

**MARWARI COLLEGE, RANCHI**  
(AN AUTONOMOUS UNIT OF RANCHI UNIVERSITY FROM 2009)



**Master of Computer Applications**

**COURSES OF STUDY FOR MCA**

**Number of Papers: 35**

**Full Marks: 3275**

**Number of Semesters: 6**

<b>MCA Sem. – I</b>	<b>: 650 Marks</b>
<b>MCA Sem. – II</b>	<b>: 550 Marks</b>
<b>MCA Sem. – III</b>	<b>: 650 Marks</b>
<b>MCA Sem. – IV</b>	<b>: 650 Marks</b>
<b>MCA Sem. – V</b>	<b>: 650 Marks</b>
<b>MCA Sem. – VI</b>	<b>: 125 Marks</b>

## **Framework of MCA syllabus** (Proposed for 2009-2012)

### **MCA SEMESTER - I**

#### **THEORY**

#### **CODE TITLE UNIT**

1MCA 1001 Fundamentals of Computer Science

1MCA 1002 Programming in C

1MCA 1003 Scientific Computing

1MCA 1004 Discrete Mathematics

1MCA 1005 Technical English

#### **Practical**

1MCA 1001L Lab on C Programming

1MCA 1002L Lab on Scientific Computing

### **MCA SEMESTER - II**

2MCA 2001 Data Structure

2MCA 2002 Object Oriented Programming

2MCA 2003 Operating System

2MCA 2004 Computer System Architecture

#### **Practical**

2MCA 2001L Lab on Data Structure

2MCA 2002L Lab on C++ Programming

### **MCA SEMESTER - III**

3MCA 3001 Design and Analysis of Computer Algorithms

3MCA 3002 Fundamentals of Database Management System

3MCA 3003 Formal Languages & Automata Theory

3MCA 3004 Java Programming

3MCA 3005 Fundamentals of Computer Networks

#### **Practical**

3MCA 3001L Lab on Database Management System

3MCA 3002L Lab on Java Programming

### **MCA SEMESTER - IV**

4MCA 4001 Principles of Software Engineering

4MCA 4002 Network Security & Cryptography

4MCA 4003 Multimedia & Animation

4MCA 4004 Enterprises Resource Planning

4MCA 4005 Computerized Financial Accounting

#### **Practical**

4MCA 4001L Lab on Software Engineering (Rational Rose)

4MCA 4002L Lab on Multimedia & Animation

### **MCA SEMESTER - V**

5MCA 5001 Data Mining & Data Warehousing

5MCA 5002 Artificial Intelligence & Expert Systems

5MCA 5003 Website Designing & Management

5MCA 5004 E-Commerce

5MCA 5005 Principles of Management

**Practical**

5MCA 5001L Lab on Data Mining & Data Warehousing

5MCA 5002L Lab on Website Designing

**MCA SEMESTER - VI**

6MCA 6001 Final Project

Year	Semester	Code	Paper	Full Marks	Mid Sem	End Sem	Total Pass Marks
First Year	First	1MCA 1001	Fundamentals of Computer Science	100	30	70	45
		1MCA 1002	Programming in 'C'	100	30	70	45
		1MCA 1003	Scientific Computing	100	30	70	45
		1MCA 1004	Discrete Mathematics	100	30	70	45
		1MCA 1005	Technical English	100	30	70	45
		1MCA 001L	Lab on 'C' Programming	75		75 (38E+37I)	34
	1MCA 002L	Lab on Scientific Computing	75		75 (38E+37I)	34	
	Second	2MCA 2001	Data Structure	100	30	70	45
		2MCA 2002	Object Oriented Programming in C++	100	30	70	45
		2MCA 2003	Operating System Architecture	100	30	70	45
		2MCA 2004	Computer System Architecture	100	30	70	45
		2MCA2001L	Lab on Data Structure	75		75 (38E+37I)	34
2MCA 2002L		Lab on C++ Programming	75		75 (38E+37I)	34	
Second Year	Third	3MCA 3001	Design And Analysis of Computer Algorithms	100	30	70	45
		3MCA 3002	Fundamentals of Database Management System	100	30	70	45
		3MCA 3003	Formal Languages & Automata Theory	100	30	70	45
		3MCA 3004	Java Programming	100	30	70	45
		3MCA 3005	Fundamentals of Computer Networks	100	30	70	45
		3MCA 001L	Lab on Database Management Systems	75		75 (38E+37I)	34
		3MCA3002L	Lab on Java Programming	75		75 (38E+37I)	34
	Fourth	4MCA 4001	Principles of Software Engineering	100	30	70	45
		4MCA 4002	Network Security & Cryptography	100	30	70	45
		4MCA 4003	Multimedia & Animation	100	30	70	45
		4MCA 4004	Enterprise Resource Planning	100	30	70	45
		4MCA 4005	Computerized Financial Accounting	100	30	70	45
		4MCA4001L	Lab on Software Engineering using any case tool	75		75 (38E+37I)	34
		4MCA 002L	Lab on Multimedia & Animation	75		75 (38E+37I)	34
Third Year	Fifth	5MCA5001	Data Mining & Data Warehousing	100	30	70	45
		5MCA5002	Artificial Intelligence & Expert System	100	30	70	45
		5MCA5003	Website Designing & Management	100	30	70	45
		5MCA5004	E-Commerce	100	30	70	45
		5MCA5005	Principles of Management	100	30	70	45
		5MCA5001L	Lab on Data Mining & Data Warehousing	75		75 (38E+37I)	34
		5MCA5002L	Lab on Website Designing	75		75 (38E+37I)	34
	Sixth	6MCA6001	Final Project	125		125	60

**Note: E: External, I: Internal, P: Practical & JT: Job Training**

# MCA – 1<sup>st</sup> Year

## SEMESTER- I

### (Paper-1)

#### 1MCA 1001 Fundamentals of Computer Science

Full Marks: 30 (MSE) +70 (ESE) = 100 Time: 3 hrs. Pass Marks: 45

#### Instructions to question setter and examinee

This paper will be of **70 marks** and divided into three groups:

**Group A** : Multiple choice question, fill in the blanks and true false types (15 x 1= 15)

**Group B** : Concept based questions (5 questions of 4 marks each, word limits 150 words) (5 x 4 = 20).

**Group C** : Descriptive type questions (5 questions of 7 marks each, word limit 400) (5 x 7 = 35).

The questions must cover the entire syllabus with equal distribution of marks as far as practicable.

#### Details:

Data and number representation- binary-complement representation, BCD-ASCII, conversion of numbers from one Number system to the other, (r-1)'s & r's complement representation, binary arithmetic.

Structure of a digital machine (VON-Neumann architecture), Logic gates, basic logic operations, truth tables, Boolean expression, simplification.

Combination circuits, adders, multiplexer, Sequential circuits, Registers.

ROM, PROM, EPROM and dynamic RAM, Digital Components, bus structure- Address bus, Data bus & DMA controller.

Karnaugh Map, Coder, Decoder, Counter – Asynchronous & Synchronous. Flip Flops – RS, JK, and D & T.

Basic Computer Organization & Design, Micro-programmed Control. Data representation, Register transfer & micro-operations, Central processing unit, Pipeline & vector processing, Computer arithmetic.

Input - output organisation, Memory organisation, Microprocessors (8085), Personal

Computing. CPU architecture, instruction format, addressing mode, stacks and handling of interrupts.

Assembly language – Elementary problems.

#### Books:

1. Computer System Architecture, Morris Mano, PHI
2. Computer Organization, Hamacher, MGH
3. Computer Architecture, Carter, Schaum Outline Series, TMH
4. System Architecture, Buad, VIKAS
5. The Fundamentals of Computer Organization, Raja Rao, Scitech
6. Computer Organization & Design, Pal Chowdhury, PHI

# MCA – 1<sup>st</sup> Year

## SEMESTER- I

### (Paper-2)

#### 1MCA 1002 Programming in 'C'

**Full Marks: 30 (MSE) +70 (ESE) = 100    Time: 3 hrs.    Pass Marks: 45**

#### Instructions to question setter and examinee

This paper will be of **70 marks** and divided into three groups:

**Group A :** Multiple choice question, fill in the blanks and true false types (15 x 1= 15)

**Group B :** Concept based questions (5 questions of 4 marks each, word limits 150 words) (5 x 4 = 20).

**Group C :** Descriptive type questions (5 questions of 7 marks each, word limit 400) (5 x 7 = 35).

The questions must cover the entire syllabus with equal distribution of marks as far as practicable.

#### Details:

##### Module-I (12 hours)

Introduction to computer: Evolution of computer, Computer system, Compiling environment, Time sharing, Client-Server environment, Distributed computing, Programming languages, Writing and editing programs, Compiling, linking and executing programs, System development, Life cycle, Program development.

Number representation in computer: Number systems, Storing of integers and real numbers, Overflow and underflow, exceptions, Flow chart

C language fundamentals: Character set, Key words, Identifiers, data types, Constants and variables, Statements, Expressions, Operators, Precedence and associativity of operators, Side effects, Type conversion, Managing input and output

Control structures: Decision making, branching and looping.

##### Module-II (15 hours)

Arrays: one dimensional, multidimensional array and their applications, Declaration and manipulation of arrays

Strings: String variable, String handling functions, Array of strings

Functions: Designing structured programs, Functions in C, User defined and standard functions, Formal vs. actual arguments, Function category, Function prototype, Parameter passing, Recursive functions.

Storage classes: Auto, Extern, register and static variables

##### Module-III (13 hours)

Pointers: Pointer variable and its importance, pointer arithmetic and scale factor, Compatibility, Dereferencing, L-value and R-value, Pointers and arrays, Pointer and character strings, Pointers and functions, Array of pointers, pointers to pointers

Dynamic memory allocation

Structure and union: declaration and initialization of structures, Structure as function parameters, Structure pointers, Unions.

