Explain the effect of noise on edge detection.
   d) What is meant by image restoration?
   e) Explain about alpha-trimmed mean filter?
   f) Write the difference between wavelet transform and Fourier transform.
   g) Explain about image acquisition.

**UNIT - I**

2. a) Explain about image sampling and Quantization.

   b) Prove that both the 2-D continuous and discrete Fourier transforms are linear operations.

**OR**

3. a) Explain the concept of Unsharp masking and High boost filtering.

   b) Explain image sharpening using Butterworth high pass and Gaussian high pass filters

**UNIT - II**

4. a) What are the different types of mean filters used for noise reduction? Explain.

   b) Explain about image restoration using minimum mean square error filtering.

**OR**

5. a) Explain the procedure of converting colors from HSI to RGB.

   b) Discuss about noise in color images.

**UNIT - III**

6. a) Explain how to compute the Haar transform of the 2 x 2 image.

   b) With an example, explain Huffman coding.

**OR**

7. a) With necessary figures, explain the opening and closing operations.

   b) Discuss about region based segmentation

**UNIT – IV**

8 .a).Discuss about wavelet transform in two dimensions.

b) What is block transform coding? Explain.

**OR**

9. a) Explain the following morphological algorithms

i) Thinning ii) Thickening

   b) Explain edge linking using Hough transform.

| MCA 5.5.2 | OPEN SOURCE TECHNOLOGIES | |
|---|---|---|
| Instruction: 4 periods / week | | Credits: 4 |
| Internal : 30 marks | University Exam: 70 marks | Total : 100 Marks |

**Objectives:**
The course is designed to meet the objectives of:

1. To create the awareness and importance of Open Source Systems.
2. To familiarize the student with basics of open source Systems.
3. To bring insight into different Open Source technologies.
4. Basic concepts of PHP language and developing web applications.
5. PHP Browser Handling and form data access.
6. Creation of database driven web applications.
7. Ajax for partial rendering.
8. The use of XML and RSS with PHP.

**Outcomes:**

Students upon completion of this course will be able to:

- Develop web applications using Apache, PHP, and MySQL and apply the OOP concepts.
- Create database driven web applications.
- Create powerful web applications using Ajax.
- Create images at the web server.
- Manipulate XML documents using PHP and Create RSS

## SYLLABUS

**UNIT – I**
Essential PHP
Operators and Flow Control
Strings and Arrays.

**UNIT – II**
Reading Data in Web Pages
PHP Browser-HANDLING Power.

**UNIT – III**
Object Oriented Programming
Advanced Object Oriented Programming
File Handling.

**UNIT – IV**
Working with Databases
Sessions, Cookies, and FTP
Ajax

**UNIT – V**

Advanced Ajax
Drawing Images on the Server
XML and RSS.

**Prescribed Book**

1. Steven Holzner, “PHP: The Complete Reference”, TATA McGraw Hill, 2015.

**Reference Books**

1. W. Jason Gilmore,“Beginning PHP and MySQL: From Novice to Professional”, Apress.
2. Steve Suehring, Tim Converse, Joyce Park,“PHP 6 and MySQL 6 Bible”, Wiley Publishing, Inc.

**Model Paper**

**MCA 5.5.2: Open Source Technologies**

**Time: 3 Hrs** **Max. Marks: 70**

**Answer Question No.1 Compulsory:** **7 x 2 = 14 M**
**Answer ONE Question from each unit:** **4 x 14 = 56 M**

1. Define the terms
   a) Command line PHP
   b) PHP ternary operator
   c) Arrays
   d) Loops in PHP
   e) HTTP Headers
   f) Access modifier
   g) Session
   **h)** GET & POST

**UNIT – I**

2. a. Explain creating development environment.
   b. Write about PHP data types.

**(OR)**

3. Discuss String functions and formatting text strings

**UNIT – II**

4. a. Differentiate Text Field with Text Area. Write a program to justify them.
   b. Explain Check boxes and radio buttons handling

**(OR)**

5. Describe data validation and explain client side data validation.

**UNIT - III**

6. a. Describe classes and objects
   b. Explain constructors with an example

**(OR)**

7. Define Interface and explain how to create an interface.

**UNIT – IV**

8. How to access databases in PHP?

**(OR)**

9. a. Describe cookies and setting a cookies
   b. Explain the creation of XMLHttpRequest Object

| MCA 5.5.3 | BLOCK CHAIN TECHNOLOGY | |
|---|---|---|
| Instruction: 4 periods / week | | Credits: 4 |
| Internal : 30 marks | University Exam: 70 marks | Total : 100 Marks |

**Objectives:**

The course is designed to meet the objectives of:

1. To introduce the concept of Blockchain
2. To overcome the problems of centralization
3. To introduce the concept of Bitcoin
4. To make them familiar with Bitcoin network, payments, clients and APIs.

**Outcomes:**

Students successfully completing this module will be able to:

1. Familiarized with Blockchain Terminology.
2. Understand the concept of Blockchain, Bitcoin
3. Understand de-centralization
4. Gain knowledge about the domain of blockchain in real time.

## SYLLABUS

**Unit – I**

Blockchain , the growth of blockchain technology, distributed systems, the history of blockchain and Bitcoin, types of blockchain. Decentralization , methods of decentralization , routes of decentralization, blockchain and full ecosystem decentralization, smart contracts, Decentralized organizations and platforms for decentralization.

**Unit – II**

Symmetric Cryptography , working with the OpenSSL command line, cryptographic primitives. Public Key Cryptography, asymmetric cryptography, public and private keys and financial markets and trading.

**Unit – III**

Introducing Bitcoin, Bitcoin, digital keys and addresses, transactions, blockchain, mining. Alternative Coins. Limitations of Bitcoin

**Unit – IV**

Bitcoin Network and payments, The Bitcoin network, wallets, Bitcoin payments, innovation in Bitcoin, Bitcoin Clients and APIs.

**Prescribe Book**

Mastering Blockchain 2nd Edition, Imran Bashir, PACKT Publication

**Reference Books**

Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. Bitcoin and cryptocurrency technologies: a comprehensive introduction. Princeton University Press, 2016.

**Model Paper**

**MCA 5.5.3: Block Chain Technology**

**Time: 3 Hrs** **Max. Marks: 70**

**Answer Question No.1 Compulsory: 7 x 2 = 14 M**
**Answer ONE Question from each unit: 4 x 14 = 56 M**

**1. Explain the following terms.**

a. Blockchain
b. Electronic Cash
c. Centralization
d. Digital Key
e. API
f. Double spending
g. Bitcoin address

**UNIT-I**

2. a. Explain the types of Blockchain?
b. Describe smart contracts?

**(OR)**

1. Explain methods of decentralization.

**UNIT-II**

4. a. Explain working with the OpenSSL command line.
b. Explain digital Signatures.

**(OR)**

5. a. How asymmetric cryptography is used in blockchain?
b. Explain the terms : public key and private key.

**UNIT-III**

6. a. Explain various interactive picture construction techniques.
b. Describe Bitcoin. Explain how Bitcoin works?

