



# Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal(M.P.)

## Scheme of Examination W.e.f. 2013-14

### Fourth Semester- Master of Computer Application

S.No.	Subject Code	Subject Name	Periods per week			Credits	Maximum Marks (Theory Slot)			Maximum Marks (Practical Slot)		Total Marks
			L	T	P		End Sem. Exam.	Tests (Two)	Assignments/Quiz	End Sem. Practical/Viva	Practical Record/Quiz/Assignment/Presentation	
1.	MCA 401	Artificial Intelligence & Applications	3	1	-	4	70	20	10	-	-	100
2.	MCA 402	Information Storage & Management	3	1	-	4	70	20	10	-	-	100
3.	MCA 403	Computer Graphics & Multimedia	3	1	-	4	70	20	10	-	-	100
4.	MCA 404	Design & Analysis of Algorithms	3	1	-	4	70	20	10	-	-	100
5.	MCA 405	Elective 1 (E1)	3	1	-	4	70	20	10	-	-	100
6.	MCA 406	Minor Project -I	-	-	8	8	-	-	-	120	80	200
7.	MCA 407	Computer Graphics Lab	-	-	2	2	-	-	-	30	20	50
		Total	15	5	10	30	350	100	50	150	100	750

**L: Lecture - T: Tutorial - P: Practical**

Elective –I

A) Java Programming & Technology

B) Compiler Design

C) Managerial Economics

D) Advanced Database Management System

## **MCA-401 Artificial Intelligence & Applications**

### **UNIT-I**

#### **General Issues and Overview of AI**

The AI problems, what is an AI technique, Characteristics of AI applications. Introduction to LISP programming: Syntax and numeric functions, Basic list manipulation functions, predicates and conditionals, input output and local variables, iteration and recursion, property lists and arrays.

### **UNIT-II**

#### **Problem Solving, Search and Control Strategies**

General problem solving, production systems, control strategies forward and backward chaining, exhaustive searches depth first breadth first search.

#### **Heuristic Search Techniques**

Hill climbing, branch and bound technique, best first search & A\* algorithm, AND / OR graphs, problem reduction & AO\* algorithm, constraint satisfaction problems.

### **UNIT-III**

#### **Knowledge Representations**

First order predicate calculus, skolemization, resolution principle & unification, interface mechanisms, horn's clauses, semantic networks, frame systems and value inheritance, scripts, conceptual dependency.

### **UNIT-IV**

#### **Natural Language processing**

Parsing techniques, context free grammar, recursive transitions nets (RNT), augmented transition nets (ATN), case and logic grammars, syntactic analysis.

#### **Game playing**

Minimax search procedure, alpha-beta cutoffs, additional refinements.

#### **Planning**

Overview an example domain the block world, component of planning systems, goal stack planning, non linear planning.

### **UNIT-V**

#### **Probabilistic Reasoning and Uncertainty**

Probability theory, bayes theorem and bayesian networks, certainty factor.

#### **Expert Systems**

Introduction to expert system and application of expert systems, various expert system shells, vidwan frame work, knowledge acquisition, case studies, MYCIN.

#### **Learning**

Rote learning, learning by induction, explanation based learning.

### **BOOKS**

1. Elaine Rich and Kevin Knight "Artificial Intelligence" - Tata McGraw Hill.
2. "Artificial Intelligence" 4 ed. Pearson.
3. Dan W. Patterson "Introduction to Artificial Intelligence and Expert Systems", Prentice India.
4. Nils J. Nilson "Principles of Artificial Intelligence", Narosa Publishing House.
5. Clocksin & C.S.Melish "Programming in PROLOG", Narosa Publishing House.
6. M.Sasikumar,S.Ramani etc. "Rule based Expert System", Narosa Publishing House.

Note : Paper is to be set unit wise with internal choice.

## **MCA-402 INFORMATION STORAGE AND MANAGEMENT**

### **Unit-I**

Introduction to Storage Technology: Data proliferation, evolution of various storage technologies, Overview of storage infrastructure components, Information Lifecycle Management, Data categorization.

### **Unit-II**

Storage Systems Architecture: Intelligent disk subsystems overview, Contrast of integrated vs. modular arrays, Component architecture of intelligent disk subsystems, Disk physical structure components, properties, performance, and specifications, RAID levels & parity algorithms, hot sparing, Front end to host storage provisioning, mapping and operation.

### **Unit-III**

Introduction to Networked Storage: JBOD, DAS, NAS, SAN & CAS evolution and comparison. Applications, Elements, connectivity, standards, management, security and limitations of DAS, NAS, CAS & SAN.