File Management: Defining and opening a file, Closing a file, Input/output Operations in files, Random Access to files, Error handling

The Pre-processor directives, command line arguments, Macros.

#### Text books:

1. Behrouz A. Forouzan and Richard F. Gilberg. Computer Science: A Structured Approach Using C, Third Edition, 2007, CENGAGE Learning India Pvt. Ltd., New Delhi.
2. E. Balguruswamy, "Programming in ANSI C", 4<sup>th</sup> edition, 2007, McGraw Hill Publication, New Delhi.

#### Reference books:

1. K.R. Venugopal, S.R. Prasad, "Mastering C, McGraw Hill Education India
2. P. Dey, M. Ghosh, "Programming in C", Oxford University Press
3. K.N. King, "C Programming-A modern approach", W.W. Norton
4. S. Prata, "C Primer plus", 5th Edition, Pearson Education India

# MCA – 1<sup>st</sup> Year

## SEMESTER- I

(Paper-3)

1MCA 1003 Scientific Computing

Full Marks: 30 (MSE) +70 (ESE) = 100 Time: 3 hrs. Pass Marks: 45

### Instructions to question setter and examinee

This paper will be of **70 marks** and divided into three groups:

**Group A** : Multiple choice question, fill in the blanks and true false types (15 x 1= 15)

**Group B** : Concept based questions (5 questions of 4 marks each, word limits 150 words) (5 x 4 = 20).

**Group C** : Descriptive type questions (5 questions of 7 marks each, word limit 400) (5 x 7 = 35).

The questions must cover the entire syllabus with equal distribution of marks as far as practicable.

### Details:

Basic Statistics-measure of central tendency, dispersion, Probability, distribution introduction to mass function, density function, distribution function (Binomial, Poisson, Normal), estimation of parameters (unbiasedness-concept of noise/error, consistency) Interpolation-Newtons Forward, Backward, Sterling & Bessel's Interpolation formula, Lagrange's Interpolation Integration- Trapezoidal, Simpson's 1/3 rd, Weddel's Rule, Romberg Integration, Gauss- Legendre two & three point formula, Newton Cotes Formula. Gram-Schmidt orthogonalisation, Tchebycheff polynomial Solution of transcendental equations- Method of Iteration, Method of Bisection, Newton - Raphson Method, Regula-Falsi method, Secant Method. Solution of system of linear equations- Gauss Elimination Method, Gauss-Jacobi, Gauss- Seidel, LU factorisation, Tri-diagonalisation. Inverse Interpolation. Least Square Curve fitting-linear & non-linear Solution of Differential Equations- Picard's method, Euler-modified method, Taylor's Series method, Runge-Kutta method, Milne's Predictor-Corrector method.

### Books:

1. Numerical Analysis, Shastri, PHI
2. Numerical Analysis, S. Ali Mollah
3. Numerical Analysis, James B. Scarborough
4. Numerical Methods for Mathematics ,Science & Engg., Mathews, PHI
5. Numerical Analysis, G.S. Rao, New Age International
6. Programmed Statistics (Questions – Answers), G.S. Rao, New Age International
7. Numerical Analysis & Algorithms, Pradeep Niyogi, TMH
8. Computer Oriented Numerical Mathematics, N. Dutta, VIKAS
9. Numerical Methods, Arumugam, Scitech
10. Probability and Statistics for Engineers, Rao, Scitech
11. Numerical Methods in Computer Application, Wayse, EPH

# MCA – 1<sup>st</sup> Year

## SEMESTER- I

(Paper-4)

### 1MCA 1004 Discrete Mathematics

Full Marks: 30 (MSE) +70 (ESE) = 100 Time: 3 hrs. Pass Marks: 45

#### Instructions to question setter and examinee

This paper will be of **70 marks** and divided into three groups:

**Group A :** Multiple choice question, fill in the blanks and true false types (15 x 1= 15)

**Group B :** Concept based questions (5 questions of 4 marks each, word limits 150 words) (5 x 4 = 20).

**Group C :** Descriptive type questions (5 questions of 7 marks each, word limit 400) (5 x 7 = 35).

The questions must cover the entire syllabus with equal distribution of marks as far as practicable.

#### Details:

##### Module-I (15 hours)

Logic, Relation & Functions:

Logic: Propositions and logical Operations, Conditional statements; Predicate Calculus-First order logic, universal and existential quantifiers; Proof Techniques- methods of proof, Mathematical induction, recurrence relations.

Relation and Diagraphs- Properties of relations, composition of relations, closure operation on relations, equivalence relations and partitions, paths in relation and diagraphs, Operations on relations, Transitive closure and Warshall's Algorithm.

Partial ordered sets (poset), Hasse diagram, External elements of partially ordered sets

Functions, Functions for computer science, Growth of functions, Permutation functions

##### Module -II (13 hours)

Topics in Graph Theory: Directed and undirected graphs, basic terminology, paths and circuits, Eulerian paths and circuits, Hamiltonian paths and circuits, Transport Network, Graph coloring.

Trees: definition and properties, rooted trees, tree traversals— preorder, inorder, postorder, binary trees, labeled trees, spanning trees, cut sets, Graph traversals — BFS and DFS, Minimum cost spanning trees-Prim's and Kruskal's algorithm, Shortest paths in weighted graphs- Dijkstra's algorithm,.

##### Module-III (12 hours)

Algebraic Structures and Applications: Binary operations, semi-groups and groups, subgroups, cosets, Lagrange's theorem, Product and quotient semi-groups and groups, Normal subgroup, Homomorphism; coding of binary information and error detection, group codes, decoding and error correction.

Lattices, finite Boolean algebra, functions of Boolean algebra.

#### Recommended Text Books:

1. Bernard Kolman, Robert Busby, Sharon C. Ross, "Discrete Mathematical Structures", Sixth Edition, 2008, Pearson Education Inc., New Delhi. / Prentice Hall of India (PHI) Pvt. Ltd., New Delhi.

#### Reference Books:

1. Kenneth H. Rosen, "Discrete Mathematics and Its Applications", Sixth Edition, 2008, Tata McGraw-Hill (TMH) Publications Pvt. Ltd., New Delhi.
2. D. S. Malik & M. K. Sen, "Discrete Mathematical Structures", First Edition, 2005, CENGAGE Learning India Pvt. Ltd., New Delhi.
3. Judith L. Gersting, "Mathematical Structures for Computer Science: A Modern treatment to Discrete Mathematics", Fifth / Sixth Edition (Asian Student Editions), 2008, W. H. Freeman & Company, New Delhi.
4. Richard Johnsonbaugh, "Discrete Mathematics", Seventh Edition, 2008, Pearson Education Inc., New Delhi.



# MCA – 1<sup>st</sup> Year

## SEMESTER- I

(Paper-5)

### 1MCA 1005 Technical English

Full Marks: 30 (MSE) +70 (ESE) = 100 Time: 3 hrs. Pass Marks: 45

#### Instructions to question setter and examinee

This paper will be of **70 marks** and divided into three groups:

**Group A :** Multiple choice question, fill in the blanks and true false types (15 x 1= 15)

**Group B :** Concept based questions (5 questions of 4 marks each, word limits 150 words) (5 x 4 = 20).

**Group C :** Descriptive type questions (5 questions of 7 marks each, word limit 400) (5 x 7 = 35).

The questions must cover the entire syllabus with equal distribution of marks as far as practicable.

#### Details:

##### Module-I The elements of communication (6 hours)

- 1.1 The importance of communication through English at the present time
- 1.2 The process of communication & factors that influence communication :
  - a) Sender, receiver, channel, code, topic, message, context, feedback, 'noise',
  - b) Filters and barriers
- 1.3 The importance of audience and purpose
- 1.4 The information gap principle : given and new information ; information overload
- 1.5 Verbal and non-verbal communication: body language
- 1.6 Comparing general communication and business communication

##### Module-II The sounds of English (14 hours)

- 2.1 Vowels, diphthongs, consonants, consonant clusters
- 2.2 The International Phonetic Alphabet (IPA) ; phonemic transcription
- 2.3 Problem sounds
- 2.4 Syllable division and word stress
- 2.5 Sentence rhythm and weak forms
- 2.6 Contrastive stress in sentences to highlight different words
- 2.7 Intonation: falling, rising and falling-rising tunes
- 2.8 Varieties of Spoken English: Standard Indian, American and British

(Note : This unit should be taught in a simple, non-technical manner, avoiding technical terms as far as possible.)

##### Module-III Review of English grammar (10 hours )

- 3.1 Stative and dynamic verbs
- 3.2 The auxiliary system ; finite and non-finite verbs
- 3.3 Time, tense and aspect
- 3.4 Voices: active and passive
- 3.5 Modality
- 3.6 Negation
- 3.7 Interrogation ; reported and tag questions
- 3.8 Conditionals
- 3.9 Concord
- 3.10 Phrasal verbs

(Note: The teaching of grammar should be treated as a diagnostic and remedial activity and integrated with communication practice. The areas of grammar in which errors are common should receive special attention when selecting items for review. Teaching need not be confined to the topics listed above.)