OR

7. Explain the limitation of blockchain?

UNIT-IV

8. How to pay with Bitcoin and Bitcoin cash?

**OR**

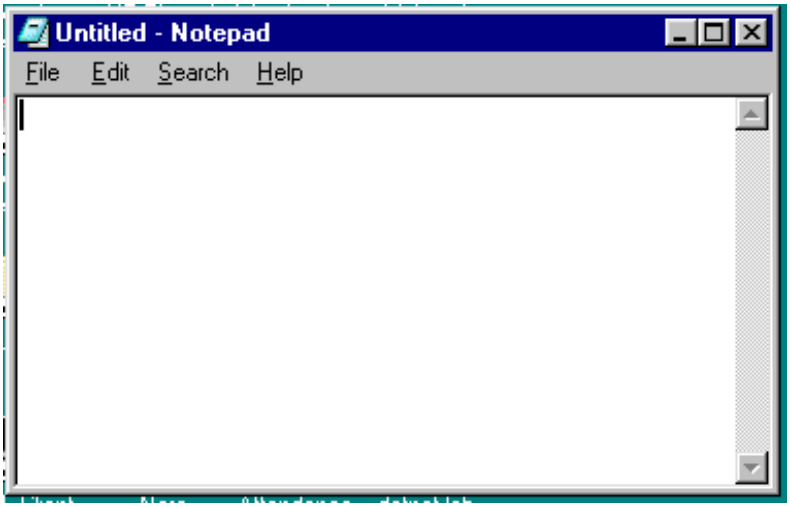
9. a. Describe wallets.
b. Describe Bitcoin mining.

| MCA 5.6 | .NET PROGRAMMING LAB | |
|---|---|---|
| Instruction: 6 periods / week | | Credits: 3 |
| Internal : 30 marks | University Exam: 70 marks | Total : 100 Marks |

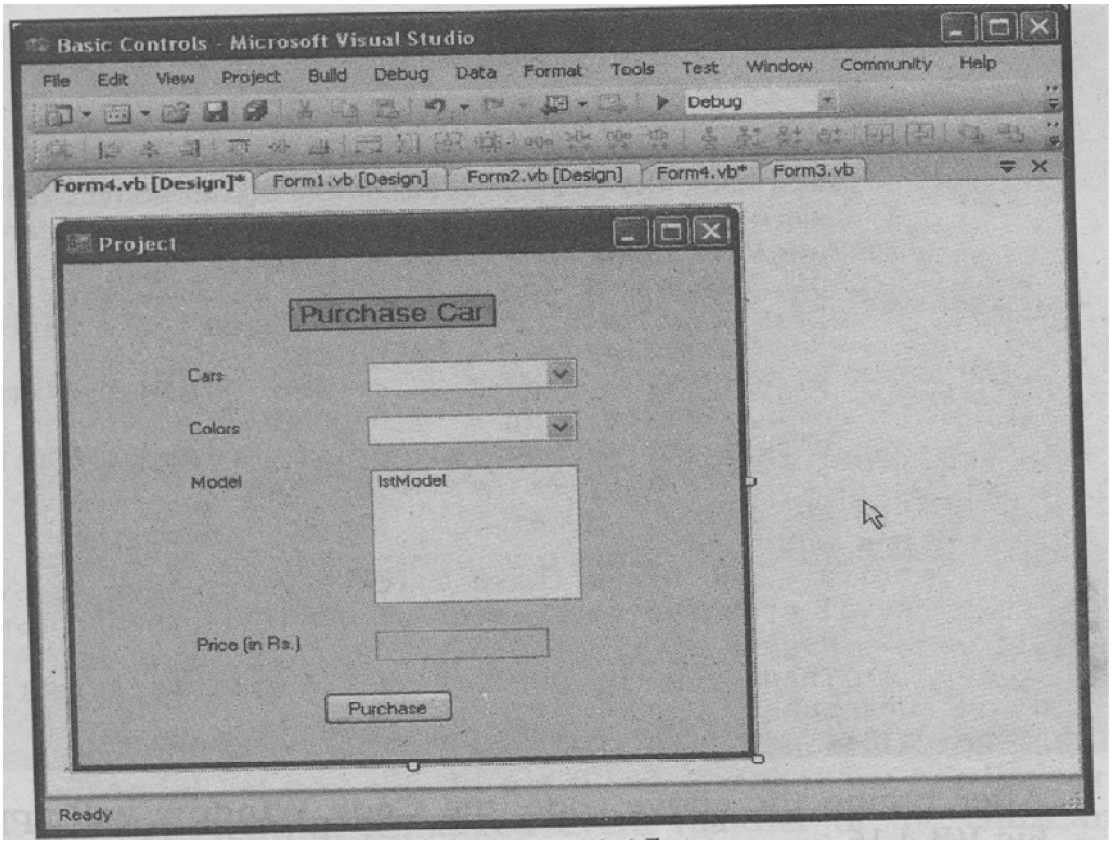
**LAB CYCLE**

**VB .NET:**

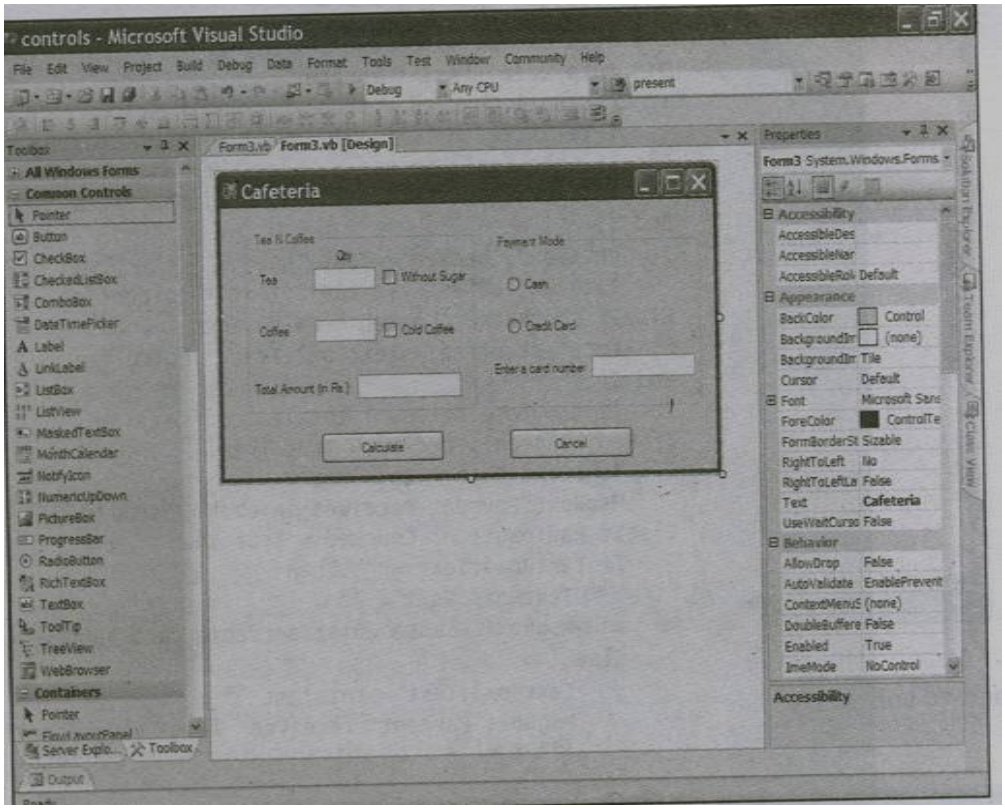
1) Develop an application which is similar to "Notepad" using menus.



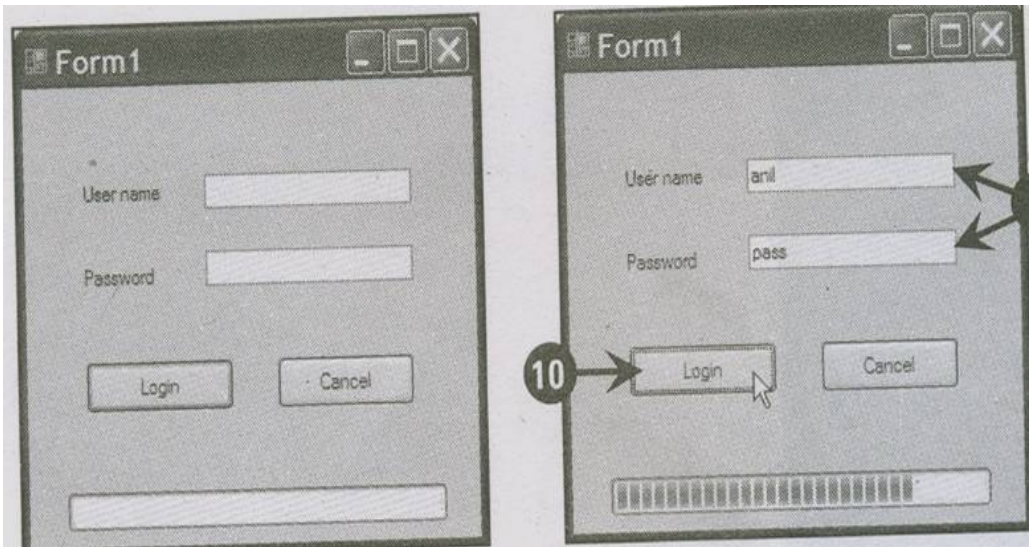

2) (a) Develop an application for facilitating purchasing order which will look like as shown below :