### **Unit -IV**

Hybrid Storage solutions; Virtualization: Memory, network, server, storage & appliances. Data center concepts & requirements, Backup & Disaster Recovery: Principles Managing & Monitoring: Industry management standards (SNMP, SMI-S, CIM), standard framework applications, Key management metrics (Thresholds, availability, capacity, security, performance).

### **Unit-V**

Information storage on cloud :Concept of Cloud, Cloud Computing, storage on Cloud, Cloud Vocabulary, Architectural Framework, Cloud benefits, Cloud computing Evolution, Applications & services on cloud, Cloud service providers and Models, Essential characteristics of cloud computing, Cloud Security and integration.

### **References:**

1. G. Somasundaram & Alok Shrivastava (EMC Education Services) editors; Information Storage and Management: Storing, Managing, and Protecting Digital Information; Wiley India.
2. Ulf Troppens, Wolfgang Mueller-Friedt, Rainer Erkens, Rainer Wolafka, Nils Haustein; Storage Network explained : Basic and application of fiber channels, SAN, NAS, iSER, INFINIBAND and FCOE, Wiley India.
3. John W. Rittinghouse and James F. Ransome; Cloud Computing : Implementation , Management and Security, CRC Press, Taylor Frances Pub.
4. Nick Antonopoulos, Lee Gillam; Cloud Computing : Principles, System & Application, Springer.
5. Anthony T. Velez, Toby J. Velk, and Robert Eltenpeter, Cloud Computing : A practical Approach, TMH Pub.
6. Saurabh , Cloud Computing : Insight into New Era Infrastructure, Wiley India.
7. Sosinsky, Cloud Computing Bible, Wiley India.

## **MCA-403 Computer Graphics & Multimedia**

### **UNIT-I**

Computer Graphics : definition, classification & Applications, Development of Hardware & Software for Computer Graphics. Display devices, Hard copy devices. Interactive Input devices, display processor, Line drawing; various algorithms and their comparison, circle generation- Bresenham's mid point circle drawing algorithm, mid point ellipse drawing algorithm.

### **UNIT-II**

Attributes of output primitives, line style, color and intensity, Area filling algorithms, Scan line algorithm, boundary fill flood fill algorithm, Antialiasing techniques. Two dimensional transformations; translation, scaling, rotation, reflection sheering, composite transformation, transformation commands, character generation.

### **UNIT-III**

Viewing coordinates, Window, view port, clipping, Window to view port transformation, line clipping algorithm; Cohen Sutherland, polygon clipping; Sutherland hodgman algorithm, 3D clipping : Normalized view volumes, view port clipping, clipping in homogeneous coordinates.

Illumination model: Light sources, diffuse reflection specular reflection, reflected light, intensity levels, surface shading; phong shading ground shading, color models like RGB, YIQ, CMY, HSV etc.

### **UNIT-IV**

3-D Viewing: Three-dimensional concepts, 3D display techniques, 3D representation polygon & curved surfaces. Design of curves & surfaces- Bezier's Method, B-spline methods, 3D transformation translation, scaling, composite transformation rotation about arbitrary axis, projections: Parallel & Perspective, Hidden surface and line removal; back face removal, depth buffer and scan line methods.

### **UNIT-V**

Introduction to multimedia, multimedia components, multimedia hardware, SCSI, IDE, MCI, Multimedia data and file formats, RTF, TIFF, MIDI, JPEG, DIB, MPEG, Multimedia tools, presentations tools, Authoring tools, presentations.

### **BOOKS**

1. D.Hearn and M.P. Baker "Computer Graphics" (2nd ed), PHI.
2. S. Harrington – "Computer Graphics - a Programming approach" (2nd ed) McGrawhill.
3. New Mann & Sprovl- "Principles of interactive computer graphics" (2nd ed) McGrawhill.
4. Roger S. David "Procedural Elements for Computer Graphics", McGraw Hill.
5. Roger S David "Mathematical Elements for Computer Graphics", McGraw Hill.
6. Foley & Vandan "Computer Graphics Principles & Practice in "C" "Addision Wesly.
7. Tay Vaughan " Multimedia Making it Work" 5<sup>th</sup> Ed. 2001, Tata McGraw Hill.
8. Prabhat K. Andleigh & Kiran Thakur "Multimedia System Design", PHI
9. Drew, "Fundamentals of Multimedia", Pearsons.
10. Nigel Chapman, J. Chapman "Digital Multimedia" Wiley India.

Note : Paper is to be set unit wise with internal choice.