#### Books recommended:

1. A course in communication skills by Dutt, Rajeevan & Prakash (Foundation Books, Cambridge)
2. Business Communication by Meenakshi Raman and Prakash Singh (Oxford)
3. Business Communication Today by Bovee et al (Pearson)

**MCA – 1<sup>st</sup> Year**  
**SEMESTER- I**  
**(Paper-6)**  
**1MCA 1001L Lab on 'C' Programming**

**Full Marks: 25 (MSE) + 50 {ESE (25E+25I)} = 75      Time: 3 hrs.      Pass Marks: 34**

**PRACTICAL**

1. Introduction to OS: Linux/Unix, DOS, and Windows.
2. vi editor basics, common commands on UNIX.
3. File handling, directory structures, file permissions, Creating and editing simple C programme, Compilation and execution.
4. C programming on variables and expressions.
5. Precedence of operators, Type casting.
6. Decision control structures— if and nested if-else.
7. Loop controls— do, while, for and case control structure.
8. Unconditional jumps— break, continue, goto.
9. Modular program development using functions.
10. Arrays and matrix operations—add, subtract, multiply.
11. Recursion
12. Pointers, address operators and pointer arithmetic.
13. Structures and Unions, Accessing their members.
14. Self-Referential Structures and Linked lists.
15. Files and file operations, standard streams.
16. Dynamic memory allocation and deallocations.
17. Different mathematical operations using <math.h>.
18. Pointers to pointers, arrays, functions, structures and unions.
19. Command line arguments, enums and preprocessors.
20. International features and Code optimization.

**MCA – 1<sup>st</sup> Year**  
**SEMESTER- I**  
**(Paper-7)**  
**1MCA 1002L Lab on Scientific Computing**

**Full Marks: 25 (MSE) + 50 {ESE (25E+25I)} = 75      Time: 3 hrs.      Pass Marks: 34**

**PRACTICAL**

Programs to be written through C- language.

# MCA – 1<sup>st</sup> Year

## SEMESTER - II

### (Paper-8)

#### 2MCA 2001 Data Structure

**Full Marks: 30 (MSE) +70 (ESE) = 100 Time: 3 hrs. Pass Marks: 45**

#### Instructions to question setter and examinee

This paper will be of **70 marks** and divided into three groups:

**Group A :** Multiple choice question, fill in the blanks and true false types (15 x 1= 15)

**Group B :** Concept based questions (5 questions of 4 marks each, word limits 150 words) (5 x 4 = 20).

**Group C :** Descriptive type questions (5 questions of 7 marks each, word limit 400) (5 x 7 = 35).

The questions must cover the entire syllabus with equal distribution of marks as far as practicable.

#### Details:

##### Module-I (15 Hours)

Algorithms, Asymptotic notations and analysis, Measuring time and space complexities, Data structure and C: Functions, storage structures for arrays, sparse matrices, strings, pattern matching, structures and arrays of structures, Abstraction Mechanisms, Abstract data type, Stacks and Queues: representation and Applications.

Linked Lists: Singly linked lists, Linked stacks and queues, Operation on polynomial, Linked dictionary, Doubly linked list, Circular linked list, Doubly circular linked lists,

##### Module-II (12 Hours)

Dynamic storage Management, Garbage collection and compaction, Hashing functions. Hash tables and collision resolution techniques.

Trees: Binary trees, Terminologies and memory representation, Binary search trees, General trees, Tree traversing, Operations on binary trees, - Expression manipulations, Threaded binary trees, Height balancing trees, Heaps, forest, File structures, Introduction to multi-way search trees, B-tree and B+-trees.

##### Module-III (10 Hours)

Graphs: Terminologies and representation, Path matrix, graph traversal,- DFS and BFS, shortest path problems, Bi-connected graphs, Topological sort.

Sorting techniques: Bubble sort, selection sort, Insertion sort, Merge sort, Quick sort, Heap sort, Radix sort, Linear search and binary search.

#### Text books:

1. Richard Gilberg, Behrouz A. Forouzan, "Data Structures: A pseudo code approach with C", Second Edition, 2007, CENGAGE India Pvt. Ltd., New Delhi.
2. G.A. V. Pai, "Data Structure and Algorithms", McGraw Hills Education India

#### Reference Books:

1. Alfred V. Aho, John E. Hopcroft & Jeffrey D. Ullman, "Data Structures and Algorithm", First Edition, 1983, Pearson Education Inc., New Delhi.
2. Ian Chai & J. White, "Structuring data and building Algorithms", McGraw Hill Education India
3. Aaron M. Tenenbaum, Yedidyah Langsam & Moshe J. Augenstein, "Data Structure Using C", 1st Edition, 1990, Prentice-Hall of India (PHI) Pvt. Ltd., / Pearson Education Inc., New Delhi.
4. Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, "Fundamentals of Data Structures in C", Second Edition, 2008, Universities Press Pvt. Ltd. Hyderabad.

# MCA – 1<sup>st</sup> Year

## SEMESTER - II

### (Paper-9)

#### 2MCA 2002 Object Oriented Programming in C++

Full Marks: 30 (MSE) +70 (ESE) = 100 Time: 3 hrs. Pass Marks: 45

#### Instructions to question setter and examinee

This paper will be of **70 marks** and divided into three groups:

**Group A :** Multiple choice question, fill in the blanks and true false types (15 x 1= 15)

**Group B :** Concept based questions (5 questions of 4 marks each, word limits 150 words) (5 x 4 = 20).

**Group C :** Descriptive type questions (5 questions of 7 marks each, word limit 400) (5 x 7 = 35).

The questions must cover the entire syllabus with equal distribution of marks as far as practicable.

#### Details:

##### Module-I (12 hrs)

Introduction to C++: C++ as multi-paradigm language, features supported by C++, syntax, data-type, const and bool qualifiers, variables, strings, operators

Control Structures, Decision and Loop Control Statements, Modular program design using functions, Top down program design with examples, parameter passing mechanisms, inline functions, recursion, Arrays and pointers, dynamic arrays, structures and unions in C++, Coding Style in C++

Object Oriented Programming in C++: Abstraction, OOP concepts, software life cycle, Abstraction Mechanisms: Procedural Abstraction and data abstraction; Classes and objects, object creation, access specifier-private, public and protected, constructors, default constructors, copy constructors, destructors, member functions, static members, references; Message communication using objects

##### Module-II (12 hrs)

Inheritance: Is-a Vs. Has-a relationships, simple inheritance—Class hierarchy, derived classes, Multiple inheritance, multileveled and hybrid inheritance, Abstract Base Classes, Composition and aggregation with example, polymorphism—compile time & run time polymorphisms, object slicing, base class initialization, virtual functions and Dynamic Binding.

Overloading: Function overloading and Operator overloading, ambiguity, Overloading Restriction, friends function, member operators, operator function, I/O operators, Automatic Conversions and Type Casts for Classes, Memory management in C++: new, delete, object copying— deep & shallow copy, this pointer.

##### Module-III (12 hrs)

Exception Handling Mechanisms: Exceptions and exception class, exception declarations, unexpected exceptions, RTTI, Calling abort(), Returning an Error Code, Exception Mechanism, Using Objects as Exceptions

Templates and Standard Template Library (STL): Generic Programming in C++, Template classes, declaration, Template functions, Template Classes and Friends, Namespaces and separate compilation; String class, Containers, Iterators, Vectors

Files in C++: Buffers, and the ostream File, redirection, streams and I/O streams classes, File Input and Output, Stream Checking and is open (), Opening Multiple Files, Command-Line Processing, File Modes

#### Recommended Texts:

1. B.A. Forouzan & R. F. Gilberg, “A structured approach using C++”, CENGAGE learning India
2. E. Balguruswamy. Object-Oriented Programming with C++, 3rd Edition, 2007, Tata McGraw-Hill (TMH) Publication Pvt. Ltd., New Delhi.

#### Reference Books:

1. David Parsons, “Object-Oriented Programming with C++”, , Pearson Education .
2. H. Schild, “A complete reference to C++”, TMH
3. Walter Savitch, “Absolute C++”, 2nd Edition, 2007, Pearson Education Inc., New Delhi.
4. Stephen Prata, ” C++ Primer plus”, Pearson Education

**MCA – 1<sup>st</sup> Year****SEMESTER - II****(Paper-10)****2MCA 2003 Operating System Architecture****Full Marks: 30 (MSE) +70 (ESE) = 100 Time: 3 hrs. Pass Marks: 45****Instructions to question setter and examinee**

This paper will be of **70 marks** and divided into three groups:

**Group A :** Multiple choice question, fill in the blanks and true false types (15 x 1= 15)

**Group B :** Concept based questions (5 questions of 4 marks each, word limits 150 words) (5 x 4 = 20).

**Group C :** Descriptive type questions (5 questions of 7 marks each, word limit 400) (5 x 7 = 35).

The questions must cover the entire syllabus with equal distribution of marks as far as practicable.

**Details:****UNIT I**

Introduction Early Operating Systems – Buffering & Spooling – Multiprogramming – Time Sharing – Protection – Operating System Structures.

Process Management: Process Concept – Hierarchy of Process – Critical Section Problem – Semaphores – Process Coordination Problems – Inter Process Communication

**UNIT II**

CPU Scheduling : Scheduling Concepts – Scheduling Algorithms – Algorithms – Algorithm Evaluation – Multiple Processor Scheduling

Deadlock: Deadlock Problem: Characterization – Prevention – Avoidance – Detection – Recovery – Combined Approach to Deadlock Handling.

**UNIT III**

Memory Management: Introduction – Multiple Partition – Paging – Segmentation – Paged Segmentation – Virtual Memory Concept – Overlays – Demand Paging and Performance – Page Replacement Algorithms – Allocation Algorithms – Trashing.

**UNIT IV**

Secondary Storage Management: Physical Characteristics – Disk Scheduling – Disk Scheduling Algorithms – Sector Queuing File Systems: File Operations – Access methods – Allocation Methods – Directory Systems – File Protection – Implementation Issues.

**UNIT V**

Case Studies: Linux and Windows 2000 Operating Systems.