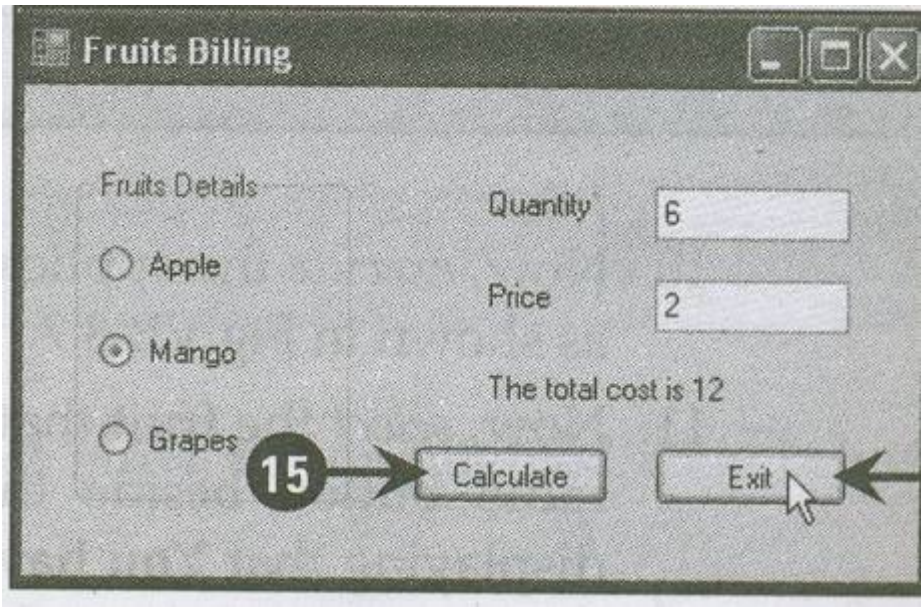

(b) Develop an application for billing system in coffee shops which will look like as shown below :



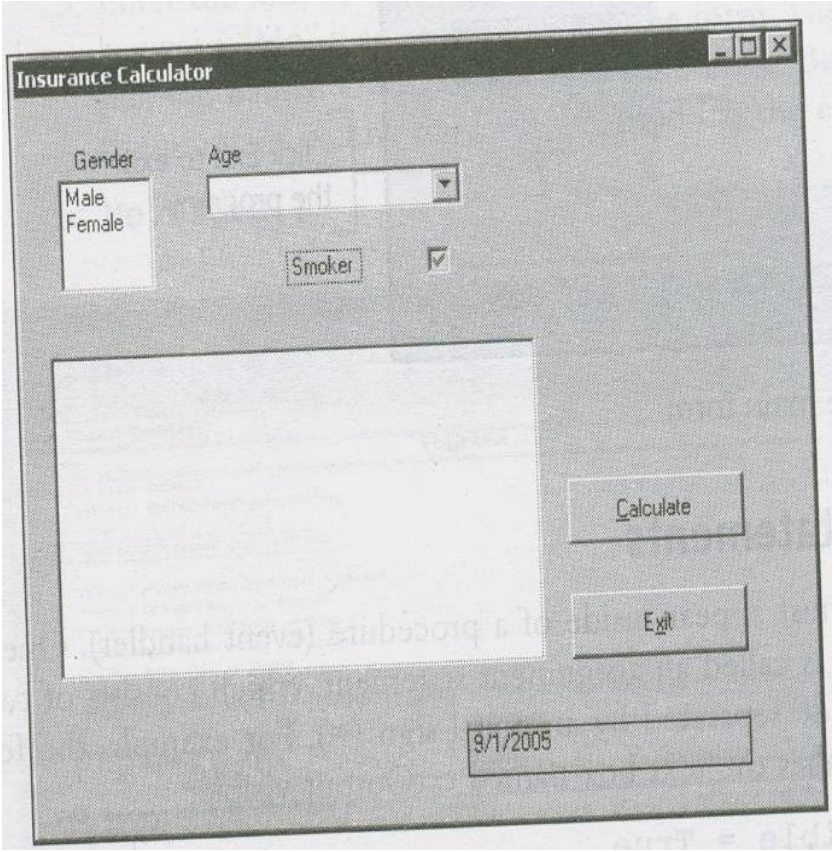
3) (a)Develop an application which is similar to login form including the progress bar controls.




(b) Develop an application for fruits billing system which will look like as shown below :




4) Develop an application which is helpful for calculating the insurance.




