SCHEME OF EXAMINATION
FOR MASTER OF COMPUTER APPLICATIONS (MCA)
(SIX-SEMESTER Programme)

Semester – I					
Paper No.	**Title of the Paper**	**Duration Of Exam**	**Maximum Marks**		**Total**
			Theory	**Sessional***	
MCA-101	Computer Fundamentals and Problem Solving Using C	3 Hours	80	20	100
MCA-102	Computer Organisation	3 Hours	80	20	100
MCA-103	Discrete Mathematical Structures	3 Hours	80	20	100
MCA-104	Software Engineering	3 Hours	80	20	100
MCA-105	Computer Oriented Numerical and Statistical Methods	3 Hours	80	20	100
MCA-106	Software Laboratory - I C (Based on MCA-101)	3 Hours			100
MCA-107	Software Laboratory – II C (Based on MCA-105)	3 Hours			100
MCA-108	Seminar				20
				Total	720

Semester – II					
Paper No.	**Title of the Paper**	**Duration Of Exam**	**Maximum Marks**		**Total**
			Theory	**Sessional***	
MCA-201	Data Structures Using C	3 Hours	80	20	100
MCA-202	Computer Networks And Data Communication	3 Hours	80	20	100
MCA-203	System Simulation	3 Hours	80	20	100
MCA-204	Computer Oriented Optimization Techniques	3 Hours	80	20	100
MCA-205	Object Oriented Programming Using C ++	3 Hours	80	20	100
MCA-206	Software Laboratory - III C Language (Based on MCA-201)	3 Hours			100
MCA-207	Software Laboratory - IV C++ (Based on MCA-205)	3 Hours			100
MCA-208	Seminar			20	20
				Total	720

Semester – III					
Paper No.	**Title of the Paper**	**Duration Of Exam**	**Maximum Marks**		**Total**
			Theory	**Sessional***	
MCA-301	Data Base Systems	3 Hours	80	20	100
MCA-302	Visual Programming	3 Hours	80	20	100
MCA-303	Design and Analysis of Algorithms	3 Hours	80	20	100
MCA-304	Operating System	3 Hours	80	20	100
MCA-305	Principles of Programming Languages	3 Hours	80	20	100
MCA-306	Software Laboratory – V RDBMS (Based on MCA-301)	3 Hours			100
MCA-307	Software Laboratory - VI VB (Based on MCA-302)	3 Hours			100
MCA-308	Seminar				20
				Total	720

Semester – IV					
Paper No.	**Title of the Paper**	**Duration Of Exam**	**Maximum Marks**		**Total**
			Theory	**Sessional ***	
MCA-401	Web Engineering	3 Hours	80	20	100
MCA-402	Data Warehousing & Data Mining	3 Hours	80	20	100
MCA-403	Programming in Java	3 Hours	80	20	100
MCA-404	Object Oriented Methodology	3 Hours	80	20	100
MCA-405	Elective	3 Hours	80	20	100
MCA-406	Software Laboratory - VII XML/Java Script/C# with .NET (Based on MCA-401)	3 Hours			100
MCA-407	Software Laboratory - VIII Programming in Java (Based on MCA-403)	3 Hours			100
MCA-408	Seminar				20
				Total	720
Elective Papers					
(i) Microprocessors and Interfaces					
(ii) Management Information System					
(iii) Artificial Intelligence					
(iv) Theory of Computation					
(v) Software Quality Models					

Semester – V					
Paper No.	**Title of the Paper**	**Duration Of Exam**	**Maximum Marks**		**Total**
			Theory	**Sessional***	
MCA-501	Computer Graphics	3 Hours	80	20	100
MCA-502	Linux and Shell Programming	3 Hours	80	20	100
MCA-503	Computer Architecture and Parallel Processing	3 Hours	80	20	100
MCA-504	System Programming and Compiler Construction	3 Hours	80	20	100
MCA-505	Software Project Management	3 Hours	80	20	100
MCA-506	Software Lab - IX C/C++ (Based on MCA-501)	3 Hours			100
MCA-507	Software Lab - X Shell Programming (Based on MCA-501)	3 Hours			100
MCA-508	Seminar				20
				Total	720
Elective Papers					
(i) Current Trends and Technology					
(ii) High Performance Communication Networks					
(iii) Windows Programming					
(iv) Neural Networks					
(v) Software Project Management					

Semester - VI		
Paper No.	**Title of the Paper**	**Total**
MCA-601	Project Report	150
	Presentation & Viva-voce	150
	Internal Assessment	100
	Total	400
	Grand Total of Marks (From semester I to VI)	**4000**

*** Sessional Marks in each theory paper will be awarded by the concerned teacher on the basis of marks obtained in one class test (of 10 Marks and 90 minutes duration) and evaluation of assignments (of 10 Marks).**

Note: Size of Groups for all practical and viva-voce examinations should not be more than thirty.

MCA-101 COMPUTER FUNDAMENTALS AND PROBLEM SOLVING USING C

Maximum marks: 100 **External:** 80
Time: 3 hours **Internal:** 20

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (objective type/short-answer type questions) covering the entire syllabus and will carry 24 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 14 marks.
Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT-I

Computer Fundamentals: Definition, Block Diagram along with Computer components, characteristics & classification of computers, hardware & software, types of software, firmware.
Planning the Computer Program: Concept of problem solving, Problem definition, Program design, Debugging, Types of errors in programming, Documentation.
Techniques of Problem Solving: Flowcharting, decision table, algorithms ,Structured programming concepts, Programming methodologies viz. top-down and bottom-up programming.