**TEXT BOOKS:**

1. Silberschatz, Peter Baer Galvin & Greg Gagne, Operating System Concepts Seventh Ed., Addison – Wesley Publications.

**REFERENCES:**

1. William Stallings, Operating Systems Internals and Design Principles, PHI India, Fourth Edition, 2003.
2. H.M. Deitel, Operating Systems, Addison-Wesley, 2<sup>nd</sup> Edition.

# MCA – 1<sup>st</sup> Year

## SEMESTER - II

(Paper-11)

### 2MCA 2004 Computer System Architecture

Full Marks: 30 (MSE) +70 (ESE) = 100 Time: 3 hrs. Pass Marks: 45

#### Instructions to question setter and examinee

This paper will be of **70 marks** and divided into three groups:

**Group A :** Multiple choice question, fill in the blanks and true false types (15 x 1= 15)

**Group B :** Concept based questions (5 questions of 4 marks each, word limits 150 words) (5 x 4 = 20).

**Group C :** Descriptive type questions (5 questions of 7 marks each, word limit 400) (5 x 7 = 35).

The questions must cover the entire syllabus with equal distribution of marks as far as practicable.

#### Details:

##### Module I: (15 Hours)

Introduction: Basic architecture of computer, Functional units, Operational concepts, Bus structures, Von Neumann Concept.

Basic Processing: Instruction code, Instruction set, Instruction sequencing, Instruction cycle, Instruction format, Addressing modes, Micro instruction, Data path, Hardwired controlled unit, Micro programmed controlled unit.

Arithmetic: Design of ALU, Binary arithmetic, Addition and Subtraction of signed number, Multiplication of Positive number, Signed operand multiplication, Division, Floating point number representation and arithmetic.

##### Module II: (12 Hours)

Memory: Memory Hierarchy, RAM, ROM, Cache memory organization, Mapping techniques, Virtual memory, Mapping technique, Associative memory, Memory Interleaving, Secondary Storage, Flash drives.

##### Module III (13 Hours)

Input/Output: Accessing I/O devices, I/O mapped I/O, Programmed I/O, Memory Mapped I/O, Interrupt Driven I/O, Standard I/O interfaces, Synchronous and Asynchronous Data transfer, DMA data transfer.

Introduction to Parallel processing: Flynn's Classification, Pipelining, Array processing, vector processing

#### Text Books:

1. V. Rajaraman, and T. Radhakrishnan, "Computer Organization and Architecture", Prentice-hall of India
2. M. Murdocca, "Computer Architecture and Organization- An Integrated Approach", Willey India Pvt Ltd.

#### Reference Books:

1. William Stalling , "Computer Organization and Architecture "Pearson Education
2. J. P. Hayes "Computer Architecture and Organization" McGraw Hill Education India.
3. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, "ComputerOrganization", 5th Edition, Mc Graw-Hill Education India.
4. A.S. Tananbaum "Structured Computer Organization" Pearson Education.

**MCA – 1<sup>st</sup> Year****SEMESTER - II****(Paper-12)****2MCA 2001L Lab on Data Structure****Full Marks: 25 (MSE) + 50 {ESE (25E+25I)} = 75      Time: 3 hrs.      Pass Marks: 34****PRACTICAL****LAB ON DATA STRUCTURE**

1. Matrix Operations-Add, Multiply, Rank, Det.etc.
2. Stack & Queue operations using Arrays.
3. Self-referential structures & single linked list operations.
4. Implementing Stack and queues using linked lists.
5. Implementing Polish Notations using Stacks.
6. Circular and double linked list operations.
7. linear & binary search, bubble sort technique.
8. Insertion sort, selection sort & merge sort techniques.
9. Quick sort and counting sort techniques.
10. Radix (bucket) and address calculation sort methods.
11. Binary tree traversals (preorder, inorder, postorder).
12. Graph representation with matrix & adjacency lists etc.



# **MCA – 1<sup>st</sup> Year**

## **SEMESTER - II**

**(Paper-13)**

**2MCA 2002L Lab on C++ Programming**

**Full Marks: 25 (MSE) + 50 {ESE (25E+25I)} = 75      Time: 3 hrs.      Pass Marks: 34**

**PRACTICAL**

**LAB ON C++ Programming**

# MCA – 2<sup>nd</sup> Year

## SEMESTER - III

(Paper-14)

### 3MCA 3001 Design and Analysis of Computer Algorithms

Full Marks: 30 (MSE) +70 (ESE) = 100 Time: 3 hrs. Pass Marks: 45

#### Instructions to question setter and examinee

This paper will be of **70 marks** and divided into three groups:

**Group A** : Multiple choice question, fill in the blanks and true false types (15 x 1= 15)

**Group B** : Concept based questions (5 questions of 4 marks each, word limits 150 words) (5 x 4 = 20).

**Group C** : Descriptive type questions (5 questions of 7 marks each, word limit 400) (5 x 7 = 35).

The questions must cover the entire syllabus with equal distribution of marks as far as practicable.

#### Details:

##### UNIT I

**INTRODUCTION:** Algorithm - pseudo code for expressing algorithms – analysis - time complexity and space complexity - efficiency of algorithms - O-notation - Omega notation and Theta notation.

**DIVIDE AND CONQUER:** General method – binary search - merge sort - quick sort.

##### UNIT II

**GREEDY METHOD:** General method- Knapsack problem - job sequencing with deadlines - minimum-cost spanning trees: Prim's and Kruskal's algorithms - Single source shortest paths: Dijkstra's algorithm.

##### UNIT III

**DYNAMIC PROGRAMMING:** General method - Multistage Graphs – All pairs shortest paths, Single source shortest paths - optimal binary search trees - 0/1 Knapsack problem - Traveling sales person problem.

##### UNIT IV

**BACK TRACKING:** General method - n-queen problem - sum of subsets problem - graph colouring - Hamiltonian cycles - Knapsack problem.

##### UNIT V

**BRANCH AND BOUND:** Least Cost(LC) search, Bounding - LC branch and bound - FIFO branch and bound - Travelling sales person problem.

#### TEXT BOOKS:

1. E. Howrowitz and Sahni, *Fundamentals of computer algorithms*, Galgotia Publications, 1998.

#### REFERENCES:

1. Gilles Brassard and Paul Bratley, *Fundamentals of Algorithm*, Prentice Hall of India Pvt. Ltd. 1997.
2. Mark Allen Weiss, *Data Structures and Algorithm Analysis in C*, Addition-wesley, Third Indian Reprint, 2000.

# MCA – 2<sup>nd</sup> Year

## SEMESTER - III

(Paper-15)

### 3MCA 3002 Fundamentals of Database Management System

Full Marks: 30 (MSE) +70 (ESE) = 100 Time: 3 hrs. Pass Marks: 45

#### Instructions to question setter and examinee

This paper will be of **70 marks** and divided into three groups:

**Group A :** Multiple choice question, fill in the blanks and true false types (15 x 1= 15)

**Group B :** Concept based questions (5 questions of 4 marks each, word limits 150 words) (5 x 4 = 20).

**Group C :** Descriptive type questions (5 questions of 7 marks each, word limit 400) (5 x 7 = 35).

The questions must cover the entire syllabus with equal distribution of marks as far as practicable.

#### Details:

##### SECTION-I

Overview of DBMS, Basic DBMS terminology, data independence. Architecture of a DBMS, Distributed databases, structure of distributed databases, design of distributed databases.

Introduction to data models: entity relationship model, hierarchical model: from network to hierarchical, relational model, object oriented database, object relational database, comparison of OOD & ORD, comparison of network, hierarchical and relational models.

##### SECTION-II

Relational model: storage organizations for relations, relational algebra, relational calculus, functional dependencies, multivalued dependencies, and normalization.

##### SECTION-III

Relational query language: SQL, database integrity, security, concurrency, recovery, client/server architecture, and technical introduction to oracle

##### SECTION-IV

Degree Of Data Abstraction, The Database Life Cycle (DBLC): Initial Study Of The Database, Database Design, Implementation And Loading, Testing And Evaluation, Operation, Maintain Ace And Evaluation.

Centralized Verses Decentralized Design, What Is A Transaction? Concurrency Control (Locking Methods, Time Stamping Method, Optimistic Method) DDBMS Distributed Database Management Systems) Advantage and Disadvantages.

Homogeneous and Heterogeneous DBMS,

##### SECTION-V

Distributed Database Transparency Features. Level Of Data And Process Distribution:

SPSD (Single-Site Processing, Single-Site Data), MPSD (Multiple-Site Processing, Single Site Data), MPMD (Multiple -Site Processing, Multiple-Site Data)

Systems, Client / Server: Architecture and Implementation Issues.

Client / Server Systems, What Is Client / Server? The Forces That Drive Client /Server

##### SECTION-VI

(DSS) Decision Support Systems: Operational Data Vs. Decision Support Data, The DSS Database Requirements. The Data Warehouse: The Evaluation Of The Data Warehouse, Rules For Data Warehouse. Online Analytical Processing (OLAP):

OLAP Architecture Relational, OLAP And Comparison, Data Mining.

#### TEXT BOOKS:

1. Fundamental of Database Systems – Elmasri Navathe-Pearson Education Asia
2. Database – Principles, Programming and Performance – Parick O’ Neil Elizabeth O’ Niel, Harcourt Asia PTE Limited.

#### REFERENCES BOOKS:

1. An Introduction to Database Systems – C.J. Date, Addison Wesley, Pearson Education Press
2. Database System Concepts- Abraham Silberschat, Henry F. Korth, S. Sudarshan, Tata McGraw Hill.