5) (a) Develop an application using font dialog control

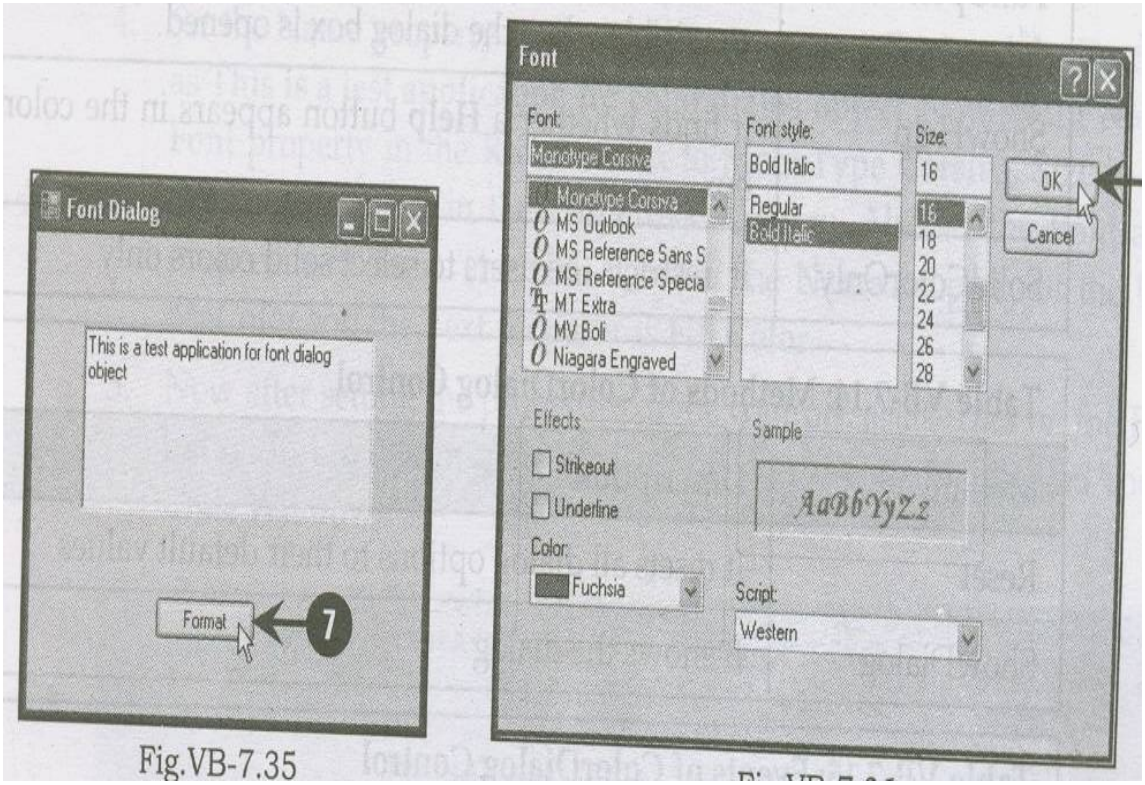


Fig.VB-7.35

(b) Develop an application using color dialog control

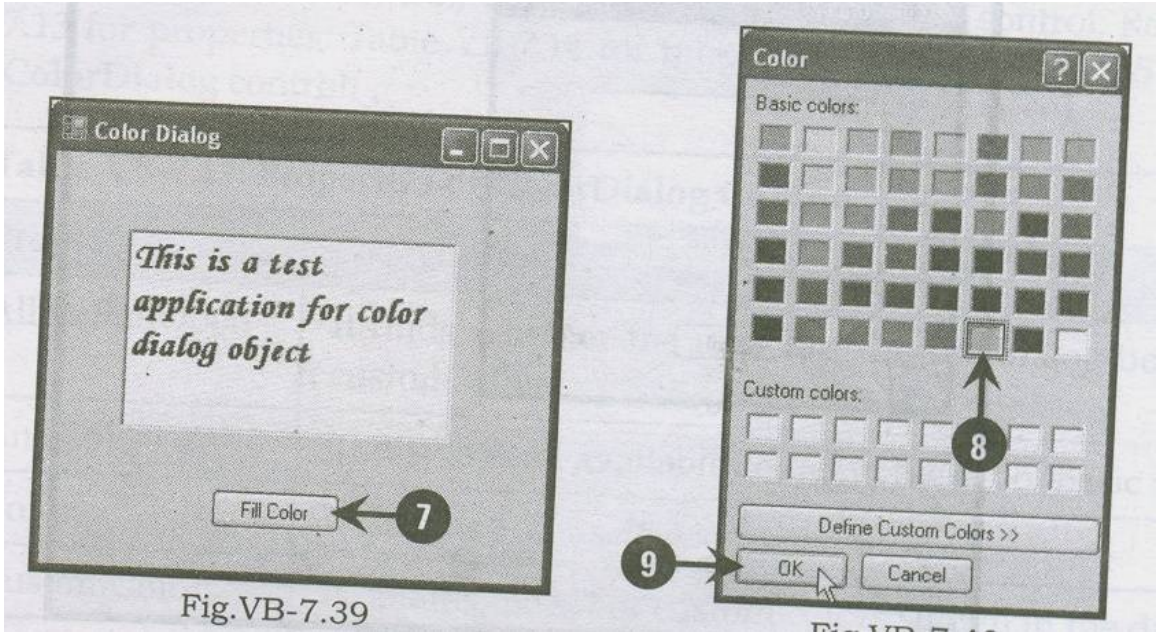


Fig.VB-7.39

6) Develop an application to display the file selected by the user in a web browser control.

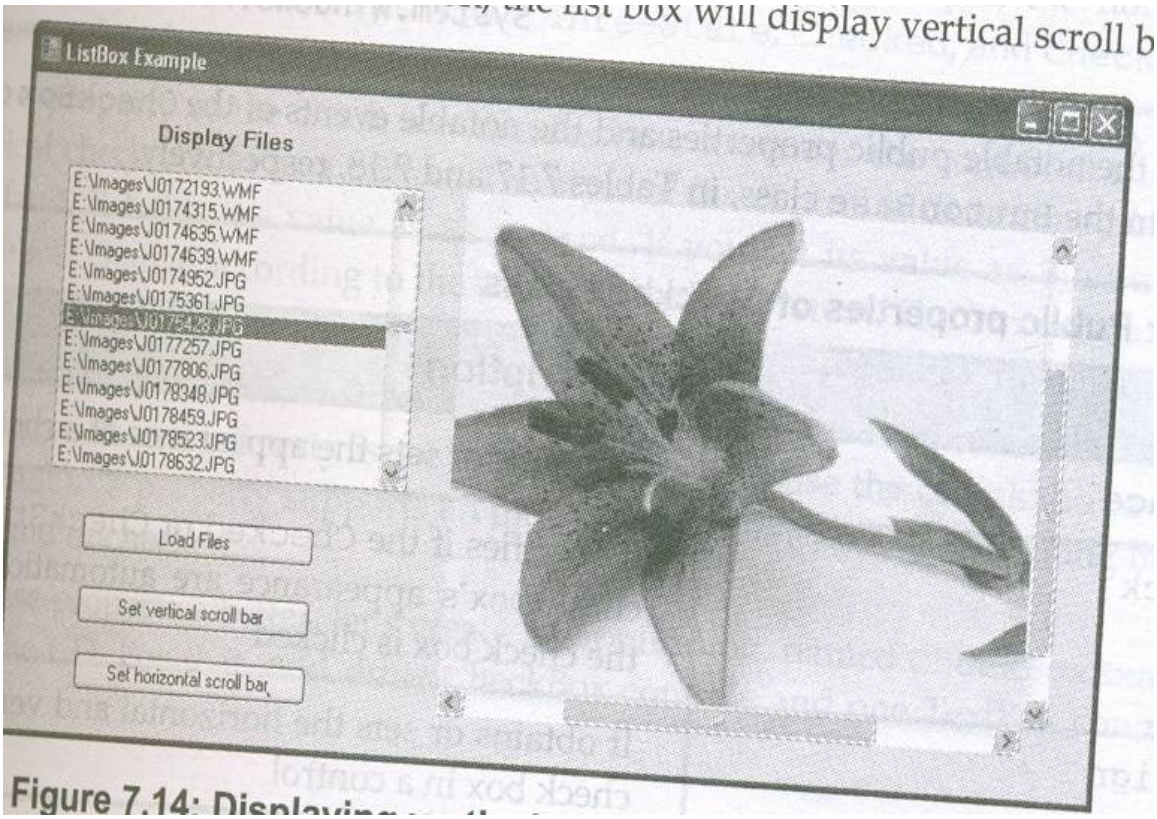
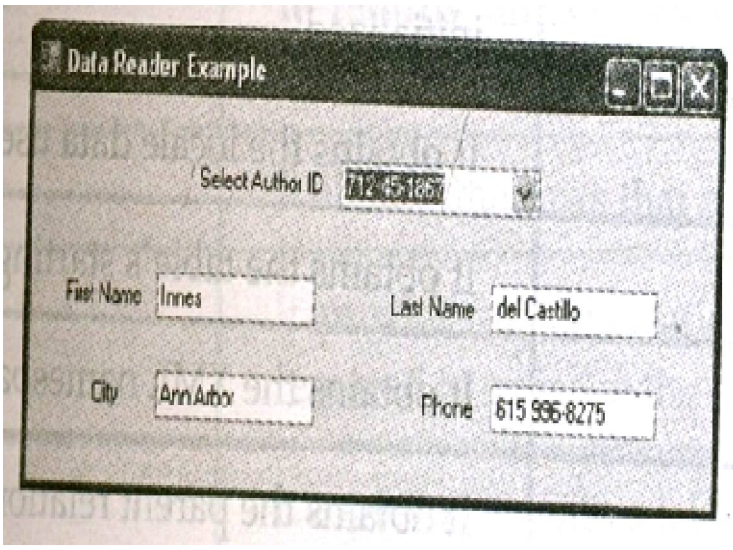



Figure 7.14: Displaying

7) Develop an application using the data reader to read from a database.




**ASP.NET:**

8) Design an application for dynamically populating a checkbox list.