## **MCA-404 Design and Analysis of Algorithms**

### **UNIT – I**

**Pre-requisites:** Data structure & Discrete structures, models of computation, algorithm analysis, order architecture, time space complexities average and worst case analysis.

### **UNIT-II**

**Divide and conquer:** Structure of divide-and-conquer algorithms: examples; Binary search, quick sort, Strassen Multiplication; Analysis of divide and conquer run time recurrence relations.

**Graph searching and Traversal:** Overview, Traversal methods (depth first and breadth first search)

### **UNIT-III**

**Greedy Method:** Overview of the greedy paradigm examples of exact optimization solution (minimum cost spanning tree), Approximate solution (Knapsack problem), Single source shortest paths.

**Branch and bound:** LC searching Bounding, FIFO branch and bound, LC branch and bound application: 0/1 Knapsack problem, Traveling Salesman Problem, searching & sorting algorithms.

### **UNIT-IV**

**Dynamic programming:** Overview, difference between dynamic programming and divide and conquer, Applications: Shortest path in graph, Matrix multiplication, Traveling salesman Problem, longest Common sequence.

**Back tracking:** Overview, 8-queen problem, and Knapsack problem

### **UNIT-V**

**Computational Complexity:** Complexity measures, Polynomial Vs non-polynomial time complexity; NP-hard and NP-complete classes, examples.

Combinational algorithms, string processing algorithm, Algebraic algorithms , set algorithms

### **BOOKS**

1. Ullman "Analysis and Design of Algorithm" TMH
2. Goodman "Introduction to the Design & Analysis of Algorithms, TMH-2002.
3. Sara Basse, A. V. Gelder, " Computer Algorithms," Addison Wesley
4. T. H. Cormen, Leiserson , Rivest and Stein, "Introduction of Computer algorithm," PHI
5. E. Horowitz, S. Sahni, and S. Rajsekaran, "Fundamentals of Computer Algorithms," Galgotia Publication

Note : Paper is to be set unit wise with internal choice.

## **MCA-405 Elective-I : E1(A) Java Programming & Technologies**

### **UNIT-I**

**The Java Environment:** History of Java: Comparison of Java and C++; Java as an object oriented language: Java buzzwords; A simple program, its compilation and execution; the concept of CLASSPATH; Basic idea of application and applet;

**Basics:** Data types; Operators- precedence and associativity; Type conversion; The decision making – if, if ..else, switch; loops – for, while, do...while; special statements–return, break, continue, labeled break, labeled continue; Modular programming methods; arrays; memory allocation and garbage collection in java keywords.

**Object Oriented Programming in Java:** Class; Packages; scope and lifetime; Access specifiers; Constructors; Copy constructor; this pointer; finalize () method; arrays; Memory allocation and garbage collection in java keywords

**Inheritance :** Inheritance basics, method overriding, dynamics method dispatch, abstract classes.

### **UNIT-II**

**Interfaces :** defining an interface, implementing & applying interfaces, variables in interfaces, extending interfaces.

**Multithreading and Exception Handling:** Basic idea of multithreaded programming; The lifecycle of a thread; Creating thread with the thread class and runnable interface; Thread synchronization; Thread scheduling; Producer-consumer relationship; Daemon thread, Selfish threads; Basic idea of exception handling; The try, catch and throw; throws Constructor and finalizers in exception handling; Exception Handling.

### **UNIT-III**

**Applets:** Applet security restrictions; the class hierarchy for applets; Life cycle of applet; HTML Tags for applet.

**The AWT:** The class hierarchy of window fundamentals; The basic user interface components Label, Button, Check Box, Radio Button, Choice menu, Text area, Scroll list, Scroll bar; Frame; Layout managers-flow layout, Grid layout, Border layout, Card layout.

**The Java Event Handling Model:** Java's event delegation model – Ignoring the event, Self contained events, Delegating events; The event class hierarchy; The relationship between interface, methods called, parameters and event source; Adapter classes; Event classes action Event, Adjustment Event, Container Event, Focus Event, Item Event, Eey Event, Mouse Event, Text Event, Window Event.

### **UNIT-IV**

**Input/Output :** Exploring Java i.o., Directories, stream classes

The Byte stream : Input stream, output stream, file input stream, file output stream, print stream, Random access file, the character streams, Buffered reader, buffered writer, print writer, serialization.

**JDBC:** JDBC-ODBC bridge; The connectivity model; The driver manager; Navigating the resultset object contents; java.sql Package; The JDBC exception classes; Connecting to Remote database.

### **UNIT-V**

**Networking & RMI:** Java Networking : Networking Basics : Socket, Client server, reserved sockets, proxy servers, Inet address, TCP sockets, UDP sockets.