#### Books Recommended:

1. DBMS – Korth
2. DBMS – C.J. Date
3. Oracle – E. Byross
4. DBMS – Mazumdar

## MCA – 2<sup>nd</sup> Year

### SEMESTER - III

(Paper-16)

**3MCA 3003 Formal Languages & Automata Theory**

**Full Marks: 30 (MSE) +70 (ESE) = 100 Time: 3 hrs. Pass Marks: 45**

#### Instructions to question setter and examinee

This paper will be of **70 marks** and divided into three groups:

**Group A** : Multiple choice question, fill in the blanks and true false types (15 x 1= 15)

**Group B** : Concept based questions (5 questions of 4 marks each, word limits 150 words) (5 x 4 = 20).

**Group C** : Descriptive type questions (5 questions of 7 marks each, word limit 400) (5 x 7 = 35).

The questions must cover the entire syllabus with equal distribution of marks as far as practicable.

#### Details:

**Mathematical Preliminaries:** Sets, Relations, Functions, Graph and Trees, Strings and their properties  
Principle of Induction

**Theory of Automata:** Definition, Description of Finite Automaton, Transition Systems, Properties of Transition Functions, Acceptability of a string by a Finite Automaton, Nondeterministic Finite State Machines.

**Formal Languages:** Basic Definition and examples, Chomsky Classification of Languages, Languages and their Relations, Operations on Languages, Languages and Automata.

**Regular Sets and Regular Grammars:** Regular Expressions, Finite Automata and Regular Expressions, Pumping Lemma for Regular Sets, Application for Pumping Lemma, Closure Properties of Regular Sets, Regular Sets and Regular Grammars.

**Context-free Languages:** Context-free Languages and Derivation Trees, Ambiguity in context-free Grammars, Simplification of Context-free Grammar, Normal Forms for Context-free Grammars.

**Pushdown Automata:** Basic Definitions, Acceptance by pda, Pushdown Automata and Context-free Languages, Parsing and Pushdown Automata.

**Turning Machines and Linear Bounded Automata:** Turning Machine Model, Representation of Turning Machines, Language Acceptability by Turning Machines, Design of Turning Machines.

**Proportions and Predicates:** Proportions (Or statements), Normal Forms of Well-formed Formulas, Rules of Inference for Propositional Calculus (Statement Calculus), Predicate Calculus, Rules of Inference for Predicate Calculus.

#### Text Book:

Theory of Computer Science-K.L.P. Mishra - PHI Publication.

**MCA – 2<sup>nd</sup> Year****SEMESTER - III****(Paper-17)****3MCA 3004 Java Programming****Full Marks: 20 (MSE) +80 (ESE) = 100 Time: 3 hrs. Pass Marks: 45****Instructions to question setter and examinee****Full Marks: 30 (MSE) +70 (ESE) = 100 Time: 3 hrs. Pass Marks: 45****Instructions to question setter and examinee**This paper will be of **70 marks** and divided into three groups:**Group A :** Multiple choice question, fill in the blanks and true false types (15 x 1= 15)**Group B :** Concept based questions (5 questions of 4 marks each, word limits 150 words) (5 x 4 = 20).**Group C :** Descriptive type questions (5 questions of 7 marks each, word limit 400) (5 x 7 = 35).

The questions must cover the entire syllabus with equal distribution of marks as far as practicable.

**Details:****SECTION -I**

**FUNDAMENTALS OF OBJECT-ORIENTED PROGRAMMING :-** Introduction; Object-Oriented Paradigm; Basic Concepts of Object-Oriented Programming, Objects and Classes, Data abstraction and encapsulation, Inheritance, Polymorphism etc.; **JAVA EVOLUTION :-** Java History; Java Features (Compiled and interpreted, Platform-independent and portable, Object-oriented, Robust and secure, Distributed, Simple, small and familiar, Multithreaded and interactive, High performance, Dynamic and extensible); How Java Differs from C and C++ (Java and C, Java and C++); Java and Internet, Java and World Wide Web, Web Browsers (Hot Java, Netscape Navigator, Internet Explorer); Hardware and Software Requirements; Java Support Systems, Java Environment (Java development kit, Java standard library). **JAVA CLASSES :** Types of Classes, Scope rules, Access modifiers, Instantiating Objects of a class, Calling methods, Packages & Interfaces, The String class, Java control statements, Operators, Arrays & Vectors.

**SECTION -II****PROGRAMMING IN JAVA:** Java Applications, Applets & Servlets**JAVA APPLETS:** Life Cycle of Applet, Creating Applets, Adding Applet to HTML File; Running the Applet, Passing Parameters to an Applet, Drawing Images on the applet.**JAVA SWING:** Introduction to Swing, Swing features, Swing Components, Working with Swing, Swing basic Containers, Buttons, User Interface Components (Buttons, Text Fields, Text Areas, Check Boxes, Radio Buttons, JApplet etc.), Layouts & Layout Managers, Using Dialogs, JOptionPane class, Input Dialog Boxes, Timers & sliders, Progress Bars, Tables.**EVENT HANDLING:** Event delegation Approach, ActionListener, Adjustment Listener, Mouse Listener and Mouse Motion Listener, Window Listener, Key Listener, Change Listener, Caret Listener.**MANAGING ERRORS AND EXCEPTIONS :-** Introduction; Types of Errors (Compile-time error, Run-time error); Exceptions; Syntax of Exception Handling Code; Multiple Catch Statements; Using finally Statement; Creating User defined Exceptions**JAVA I/O HANDLING:** I/O File Handling (Input Stream & Output Streams, FileInputStream & FileOutputStream, Data I/P and O/P Streams, Buffered I/P and O/P Streams, File Class, Reader and Writer Streams, Random Access File).**SECTION -III****MULTITHREADING :** Overview of Multithreading, The Thread control methods, Thread life cycle, Newly created threads, Main thread, Creating a Thread (Implementing Runnable Interface, Extending the Thread Class), Thread Synchronization, Writing Applets with Threads.**SOCKET PROGRAMMING:** Introduction, TCP/IP Protocol, UDP Protocol, Ports, Using TCP/IP Sockets, Using UDP Sockets.**JAVA DATABASE CONNECTIVITY (JDBC) :** JDBC/ODBC bridge, Driver Manager Class, Java.SQL Package (Connection Interface, Statement Interface, Prepared Statement Interface, Result Set Interface, Result Set Meta Data Interface), SQL Exception class.**JAVA SERVLETS:** Introduction to Server Side Technologies, Servlet Life cycle, Http Servlets, Generic Servlets, init (), service (), do Get (), do Post (), destroy () , Servlets & JDBC.

# MCA – 2<sup>nd</sup> Year

## SEMESTER - III

(Paper-18)

### 3MCA 3005 Fundamentals of Computer Networks

Full Marks: 20 (MSE) +80 (ESE) = 100 Time: 3 hrs. Pass Marks: 45

#### Instructions to question setter and examinee

Full Marks: 30 (MSE) +70 (ESE) = 100 Time: 3 hrs. Pass Marks: 45

#### Instructions to question setter and examinee

This paper will be of **70 marks** and divided into three groups:

**Group A** : Multiple choice question, fill in the blanks and true false types (15 x 1= 15)

**Group B** : Concept based questions (5 questions of 4 marks each, word limits 150 words) (5 x 4 = 20).

**Group C** : Descriptive type questions (5 questions of 7 marks each, word limit 400) (5 x 7 = 35).

The questions must cover the entire syllabus with equal distribution of marks as far as practicable.

#### Details:

##### UNIT I

**Introduction:** Inter Networking concept – Application level – Network level Interconnection – Internet Architecture – Inter Connection through IP Routers, Internet Addresses – Mapping Internet addresses to Physical addresses (ARP) – Determining an Internet address at startup (RARP).

##### UNIT II

**Internet Protocol:** Datagram delivery – Routing IP datagrams, error and control messages (ICMP) – classless and subnet addresses extensions – User Datagram Protocol (UDP).

##### UNIT III

**Routing Protocols:** Routing cores – peers – routing algorithms – Autonomous Systems – Exterior Gateway Protocol – Internet Multicasting – Multicast Routing Protocols – Internet Group Management Protocol (IGMP).

##### UNIT IV

**TCP/IP over ATM:** ATM hardware – ATM cell transport – Adaptation Layer – IP address binding in ATM network – Logical IP subnet – ATMARP. **Socket Interface:** Unix I/O – networks I/O – creating sockets – connecting sockets – obtaining information about hosts, networks, protocols, services.

##### UNIT V

**Application Protocols:** Domain Name System – File transfer & access (FTP, TFTP, NFS) – electronic mail (SMTP, MIME) – Network management (SNMP) – Internet security.

#### TEXT BOOK:

Douglas E. Comer, “*Internetworking with TCP/IP Principles, Protocols and Architectures*”, Prentice Hall of India Private Limited, (4<sup>th</sup> Edition), 2002.

#### REFERENCES:

1. Behrouz A Forouzan, “*TCP/IP Protocol Suite*”, Tata McGraw Hill, 2000

# MCA – 2<sup>nd</sup> Year

## SEMESTER - III

(Paper-19)

### 3MCA 3001L Lab on Database Management System

Full Marks: 25 (MSE) + 50 {ESE (25E+25I)} = 75      Time: 3 hrs.      Pass Marks: 34

## PRACTICAL

### LAB ON DATABASE MANAGEMENT SYSTEM

1. Installation of Oracle or My SQL.
2. Learning basic DDL and DML commands
3. Learning basic DCL and TCL commands.
4. Insertion, Deletion, Updating to a table using SQL commands
5. Working with dual table.
6. Data retrieval using Select & where clause.
7. Oracle inbuilt functions-Date, aggregate, group by etc.
8. Use of Joins and Sub queries.
9. Views, sequences and indexes.
10. Managing users, privileges and roles.
11. PL/SQL-Data types, control structures.
12. Creating procedures with PL/ SQL.
13. Error handling in PL/ SQL.
14. Cursor Management in PL/ SQL.
15. Sub program design in PL/ SQL.
16. Writing Program segments in embedded SQL using C/C++.
17. Writing Programs on Packages & triggers.
18. Implementing OO features in Oracle.
19. Report generation using SQL.
20. Database backup & Recovery Management.