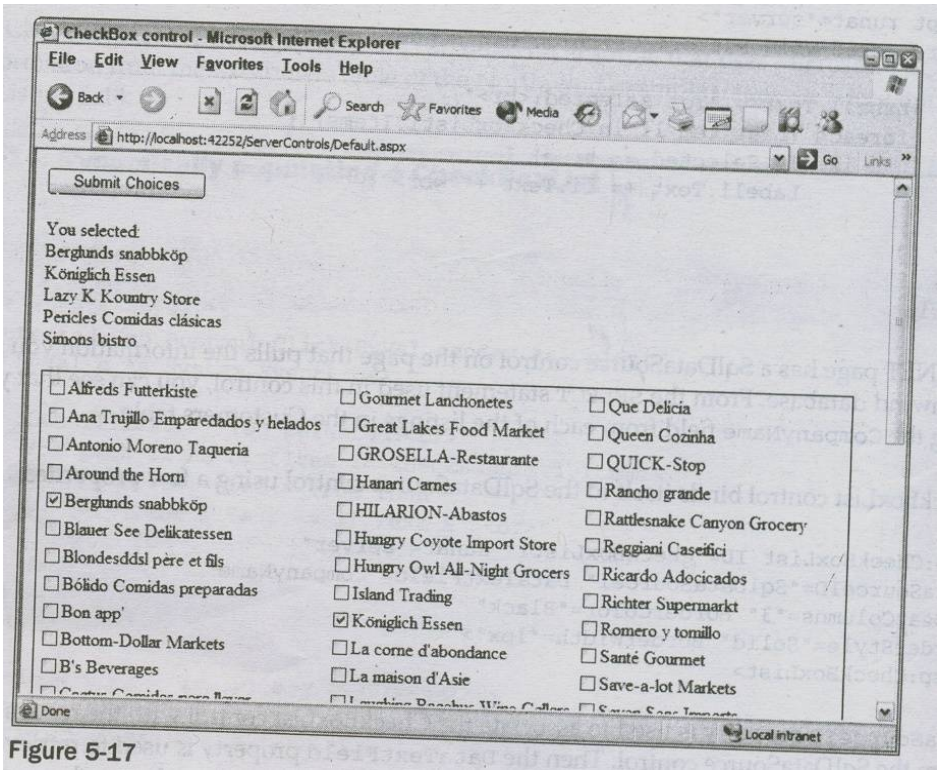


Figure 5-17

9) Develop an application for selecting a single day in the calendar control.

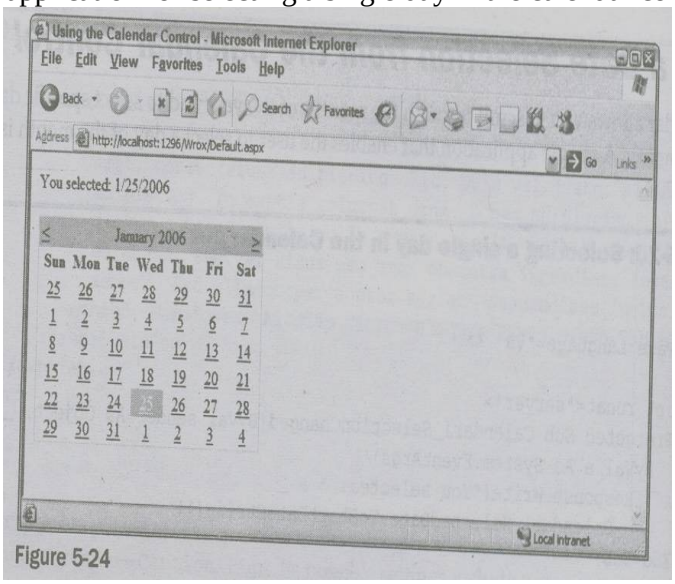
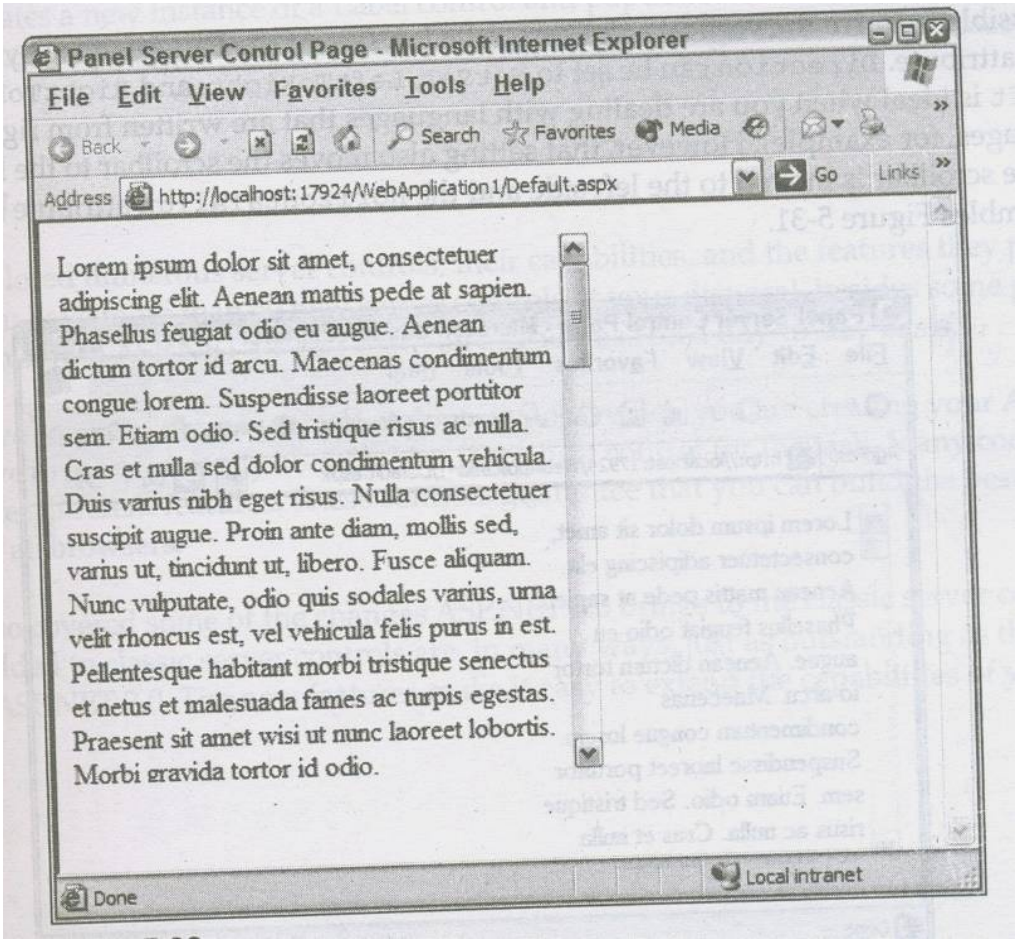


Figure 5-24

10) Design an application by using the new scroll bar feature with the panel server control.




11) Design an application with simple bulleted list control.