; RMI for distributed computing; RMI registry services; Steps of creating RMI Application and an example.

**Collections:** The collections framework, collection interfaces, collection classes.

### **BOOKS**

1. Naughton & Schildt "The Complete Reference Java 2", Tata McGraw Hill
2. Deitel "Java- How to Program:" Pearson Education, Asia
3. Horstmann & Cornell "Core Java 2" (Vol I & II ) , Sun Microsystems
4. Ivan Bayross "Java 2.0" : BPB publications
5. Ivor Horton's "Beginning Java 2, JDK 5 Ed., Wiley India.

Note : Paper is to be set unit wise with internal choice.

## MCA-405 Elective-I : E1(B) Compiler Design

### UNIT-I

**Introduction to Compiling and one pass compiler :** Compilers and translators, phases of compilers, Structure of a compiler, compiler writing tools, bootstrapping, overview of one pass compiler, Error handling.

**Finite Automata & Lexical Analysis :** Role of lexical analyser, specification of tokens, recognition of tokens, regular expression, finite automata, from regular expression to finite automata, DFA and NFA, implementation of lexical analyser, tools for lexical analyser, only introduction to LEX.

### UNIT-II

**Syntax Analysis & Parsing Techniques :** Context free grammars, Parse tree, ambiguity of parse tree, bottom up parsing and top down parsing, shift reduce parsing, operator precedence parsing, elimination of left recursion, recursive descent parsing, predictive parser construction, Transition diagram.

### UNIT-III

LR parsers, constructing SLR and canonical LR parsing tables, using ambiguous grammar, Introduction to YACC, LR(1) & LALR Parsers.

**Syntax Directed Translation :** Syntax directed translation scheme, construction of syntax trees, SDT with inherited and synthesized attributes, symbol tables.

### UNIT-IV

**Intermediate code generation :** Intermediate languages, prefix notation, three address code, quadruples and triples, translation of assignment statements, boolean expression, procedural calls and iterative statements.

**Run time Environment :** Source language issues, storage organisation and allocation strategies, parameter passing, implementation of block structured languages.

### UNIT-V

**Error Detection and Recovery :** Errors, sources of errors, Lexical & syntactic phase error, semantic errors:panic mode error recovery & phrase level error recovery mechanisms.

**Code Optimization :** Optimization of basic blocks, loop optimization, global data flow analysis, loop invariant computations and other related optimization techniques.

**Code Generation :** Issues in design of code generation, simple code generation techniques.

### BOOKS

1. Alfred V. Aho, Ravi Sethi and J.D. Ullman "Compilers- Principles, Techniques and tools" Addison Wesley. A
2. Alfred V.Aho and J.D. Ullman "Principles of Compiler Design" Narosa Publishing House.
3. Tremblay, "Theory and Practice of compiler writing", Mc Graw Hill.
4. Holuv, "Compiler Design in C", PHI.
5. Dhamdhare D.M., "Compiler Construction Principles and Practice", Macmillan India.

Note : Paper is to be set unit wise with internal choice.

**MCA-405 Elective-I : E1(C) Managerial Economics****UNIT-I**

Nature and scope of managerial economics, objectives of firm, management and behavioral theories of the firm.

**UNIT-II**

Concepts of opportunity cost , incremental, time perspective, principles of discounting and aquamarine, demand analysis purpose and concepts, elasticity of demand, methods of demand forecasting.

**UNIT-III**

Product and cost analysis: short run and long run average cost curves.  
Profits: nature and measurement policy, break even analysis, case study.

**UNIT-IV**

Law of supply, economies and diseconomies of scale, law of variable proportions.  
Production functions: single output isoquants.

**UNIT-V**

Pricing: prescriptive approach, price determination under perfect competition, monopoly, oligopoly and monopolistic competition, full cost pricing, pricing strategies

**BOOKS**

1. Dean J. Managerial Economics PHI, New Delhi
2. Mote V.L. et al Management Economics Concepts and Cases TMH, New Delhi
3. Boyes and Melvin "Text book of Economics" Wiley India.
4. Berry Keating & Wilson "Managerial Economics" Wiley India.

Note : Paper is to be set unit wise with internal choice.



## **MCA-405 Elective-I : E1(D) Advanced DataBase Management System**

### **UNIT-I**

#### **Objected Oriented and Object Relational Databases**

Modeling Complex Data Semantics, Specialization, Generalization, Aggregation and Association, Objects, Object Identity and its implementation, Clustering, Equality and Object Reference, Architecture of Object Oriented and Object Relational databases, Persistent Programming Languages, Cache Coherence. Case Studies: Gemstone, O2, Object Store, SQL3, Oracle xxi, DB2.