**MCA – 2<sup>nd</sup> Year****SEMESTER - III****(Paper-20)****3MCA 3002L Lab on Java Programming****Full Marks: 25 (MSE) + 50 {ESE (25E+25I)} = 75      Time: 3 hrs.      Pass Marks: 45****Topic**

1. Introduction, Compiling & executing a java program.
2. Program with data types & variables.
3. Program with decision control structures: if, nested if etc.
4. Program with loop control structures: do, while, for etc.
5. Program with classes and objects.
6. Implementing data abstraction & data hiding.
7. Implementing inheritance.
8. Implementing and polymorphism.
9. Implementing packages.
10. Implementing generics.
11. Program with modern features of java.
12. Implementing interfaces and inner classes
13. Implementing wrapper classes
14. Implementing generics.
15. Implementing cloning.
16. Implementing Reflections
17. Working with files.
18. Implementing a Lexical Analyzer
19. Implementing a parser
20. Implementing a code generator



# MCA – 2<sup>nd</sup> Year

## SEMESTER - IV

(Paper-21)

4MCA 4001 Principles of Software Engineering

Full Marks: 30 (MSE) +70 (ESE) = 100 Time: 3 hrs. Pass Marks: 45

### Instructions to question setter and examinee

This paper will be of **70 marks** and divided into three groups:

**Group A** : Multiple choice question, fill in the blanks and true false types (15 x 1= 15)

**Group B** : Concept based questions (5 questions of 4 marks each, word limits 150 words) (5 x 4 = 20).

**Group C** : Descriptive type questions (5 questions of 7 marks each, word limit 400) (5 x 7 = 35).

The questions must cover the entire syllabus with equal distribution of marks as far as practicable.

### Details:

#### UNIT I

**THE PRODUCT:** The evolving role of software – Software.

**THE PROCESS:** Software Engineering: A Layered Technology – The software process – Software process models – Linear sequential model - Prototyping model – RAD model – Evolutionary software process models – Component based development – Formal methods model – Fourth generation techniques.

#### UNIT II

**SOFTWARE PROJECT PLANNING:** Observation on estimating – Software scope – resources – Software project estimation – Decomposition techniques – Empirical estimation models – Make buy decision.

**PROJECT SCHEDULING AND TRACKING:** Basic Concepts – Relationship between people and effort – Scheduling – Earned value analysis.

#### UNIT III

**SYSTEM ENGINEERING:** Computer based systems – The system engineering hierarchy – Business process engineering: overview – Product engineering: overview – Requirement engineering – System modeling.

**ANALYSIS CONCEPTS AND PRINCIPLES:** Requirement Analysis – Requirement elicitation for software – Analysis principles – Software prototyping – Specification.

**ANALYSIS MODELING:** The elements of the Analysis model – Data Modeling – Functional modeling and information flow – Behavioral modeling – The mechanics of structured analysis – Data Dictionary.

#### UNIT IV

**DESIGN CONCEPTS AND PRINCIPLES:** Software design and software engineering – The design process – Design principles – Design concepts – Effective modular design – Design heuristics for effective modularity – Design Model – Design Documentation.

**ARCHITECTURAL DESIGN:** software Architecture – Data design – Architectural styles – Mapping requirements into software architecture – Transform mapping – Transactional mapping – Refining architectural design.

**USER INTERFACE DESIGN:** The Golden rules – User interface design – Task analysis and modeling – Interface design activities – Implementation tools – Design evaluation.

#### UNIT V

**SOFTWARE TESTING TECHNIQUES:** Software testing fundamentals – Test case design – white box testing basis path testing – Control structure testing – Black box testing – Testing for specialized environments, architectures and applications

**SOFTWARE TESTING STRATEGIES:** A strategic approach to software engineering – Strategic issues – unit testing – Integration Testing – Validation testing – System testing – The Art of debugging.

### TEXT BOOK

1. Roger S. Pressman, “Software Engineering. A Practitioners Approach”, Fifth Edition, 2001

### REFERENCES

1. C. Ghezzi, M. Jazayeri and D. Mandrioli, “Fundamentals of Software Engineering”, Prentice Hall of India Private Limited 1991.
2. Richard Farley, “Software Engineering Concepts”, Tata McGraw Hill, 1988

# MCA – 2<sup>nd</sup> Year

## SEMESTER - IV

(Paper-22)

**4MCA 4002 Network Security & Cryptography**

**Full Marks: 30 (MSE) +70 (ESE) = 100 Time: 3 hrs. Pass Marks: 45**

### Instructions to question setter and examinee

This paper will be of **70 marks** and divided into three groups:

**Group A :** Multiple choice question, fill in the blanks and true false types (15 x 1= 15)

**Group B :** Concept based questions (5 questions of 4 marks each, word limits 150 words) (5 x 4 = 20).

**Group C :** Descriptive type questions (5 questions of 7 marks each, word limit 400) (5 x 7 = 35).

The questions must cover the entire syllabus with equal distribution of marks as far as practicable.

### Details:

#### UNIT I

Symmetric Ciphers – Classical Encryption Techniques – Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Steganography – Block Ciphers and the Data Encryption Standard – Simplified Data Encryption Standard, Block Cipher Principles, The Data Encryption Standard, Strength of Data Encryption Standard, Differential and Linear Cryptanalysis, Block Cipher Design Principles, Block Cipher Modes of Operation.

#### UNIT II

Advanced Encryption Standard – Evaluation Criteria for Advanced Encryption Standard, The Advanced Encryption Standard Cipher – Substitute Byte Transformation – Contemporary Symmetric Ciphers – Triple Data Encryption Standard, Blowfish, RC5, Characteristics of Advanced Symmetric Block Ciphers – Confidentiality using Symmetric Encryption – Key Distribution.

#### UNIT III

Public Key Cryptography and RSA – Principles – RSA Algorithm, Key Management and other Public Key Cryptosystems – Key Management, Diffie-Hellman Key Exchange, Elliptic Curve Cryptography, Manage Authentication and Hash Functions – Authentication Requirements, Authentication Functions, Manage Authentication Codes.

#### UNIT IV

Digital Signatures and Authentication Protocols – Digital Signatures, Authentication Protocols, Digital Signature Standard.

#### UNIT V

Network Security Practice – Authentication Applications – Kerberos, X.509 Authentication Service – Electronic Mail Security – PGP, Secured MIME, IP Security – Overview, IP Security Architecture, Authentication Header, Encapsulation Security Payload.

#### TEXT BOOK:

William Stallings, “CRYPTOGRAPHY & NETWORK SECURITY - Principles and Practices”, Third Edition, Pearson Education.

# MCA – 2<sup>nd</sup> Year

## SEMESTER - IV

(Paper-23)

4MCA 4003 Multimedia & Animation

Full Marks: 30 (MSE) +70 (ESE) = 100 Time: 3 hrs. Pass Marks: 45

### Instructions to question setter and examinee

This paper will be of **70 marks** and divided into three groups:

**Group A** : Multiple choice question, fill in the blanks and true false types (15 x 1= 15)

**Group B** : Concept based questions (5 questions of 4 marks each, word limits 150 words) (5 x 4 = 20).

**Group C** : Descriptive type questions (5 questions of 7 marks each, word limit 400) (5 x 7 = 35).

The questions must cover the entire syllabus with equal distribution of marks as far as practicable.

### Details:

#### UNIT I

**Introduction:** Multimedia elements – multimedia applications – System architecture – evolving technologies – defining objects – data interface standards – need for data compression – multimedia databases

#### UNIT II

**Multimedia data compression:** Types of compression – Binary image compression – color, gray scale and still video image compression – video image compression – audio compression – fractal compression. Data and file formats: RTF – TIFF – RIFF, MIDI, JPEG, AVI video file formats, MPEG standards.

#### UNIT III

**Multimedia I/O technologies:** Pen input – Video and Image display systems – Print output technologies image scanners – digital voice and audio – digital camera – Video images and animation – full motion video. Multimedia storage and retrieval technologies: magnetic media technology – optical media – hierarchical storage management – cache management for storage systems.

#### UNIT IV

**Multimedia application design:** Types of Multimedia systems – Virtual reality design – components of multimedia systems – organizing multimedia databases – application work flow design issues. Multimedia authoring systems: Hypermedia application design considerations – user interface design – information access – object display / playback issues.

#### UNIT V

**Distributed Multimedia Systems:** Components – Distributed Client-Server operation – multimedia object servers – Multi-Server network topologies – Distributed multimedia databases – Managing distributed objects.

### TEXT BOOKS:

Prabhat K. Andleigh, Kiran Thakrar, “*Multimedia Systems Design*”, PHI 2002.

### REFERENCES:

1. Tay Vaughan, “*Multimedia making it works*” Fifth Edition, TMH, 2001.
2. Jeffery Jefcoat, “*Multimedia Systems and Application*”, TMH.
3. Fred Halsall, “*Multimedia Communication Application Networks, Protocols and Standards*”, Addison Wesley, 2001.