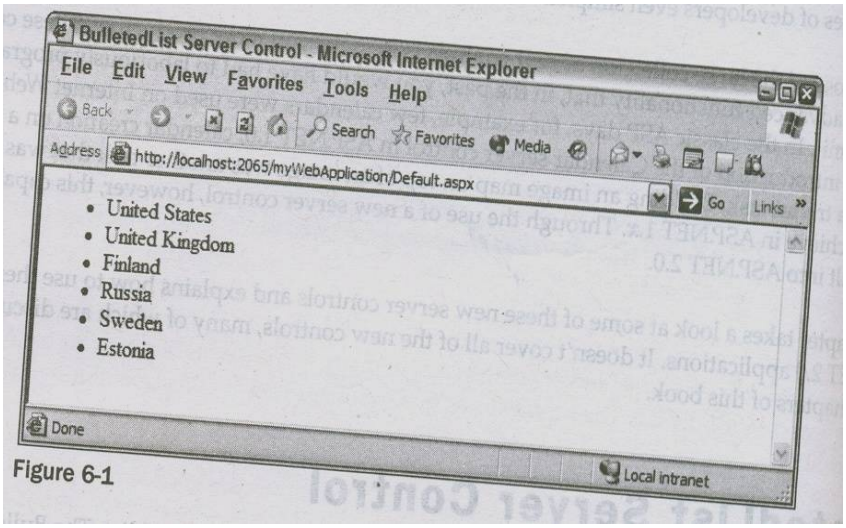
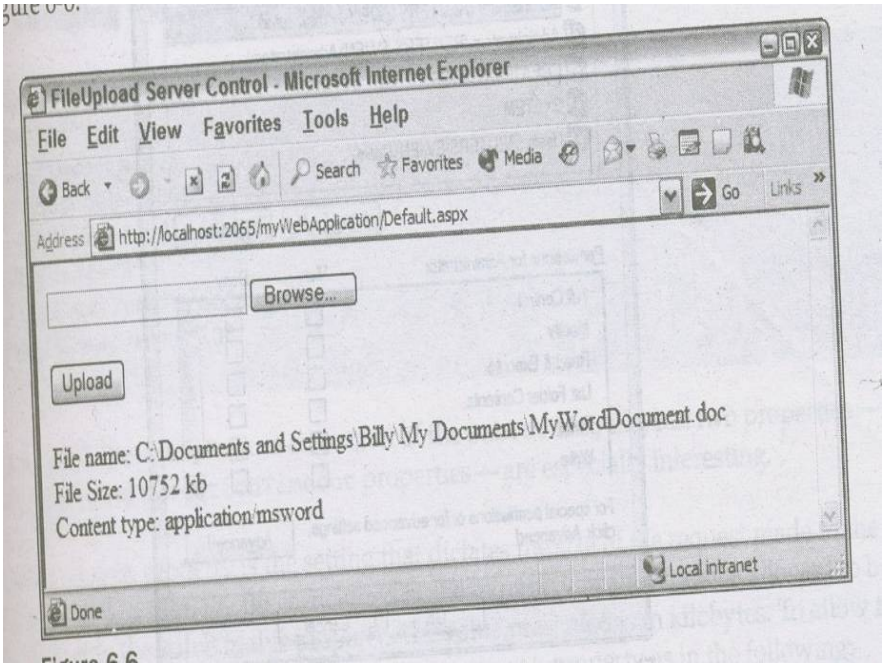
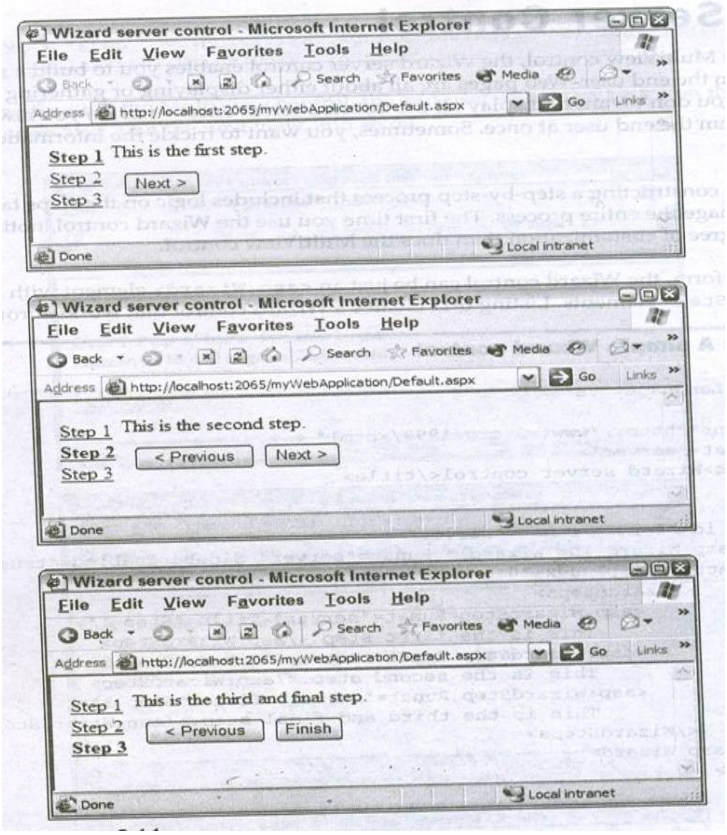



Figure 6-1

12) Design an application for uploading files using new file upload control.




13)Design an application for building a form in the wizard control.



14) Design an application by using the compare validator to test values against control values.

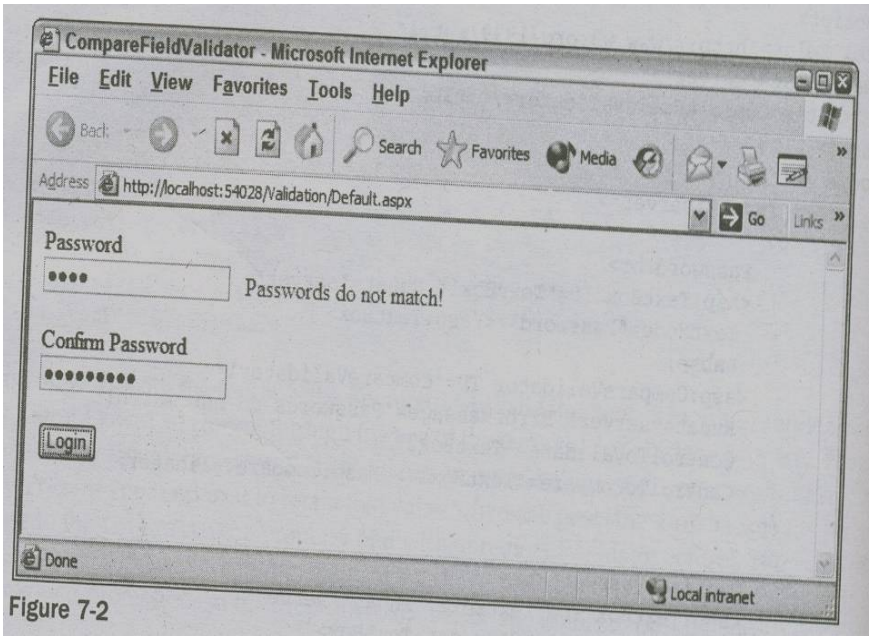


Figure 7-2

15) Design an application using the images, sounds for error notifications.

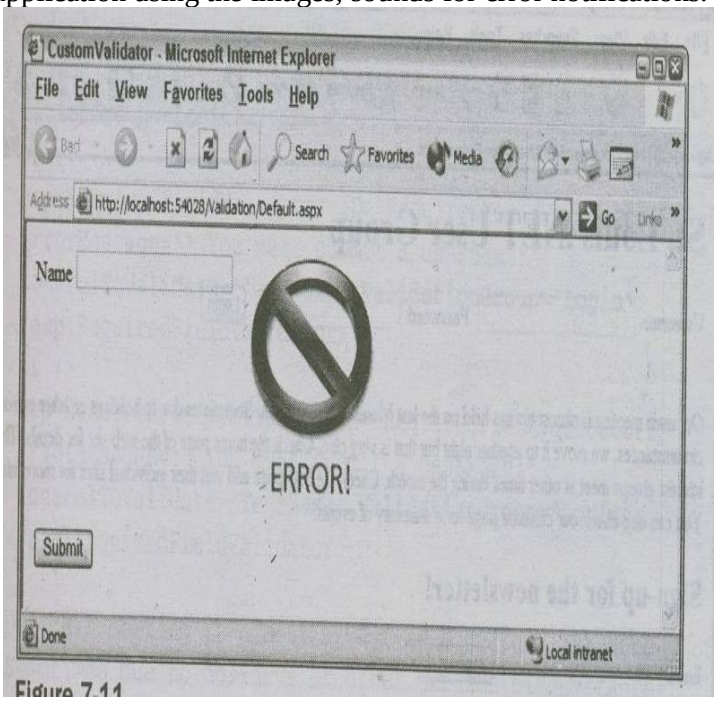
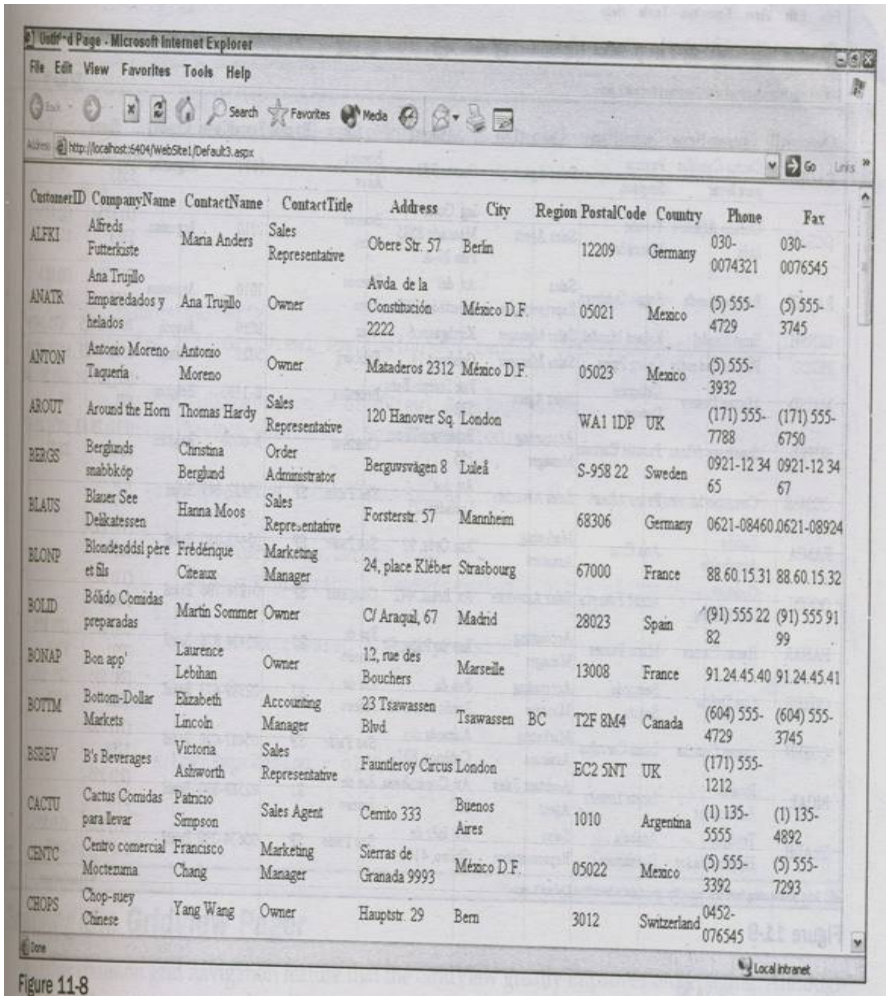