### **UNIT-II**

#### **Deductive Databases**

Data log and Recursion, Evaluation of Data log program, Recursive queries with negation.

#### **Parallel and Distributed Databases**

Parallel architectures, shared nothing/shared disk/shared memory based architectures, Data partitioning, Intra-operator parallelism, pipelining. Distributed Data Storage – Fragmentation & Replication, Location and Fragment Transparency Distributed Query Processing and Optimization, Distributed Transaction Modeling and concurrency Control, Distributed Deadlock, Commit Protocols, Design of Parallel Databases, and Parallel Query Evaluation.

### **UNIT-III**

#### **Advanced Transaction Processing**

Advanced transaction models: Savepoints, Nested and Multilevel Transactions, Compensating Transactions and Saga, Long Duration Transactions, Weak Levels of Consistency, Transaction Work Flows, Transaction Processing Monitors, Shared disk systems.

### **UNIT-IV**

#### **Active Database and Real Time Databases**

Triggers in SQL, Event Constraint and Action: ECA Rules, Query Processing and Concurrency Control, Recursive query processing, Compensation and Databases Recovery, multi-level recovery.

### **UNIT-V**

#### **Image and Multimedia Databases**

Modeling and Storage of Image and Multimedia Data, Data Structures – R-tree, k-d tree, Quad trees, Content Based Retrieval: Color Histograms, Textures, etc., Image Features, Spatial and Topological Relationships, Multimedia Data Formats, Video Data Model, Audio & Handwritten Data, Geographic Information Systems (GIS).

#### **WEB Database**

Accessing Databases through WEB, WEB Servers, XML Databases, Commercial Systems – Oracle xxi, DB2.

### **BOOKS**

1. Elmars, "Fundamentals of Database Systems", 4<sup>th</sup> Edition, Pearson Education
2. R. Ramakrishnan, "Database Management Systems", 1998, McGraw Hill International Editions
3. Elmagarmid.A.K. "Database transaction models for advanced applications", Morgan Kaufman.
4. Transaction Processing, Concepts and Techniques, J. Gray and A. Reuter, Morgan Kauffman..
5. S. Abiteboul, R. hull and V. Vianu, "Foundations of Databases", 1995, Addison – Wesley Publishing Co., Reading Massachusetts.
6. W. Kim, "Modern Database Systems", 1995, ACM Press, Addison – Wesley.
7. D. Maier, "The Theory of Relational Databases", 1993, Computer Science Press, Rockville, Maryland

**MCA-405 Elective-I : E1(E) Microprocessor and Interfaces****UNIT –I**

Intel 8086 Microprocessor: 8086 Architecture, Pin out diagram and pin description, Addressing Modes, bus transfer techniques with read/write cycle, 8086 Interrupts and Interrupt Responses.

**UNIT –II**

Interfacing of 8086 with Memories, PPI (8255), Keyboard Controller (8279), DMA Controller (8257) Interfacing of 8086 with Programmable Interval Timer (8254) and Programmable Interrupt Controller (8259).

**UNIT-III**

Introduction to Intel 80286, comparison of 80286 with 8086, 80286 Architecture signal and system connection, Real and Virtual Addressing Modes, Memory Management Scheme, 80286 Protection Mechanism, 80286 Interrupts.

**UNIT-IV**

Introduction to Intel 80386, comparison of 80386 with 8086, 80286, Difference between 80386SX and 80386DX, Memory and I/O system of 80386, Special 80386 Registers, 80386 Memory Management Scheme, memory Paging Scheme

**UNIT-V**

Introduction of 80486, Difference between 80486DX and 80486SX, Basic 80486 Architecture, 80486 Memory and I/O system, 80486 Memory Management Scheme, Introduction to Pentium, Pentium Memory and I/O system, Special Pentium Registers, Pentium Memory Management, Difference between Pentium and Pentium Pro.

**BOOKS**

1. D.V.Hall: “ Microprocessor and Interfacing, Programming and Hardware” TMH
2. D.V.Hall: “ Microprocessor and Interface Programming” TMH
3. Barry. B. Brey : “ The Intel Microprocessors Architecture, Programming and Interfacing” Pearson Education (6<sup>th</sup> Edition)
4. James L. Antonakos : “The Pentium Microprocessor” Pearson Education.
5. V.Korneev, A.Kiselev “Modern Microprocessor” 3<sup>rd</sup> Edition , Wiley Dreamtech Publication

Note : Paper is to be set unit wise with internal choice.