**MCA – 2<sup>nd</sup> Year****SEMESTER - IV****(Paper-24)****4MCA 4004 Enterprises Resource Planning****Full Marks: 30 (MSE) +70 (ESE) = 100 Time: 3 hrs. Pass Marks: 45****Instructions to question setter and examinee**

This paper will be of **70 marks** and divided into three groups:

**Group A** : Multiple choice question, fill in the blanks and true false types (15 x 1= 15)

**Group B** : Concept based questions (5 questions of 4 marks each, word limits 150 words) (5 x 4 = 20).

**Group C** : Descriptive type questions (5 questions of 7 marks each, word limit 400) (5 x 7 = 35).

The questions must cover the entire syllabus with equal distribution of marks as far as practicable.

**Details:****UNIT I**

Integrated Management Information Seamless Integration-Supply Chain Management- Integrated Data Model- Benefits Of ERP-Business Engineering And ERP- Definition Of Business Engineering- Principles of business engineering- Business engineering with information technology.

**UNIT II**

Building The Business model - ERP implementation – an Overview – Role of Consultant, Vendors and Users, Customization- Precautions- ERP Post implementation options- ERP Implementation Technology – Guidelines for ERP Implementation.

**UNIT III**

ERP domain- MPG/PRO – IFS/Avalon- Industrial and financial systems- Baan IV SAP – Market Dynamics and dynamic strategy.

**UNIT IV**

Description – Multi- client server solution- Open technology- User Interface-Application Integration.

**UNIT V**

Basic architectural Concepts- The system control interfaces- Services-Presentation interface – Database Interface.

**TEXT BOOK:**

Vinod Kumar Garg and N.K.Venkita Krishnan, '*Enterprise Resource Planning- Concepts and Practice*', PHI, 1998.

**REFERENCES:**

Jose Antonio Fernandez, '*The SAP R/3 Handbook*', Tata McGraw Hill Publications,1998.

# MCA – 2<sup>nd</sup> Year

## SEMESTER - IV

(Paper-25)

4MCA 4005 Computerized Financial Accounting

Full Marks: 30 (MSE) +70 (ESE) = 100 Time: 3 hrs. Pass Marks: 45

### Instructions to question setter and examinee

This paper will be of **70 marks** and divided into three groups:

**Group A :** Multiple choice question, fill in the blanks and true false types (15 x 1= 15)

**Group B :** Concept based questions (5 questions of 4 marks each, word limits 150 words) (5 x 4 = 20).

**Group C :** Descriptive type questions (5 questions of 7 marks each, word limit 400) (5 x 7 = 35).

The questions must cover the entire syllabus with equal distribution of marks as far as practicable.

### Details:

#### UNIT I

**Accounting:** Principles, Concepts, Conventions, Double entry system of accounting, Introduction to basic books of accounts, Sole proprietary concern, Control accounts for debtors and creditors, closing of books of accounts and preparation of Trial balance.

**Final Accounts:** Trading and profit and loss account, Balance sheet of sole proprietary concern with normal closing entries.

**Depreciation:** Meaning.

#### UNIT II

**Financial Management:** Scope – functions – jobs of financial managers.

**Ratio Analysis:** Meaning - Advantages – Limitations – Types of ratio and their applicability.

#### UNIT III

**Fund flow Statement:** Meaning of the term fund – flow of fund – working capital cycle – preparation and interpretation of fund flow statement – Cash flow statement.

**Costing Nature –Importance** – Basic principles.

#### UNIT IV

**Budget and budgetary Control:** Nature and scope – Importance – types of budgets – methods of finalization of flexible budget.

**Marginal Costing:** Natures, scope and Importance- Break Even - Analysis, Uses and its Limitations.

#### UNIT V

**Standard Costing:** Nature and scope – Computation and analysis of variances with reference to material cost – Labor cost – Overhead cost – Interpretation of the variances.

### TEXT BOOKS

1. Jain and Narang, “Financial Accounting”, Sultan and Chand Co.
2. R.L. Gupta and V.K. Gupta, “Introduction to Financial Accounting”, Sultan and Chand Co.
3. S.N. Maheswari, “Principles of Management Accounting”, Sultan and Chand Co.
4. S.P. Jain and Narang, “Advanced Cost Accounting”, Kalyani Publishers, Delhi.
5. S.P. Iyengar, “Cost and Management Accounting”, Sultan and Chand Co.
6. S.C. Kuchhal, Financial Management, Chaitnaya Publishing House, Allahabad.

**MCA – 2<sup>nd</sup> Year****SEMESTER - IV****(Paper-26)****4MCA 4001L Lab on Software Engineering****Full Marks: 25 (MSE) + 50 {ESE (25E+25I)} = 75      Time: 3 hrs.      Pass Marks: 34****PRACTICAL****LAB ON SOFTWARE ENGINEERING (using any case tool)**

1. Introduction to the UML (diagram types, usage)
2. Requirement engineering by Use Cases
3. Lab: Modeling system requirements
4. Detailing use cases: scenarios
5. Lab: Activity diagrams
6. System analysis and dynamic behavior
7. Modeling static structures: Analysis classes of RUP
8. Lab: Class diagrams
9. Capturing dynamic behavior: state charts and sequence diagrams
10. Lab: dynamic UML diagrams
11. Testing basics, Unit testing
12. Requirements based testing, Object-oriented test strategies

# **MCA – 2<sup>nd</sup> Year**

## **SEMESTER - IV**

**(Paper-26)**

**4MCA 4002L Lab on Multimedia & Animation**

**Full Marks: 25 (MSE) + 50 {ESE (25E+25I)} = 75      Time: 3 hrs.      Pass Marks: 34**

### **PRACTICAL**

#### **LAB ON MULTIMEDIA & ANIMATION**

Creating and experimenting with computer graphics.

# MCA – 3<sup>rd</sup> Year

## SEMESTER - V

(Paper-28)

**5MCA 5001 Data Mining & Data Warehousing**

**Full Marks: 30 (MSE) +70 (ESE) = 100 Time: 3 hrs. Pass Marks: 45**

### Instructions to question setter and examinee

This paper will be of **70 marks** and divided into three groups:

**Group A :** Multiple choice question, fill in the blanks and true false types (15 x 1= 15)

**Group B :** Concept based questions (5 questions of 4 marks each, word limits 150 words) (5 x 4 = 20).

**Group C :** Descriptive type questions (5 questions of 7 marks each, word limit 400) (5 x 7 = 35).

The questions must cover the entire syllabus with equal distribution of marks as far as practicable.

### Details:

#### UNIT I

Evolution of database technology – Introduction to data warehousing and data mining - Differences between operational databases and data warehouses.

#### UNIT II

Data warehouse architecture & design, Hardware & Operational design, Tuning and testing.

#### UNIT III

Data mining: Data preprocessing, data mining primitives, languages & system architectures, concept description: characterization and comparison, Mining association rules, classification and prediction.

#### UNIT IV

Cluster analysis, Applications and trends in data mining.

#### UNIT V

Introduction to Microsoft's OLE DB for Data mining, D.B. Miner.

### TEXTBOOKS:

1. Sam Anahory and Dennis Murray, "Data Warehousing in the real world", Addison Wesley 1997.
2. Jiawei Han et, al., "Data Mining: Concepts and Techniques", Morgan Kaufmaan series , 2000.

### REFERENCES:

1. Usama M. Fayyad, Gregory Piatetsky - Shapiro, Padhrai Smyth and Ramasamy Uthurusamy, "Advances in Knowledge Discovery and Data Mining", The M.I.T Press, 1996.
2. Ralph Kimball, "The Data Warehouse Life Cycle Toolkit", John Wiley & Sons Inc., 1998.
3. Sean Kelly, "Data Warehousing in Action", John Wiley & Sons Inc., 1997



# MCA – 3<sup>rd</sup> Year

## SEMESTER - V

(Paper-29)

5MCA 5002 Artificial Intelligence & Expert Systems

Full Marks: 30 (MSE) +70 (ESE) = 100 Time: 3 hrs. Pass Marks: 45

### Instructions to question setter and examinee

This paper will be of **70 marks** and divided into three groups:

**Group A** : Multiple choice question, fill in the blanks and true false types (15 x 1= 15)

**Group B** : Concept based questions (5 questions of 4 marks each, word limits 150 words) (5 x 4 = 20).

**Group C** : Descriptive type questions (5 questions of 7 marks each, word limit 400) (5 x 7 = 35).

The questions must cover the entire syllabus with equal distribution of marks as far as practicable.

### Details:

#### UNIT I

Problem solving and AI, Puzzles and Games, Problem States and Operators, Heuristic programming, state space representations, state descriptions, graph notations, non-deterministic programs.

#### UNIT II

State space search methods, breadth first and depth first search, heuristic, admissibility, optimality of algorithms, performance measures, problem reduction representations, AND/OR graphs and higher level state space.

#### UNIT III

Problem reduction search methods, cost of solution trees ordered search, alpha beta and minimum procedure, theorem proving in predicate calculus, syntax, semantics,

**Herbrand universe:** variables, qualifiers, unification, resolvents.

#### UNIT IV

Predicate calculus in problem solving, answer extraction process, resolution, automatic program writing, predicate calculus, proof finding methods.

#### UNIT V

**Expert Systems:** Expert systems and conventional programs, expert system organization, **Knowledge Engineering:** knowledge representation techniques, knowledge acquisition, acquiring knowledge from experts, automating knowledge acquisition. Building an expert system: Architecture of an expert system, ask in building an expert system, difficulties in developing an expert system.

### TEXT BOOKS:

1. E. Charnail, C. K. Reiesbeck and D. V. Mcdermett, "Artificial Intelligence Programming", Lawrence Erlbaum Associates, N.J., 1980.
2. N. J. Nilson, "Principles of Artificial Intelligence", Tiega Press, Polo Alto, 1980.
3. Elain Rich and Kevin Knight, "Artificial Intelligence", McGraw Hill, 1991.
4. Donald A. Waterman, "A Guide to Expert Systems", Tech knowledge Series in Knowledge Engineering, 1986.