Figure 7.11

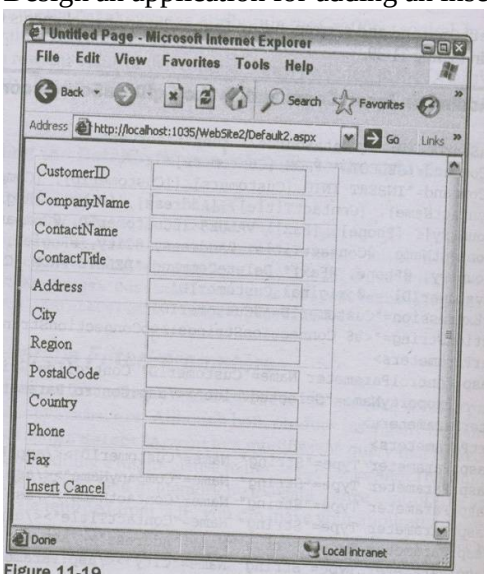
16) Design an application using the grid view control in an ASP.Net web page.

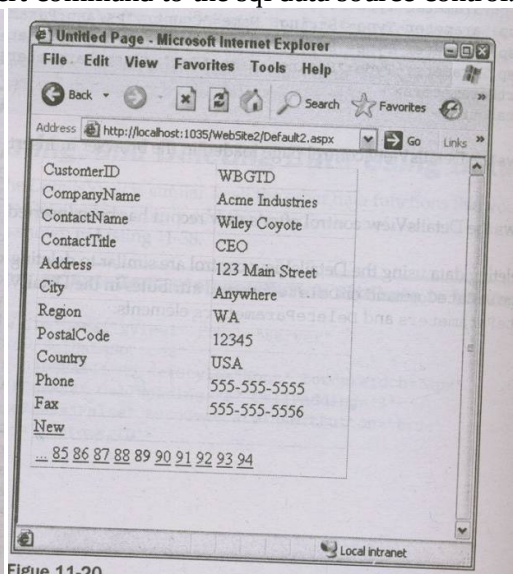



| CustomerID | CompanyName | ContactName | ContactTitle | Address | City | Region | PostalCode | Country | Phone | Fax |
|---|---|---|---|---|---|---|---|---|---|---|
| ALFKI | Alfreds Futterkiste | Maria Anders | Sales Representative | Obere Str. 57 | Berlin | | 12209 | Germany | 030-0074321 | 030-0076545 |
| ANATR | Ana Trujillo Emparedados y helados | Ana Trujillo | Owner | Avda. de la Constitución 2222 | México D.F. | | 05021 | Mexico | (5) 555-4729 | (5) 555-3745 |
| ANTON | Antonio Moreno Taquería | Antonio Moreno | Owner | Mataderos 2312 | México D.F. | | 05023 | Mexico | (5) 555-3932 | |
| AROUT | Around the Horn | Thomas Hardy | Sales Representative | 120 Hanover Sq. | London | | WA1 1DP | UK | (171) 555-7788 | (171) 555-6750 |
| BERGS | Berglunds snabbköp | Christina Berglund | Order Administrator | Berguvsvägen 8 | Luleå | | S-958 22 | Sweden | 0921-12 34 65 | 0921-12 34 67 |
| BLAUS | Blauer See Delikatessen | Hanna Moos | Sales Representative | Forsterstr. 57 | Mannheim | | 68306 | Germany | 0621-08460 | 0621-08924 |
| BLONP | Blondesddsl père et fils | Frédérique Citeaux | Marketing Manager | 24, place Kléber | Strasbourg | | 67000 | France | 88.60.15.31 | 88.60.15.32 |
| BOLID | Bólido Comidas preparadas | Martín Sommer | Owner | C/ Araquil, 67 | Madrid | | 28023 | Spain | (91) 555 22 82 | (91) 555 91 99 |
| BONAP | Bon app' | Laurence Lebihan | Owner | 12, rue des Bouchers | Marseille | | 13008 | France | 91.24.45.40 | 91.24.45.41 |
| BOTTM | Bottom-Dollar Markets | Elizabeth Lincoln | Accounting Manager | 23 Tsawassen Blvd. | Tsawassen | BC | T2F 8M4 | Canada | (604) 555-4729 | (604) 555-3745 |
| BSBEV | B's Beverages | Victoria Ashworth | Sales Representative | Fauntleroy Circus | London | | EC2 5NT | UK | (171) 555-1212 | |
| CACTU | Cactus Comidas para llevar | Patricio Simpson | Sales Agent | Cerrito 333 | Buenos Aires | | 1010 | Argentina | (1) 135-5555 | (1) 135-4892 |
| CENTC | Centro comercial Moctezuma | Francisco Chang | Marketing Manager | Sierras de Granada 9993 | México D.F. | | 05022 | Mexico | (5) 555-3392 | (5) 555-7293 |
| CHOPS | Chop-suey Chinese | Yang Wang | Owner | Hauptstr. 29 | Bern | | 3012 | Switzerland | 0452-076545 | |