# MCA – 3<sup>rd</sup> Year

## SEMESTER - V

(Paper-30)

### 5MCA 5003 Website Designing & Management

Full Marks: 30 (MSE) +70 (ESE) = 100 Time: 3 hrs. Pass Marks: 45

#### Instructions to question setter and examinee

This paper will be of **70 marks** and divided into three groups:

**Group A** : Multiple choice question, fill in the blanks and true false types (15 x 1= 15)

**Group B** : Concept based questions (5 questions of 4 marks each, word limits 150 words) (5 x 4 = 20).

**Group C** : Descriptive type questions (5 questions of 7 marks each, word limit 400) (5 x 7 = 35).

The questions must cover the entire syllabus with equal distribution of marks as far as practicable.

#### Details:

##### UNIT I

Networks , protocols, TCP/IP protocol suites, brief history of Internet, Internet Address, ports, sockets, Name Resolution, firewalls, protocol tunneling , proxy servers and Internet standards. WEB BASICS: history of web, Inside URL's web browsers, web servers, resources of Internet, H/W and S/W requirement of Internet.

##### UNIT II

**HTML**: Anatomy of HTML document, text basics, rules, images and multimedia, document layout and webs, formatted lists, cascading style sheets, forms, tables, frames and executable content. **DHTML** : Adding animation, multiplying the media, adding Interactivity (dragging and dropping ) , working with data and dialog boxes, working with text, understanding browser object models, working with VB script and java script, embedding Active-X controls in web document.

##### UNIT III

**Introduction to CGI - Perl**: Introduction to CGI, Perl data structures, control structures, pattern matching and regular expressions, I/P and O/P in Perl, report formatting in perl, perl built –in functions, custom functions, references and anonymous data structures, object oriented programming in perl, advanced data manipulation, database programming with perl, perl-CGI programming, web programming with perl script.

##### UNIT IV

**SERVELETS**: Retrieving information, sending HTML information's, sending multimedia content, session tracking, security, database connectivity, Applet servlet communication, Interservlet communication. **ASP** : Basics- variables, ASP control structures, object – properties, methods and events- request and response objects, Application, session, cookies and error handling objects. Scripting objects, ASP components, Data store Access, using Record sets and building script components for ASP.

##### UNIT V

**XML**: Anatomy of an XML Document, markup elements and attributes, creating valid documents, developing advanced DTD's XML objects, checking validity, creating XML links, advanced addressing, viewing XML in browsers , processing , event-driven programming , programming with DOM, metadata, styling XML with css.

#### TEXT BOOKS:

1. Chris Ullman, ' Beginning ASP 3.0', Wrox Press Ltd, 2001.
2. Chuckmusiano and Bill Kenndy, 'HTML The Definite Guide', O' Reilly publications, 2000.
3. Jason Hunter with William Crawford, 'Java Servlet programming, O' Reilly publications, 2000.
4. Joseph schmuller, 'Dynamic HTML', BPB publications, 2000.
5. Micheal Mcmillan, 'Perl from the ground up', Tata Mcgraw Hill Edition, 1999.

**MCA – 3<sup>rd</sup> Year****SEMESTER - V****(Paper-31)****5MCA 5004 E - Commerce****Full Marks: 30 (MSE) +70 (ESE) = 100 Time: 3 hrs. Pass Marks: 45****Instructions to question setter and examinee**

This paper will be of **70 marks** and divided into three groups:

**Group A :** Multiple choice question, fill in the blanks and true false types (15 x 1= 15)

**Group B :** Concept based questions (5 questions of 4 marks each, word limits 150 words) (5 x 4 = 20).

**Group C :** Descriptive type questions (5 questions of 7 marks each, word limit 400) (5 x 7 = 35).

The questions must cover the entire syllabus with equal distribution of marks as far as practicable.

**Details:****UNIT I**

Electronic Commerce Environment and Opportunities: Background – The Electronic Commerce Environment – Electronic Marketplace Technologies – Modes of Electronic Commerce: Overview – Electronic Data Interchange – Migration to Open EDI – Electronic Commerce with WWW / Internet – Commerce Net Advocacy – Web Commerce going forward

**UNIT II**

Approaches to safe Electronic Commerce: Overview – Secure Transport Protocols – Secure Transactions – Secure Electronic Payment Protocol(SEPP) – Secure Electronic Transaction (SET )- Certificates for Authentication – Security on Web Servers and Enterprise Networks – Electronic cash and Electronic payment schemes: Internet Monetary payment and security requirements – payment and purchase order process - Online Electronic cash

**UNIT III**

Internet/Intranet Security issues and solutions: The need for Computer Security – Specific Intruder Approaches – Security strategies – Security tools – Encryption – Enterprise Networking and Access to the Internet – Antivirus programs – Security Teams.

**UNIT IV**

MasterCard / Visa secure Electronic Transaction: Introduction – Business Requirements – Concepts – Payment processing – E-mail and secure e-mail technologies for electronic commerce:Introduction – The Mean of Distribution – A model for message handling – How does e-mail work? MIME: Multipurpose Internet Mail Extensions – S/MIME: Secure Multipurpose Internet Mail Extensions – MOSS: Message Object Security Services

**UNIT V**

Internet and Web site establishment: Introduction – Technologies for web servers – Internet tools relevant to Commerce – Internet Applications for Commerce – Internet charges – Internet Access and Architecture – Searching the Internet

**TEXT BOOKS:**

1. Daniel Minoli & Emma Minoli, “Web Commerce Technology Handbook”, Tata McGraw Hill, 1999.
2. K. Bajaj & D. Nag, “E-Commerce”, Tata McGraw Hill, 1999.

# MCA – 3<sup>rd</sup> Year

## SEMESTER - V

(Paper-32)

### 5MCA 5005 Principles of Management

Full Marks: 30 (MSE) +70 (ESE) = 100 Time: 3 hrs. Pass Marks: 45

#### Instructions to question setter and examinee

This paper will be of **70 marks** and divided into three groups:

**Group A** : Multiple choice question, fill in the blanks and true false types (15 x 1= 15)

**Group B** : Concept based questions (5 questions of 4 marks each, word limits 150 words) (5 x 4 = 20).

**Group C** : Descriptive type questions (5 questions of 7 marks each, word limit 400) (5 x 7 = 35).

The questions must cover the entire syllabus with equal distribution of marks as far as practicable.

#### Details:

##### UNIT I

Management: Science Theory and Practice - Management and Society: Social responsibility and Ethics. The nature and purpose of planning - objectives - Strategies Policies and planning premises.

##### UNIT II

Decision making. The Nature and purpose of organizing - Basic departmentation - Line / staff Authority and decentralization - Effective Organizing and organizational culture.

##### UNIT III

Human Resource Management and selection - Performance appraisal and career strategy - Manager and organizational development.

##### UNIT IV

Managing and the Human factor - Motivation - Leadership - communication.

##### UNIT V

The system and Process of controlling control techniques and information Technology - Productivity and Operations Management - Overall and Preventive Control - Towards a unified, Global management theory.

#### TEXT BOOKS:

1. Herald Knootz and Heinz Weihrich, “*Essentials of Management*”, McGraw-Hill Publishing Company, Singapore International Edition, 2000.
2. Ties AF, Stoner and R.Edward Freeman “*Management*” Prentice Hall of India Pvt., Ltd., New Delhi 110 011, 2003.
3. Joseph I, Massie, “*Essentials of Management*”, Prentice Hall of India Pvt., Ltd., New Delhi 110 011, 2002.

**MCA – 3<sup>rd</sup> Year****SEMESTER - V****(Paper-33)****5MCA 5001L Lab on Data Mining & Data Warehousing****Full Marks: 25 (MSE) + 50 {ESE (25E+25I)} = 75      Time: 3 hrs.      Pass Marks: 34****PRACTICAL****LAB ON DATA MINING & DATA WAREHOUSING**

1. Create a warehouse in MS SQL Server 2000 and import various databases from external sources such as Access/Excel/Text File by using Data Transformation Services (DTS) tool.
2. Create and schedule a DTS Package using Data Transformation services (DTS) tool. Fire at least 5 queries on the database.
3. Create a Database using Analysis Manager and create a Single-Dimensional OLAP cube by using STAR schema.
4. Create a Database using Analysis Manager and create a Multi-Dimensional OLAP cube by using Snowflake schema.
5. Create a Mining Model by using Relational Data.
6. Create a Mining Model by using OLAP Data.

**MCA – 3<sup>rd</sup> Year****SEMESTER - V****(Paper-34)****5MCA 5002L Lab on Website Designing****Full Marks: 25 (MSE) + 50 {ESE (25E+25I)} = 75      Time: 3 hrs.      Pass Marks: 34****PRACTICAL****LAB ON WEBSITE DESIGNING**

Getting a client & Discussion Board orientation, Web site style reviews, HTML editor/tutorial selection, skills check

Teaching yourself HTML editing, Teaching yourself HTML editing, part 2, Making a placeholder web page, Beginning some practice web pages, Keeping order on your web pages with tables, Adding images to your document, Hyperlinks, Image Processing GIF files, JPG files, Practicing with 'Print Screen', HTML & Style Sheets Tweaking HTML code, Web colors and hex codes, Making a cascading style sheet, Other Stuff Other software, Web ethics - copyrights and fair use, Using Java applets, Project Time! Creating a website for your client.

**MCA – 3<sup>rd</sup> Year****SEMESTER - VI****(Paper-35)****6MCA 6001 Final Project****Full Marks: 25 {(MSE) (JT)} + 100 (ESE) = 125      Time: 3 hrs.      Pass Marks: 60****PRACTICAL****Final Project**