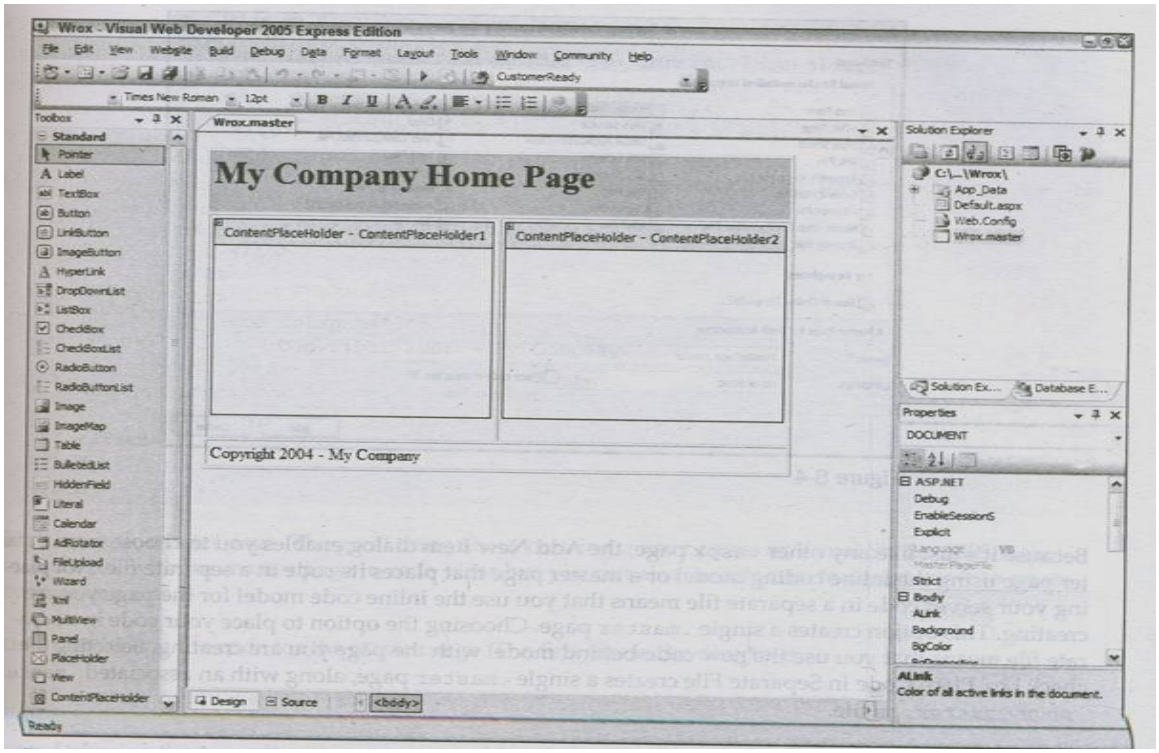
Figure 11-8

17) Design an application for adding an insert command to the sql data source control.




18) Design a web site using the concept of master pages.




**C#.NET:**

19) Develop a project for performing arithmetic, relational, logical operations.
20) Develop a project for demonstrating polymorphism, abstraction.
21) Develop a project for demonstrating switch statements.
22) Develop a project for implementing inheritance using abstract classes.
23) Develop a project for implementing interfaces using multiple inheritance.
24) Create a form that is the main window of a program using window class.
25) Create a form that is the main window with button program.
26) Create a form that is the main window of a program using the standard controls.
27) Create a form which displays the given inputs in the form of a tree view structure.
28) Develop a project for implementing exception handling in C#.
29) Develop a project which displays the student information in the relevant fields from the database which already exists.

| MCA 5.7 | BIG DATA ANALYTICS LAB | |
|---|---|---|
| Instruction: 6 periods / week | | Credits: 3 |
| Internal : 30 marks | University Exam: 70 marks | Total : 100 Marks |

## LAB CYCLE

1. Implement the following Data structures in Java
   a)Linked Lists b) Stacks c) Queues d) Set e) Map

2. (i) Perform setting up and Installing Hadoop in its three operating modes:
   a. Standalone
   b. Pseudo distributed
   c. Fully distributed
   (ii) Use web based tools to monitor your Hadoop setup.

3. Implement the following file management tasks in Hadoop:
   Adding files and directories
   Retrieving files
   Deleting files

4. Run a basic Word Count Map Reduce program to understand Map Reduce Paradigm.

5. Write a Map Reduce program that mines weather data. Weather sensors collecting data every hour at many locations across the globe gather a large volume of log data, which is a good candidate for analysis with MapReduce, since it is semi structured and record-oriented.

6. Implement Matrix Multiplication with Hadoop Map Reduce

7. Install and Run Pig then write Pig Latin scripts to sort, group, join, project, and filter your data.

8. Install and Run Hive then use Hive to create, alter, and drop databases, tables, views,functions, and indexes

| MCA 5.8 | SEMINAR | |
|---|---|---|
| Instruction: 3 periods / week | | Credits: 1 |
| Internal :<br>30 marks | University Exam:<br>70 marks | Total :<br>100 Marks |

## THIRD YEAR - SIXTH SEMESTER

| Sub Code | Name of the Subject | Int. Marks | Ext. Marks | Total Marks | No of Credits | Hours/ Week |
|---|---|---|---|---|---|---|
| MCA601 | Project Work | -- | 150 | 150 | 10 | Five Months Duration |

## PROJECT WORK

The Master of Computer Applications (MCA) programme prepares the students to take up positions as Systems Analysts, Systems Designers, Software Engineers, Programmers and Project Managers in any field related to information technology. The MCA students are encouraged to spend at least five months working on a project preferably in a software industry or any research organization.

**The following suggested guidelines must be followed in preparing the Final Project Report:**
Good quality white executive bond paper A4 size should be used for typing and duplication.

Page Specification :(Written paper and source code)
Left margin - 2.5 cms
Right margin- 1.5 cms
Top margin - 2.5 cms
Bottom margin - 2.5 cms
Page numbers - All text pages as well as Program source code listing should be numbered at the bottom center of the pages.

Normal Body Text: Font Size : 12, Times New Roman, Double Spacing, Justified. 6 point above and below para spacing
Paragraph Heading Font Size: 14, Times New Roman, Underlined, Left Aligned. 12 point above & below spacing.
Chapter Heading Font Size: 20, Times New Roman, Centre Aligned, 30 point above and below spacing.
Coding Font size : 10, Courier New, Normal

Submission of Project Report to the University : The student will submit his/her project report in the prescribed format.

The project documentation may be about 100 to 125 pages (excluding coding). The project documentation details should not be too generic in nature. Appropriate project report documentation should be done, like, how you have done the analysis, design, coding, use of testing techniques/strategies, etc., *in respect of your project*. To be more specific, whatever the theory in respect of these topics is available in the reference books should be avoided as far as possible. The project documentation should be in respect of your project only. The project documentation should include the topics given below. Each and every component shown below carries certain weightage in the project report evaluation.

- Table of Contents/Index with page numbering
- Introduction/Objectives
- System Analysis
    - ♦ Identification of Need
    - ♦ Preliminary Investigation
    - ♦ Feasibility Study
    - ♦ Project Planning
    - ♦ Project Scheduling (PERT Chart and Gantt Chart both)
    - ♦ Software requirement specifications (SRS)
    - ♦ Software Engineering Paradigm applied
    - ♦ Data models (like DFD), Control Flow diagrams, State Diagrams/Sequence diagrams, Entity Relationship Model, Class Diagrams/CRC Models/Collaboration Diagrams/Use-case Diagrams/Activity Diagrams depending upon your project requirements
- System Design
    - ♦ Modularisation details
    - ♦ Data integrity and constraints
    - ♦ Database design, Procedural Design/Object Oriented Design
    - ♦ User Interface Design
    - ♦ Test Cases (Unit Test Cases and System Test Cases)
- Coding
    - ♦ Complete Project Coding
    - ♦ Comments and Description of Coding segments
    - ♦ Standardization of the coding



    - ♦ Code Efficiency
    - ♦ Error handling
    - ♦ Parameters calling/passing
    - ♦ Validation checks
- Testing
    - ♦ Testing techniques and Testing strategies used
    - ♦ Testing Plan used
    - ♦ Test reports for Unit Test Cases and System Test Cases
    - ♦ Debugging and Code improvement
- System Security measures (Implementation of security for the project developed)

    - Database/data security
    - Creation of User profiles and access rights
- Cost Estimation of the Project along with Cost Estimation Model
- Reports (sample layouts should be placed)
- Future scope and further enhancement of the Project
- Bibliography
- Appendices (if any)
- Glossary.
- Should attach a copy of the CD containing the executable file(s) of the complete project.

**TOTAL MARKS FOR THE MCA COURSE : 3900**

**TOTAL CREDITS FOR THE MCA COURSE : 160**