UNIT-II

Searching, Sorting, and Merging: Linear & Binary Searching, Bubble, Selection, and Insertion Sorting, Merging.
Overview of C: History of C, Importance of C, Structure of a C Program.
Elements of C: C character set, identifiers and keywords, Data types, Constants and Variables.
Operators: Arithmetic, relational, logical, bitwise, unary, assignment and conditional operators and their hierarchy & associativity.

UNIT-III

Input/output: Unformatted & formatted I/O function in C.
Control statements: Sequencing, Selection: if and switch statement; alternation, Repetition: for, while, and do-while loop; break, continue, goto.
Functions: Definition, prototype, passing parameters, recursion.
Storage classes in C: auto, extern, register and static storage class, their scope, storage, & lifetime.

UNIT-IV

Arrays: Definition, types, initialization, processing an array, passing arrays to functions, Strings.
Pointers: Declaration, operations on pointers, pointers and arrays, dynamic memory allocation, pointers and functions, pointers and strings.
Structure & Union: Definition, processing, Structure and pointers, passing structures to functions.
Data files: Opening and closing a file, I/O operations on files, Error handling during I/O operation, Random access to files.

Text Books:

1. Sinha, P.K. & Sinha, Priti, Computer Fundamentals, BPB
2. Dromey, R.G., How to Solve it By Computer, PHI
3. Gottfried, Byron S., Programming with C, Tata McGraw Hill
4. Balagurusamy, E., Programming in ANSI C, McGraw-Hill

Reference Books:

1. Jeri R. Hanly & Elliot P. Koffman, Problem Solving and Program Design in C, Addison Wesley.
2. Yashwant Kanetker, Let us C, BPB
3. Norton, Peter, Introduction to Computer, McGraw-Hill
4. Leon, Alexis & Leon, Mathews, Introduction to Computers, Leon Tech World
5. Rajaraman, V., Fundamentals of Computers, PHI
6. Rajaraman, V., Computer Programming in C, PHI

MCA-102 COMPUTER ORGANIZATION

Maximum marks: 100 **External:** 80
Time: 3 hours **Internal:** 20

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (objective type/short-answer type questions) covering the entire syllabus and will carry 24 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 14 marks.
Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT-I

Information Representation: Number systems, BCD codes, Character codes – ASCII, EBCDIC, Unicode, Error Detecting and Correcting codes, Fixed-point and Floating-point representation of numbers. Binary arithmetic, Booths multiplication.
Binary Logic: Boolean algebra, Boolean functions, truth tables, canonical and standard forms, simplification of Boolean functions, Digital logic gates.

UNIT-II

Combinational Logic: Design procedure, Adders, Subtractors, Code Conversion, Analysis procedure, Multilevel NAND & NOR Circuits, XOR & XNOR functions Encoders, Decoders, Multiplexers, Demultiplexers and Comparators, Binary Parallel Adder, BCD Adder

UNIT-III

Sequential Logic: Flip-flops, Shift registers and Counters.
Memory System: Memory parameters, Semiconductor RAMs, ROMs, Magnetic and Optical storage devices, Flash memory.

UNIT-IV

CPU Organization: Processor organization, Machine instructions, instruction cycles, instruction formats and addressing modes, microprogramming concepts, and micro program sequencer.
I/O Organization: I/O interface, Interrupt structure, transfer of information between CPU/memory and I/O devices, and IOPs.

Text Books:

1. Mano, M. Morris Digital Logic and Computer Design, Prentice Hall of India Pvt. Ltd.
2. Rajaraman, V., Radhakrishanan,T., An Introduction To Digital Computer Design, Prentice Hall of India Pvt. Ltd.

Reference Books:

1. Hayes, J.P., Computer Architecture and Organization, McGraw Hill
2. Tanebaum A.S., Structured Computer Organization, Prentice Hall of India Pvt. Ltd.
3. Stallings W., Computer Organization and Architecture, Prentice Hall of India Pvt. Ltd.

MCA-103 DISCRETE MATHEMATICAL STRUCTURE

Maximum marks: 100 **External:** 80
Time: 3 hours **Internal:** 20

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (objective type/short-answer type questions) covering the entire syllabus and will carry 24 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 14 marks.
Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT –I

Groups and subgroups: Group axioms, Permutation Groups, Subgroups, Cosets, Normal Subgroups, Semi-groups, Free Semi-groups, Modular Arithmetic, Grammars, Language, Regular Expressions, Finite State Machine.

UNIT –II

Graphs: Directed and Undirected Graphs, Chains, Circuits, Paths, Cycles, Connectivity, Adjacency and Incidence Matrices, Algorithms for determining Cycle and Minimal paths, Trees ,Polish Notation, Flows in Networks.

UNIT –III

Latices and boolean algebra: Relations to partial ordering, Lattices, Hasse Diagram, Axiomatic definition of Boolean Algebra as algebraic structures with two operations, Boolean Functions, Representing Boolean Functions, Switching Circuits, Gate Circuits.

UNIT –IV

Finite fields: Definition, Representation, Structure, Integral Domain**,** Irreducible Polynomial, Polynomial Roots, Splitting Field.

Text Books:

1. Alan Doerr And Kenneth Levaseur, Applied Discrete Structures For Computer Science, Galgotia Publications Pvt. Ltd., New Delhi.
2. Seymour Lipschutz And Marc Lars Lipson, Discrete Mathematics", Mcgrraw- Hill International Editions, Schaum's Series, New York.

Reference Books:

1. Olympia Nicodemy, " Discrete Mathematics ", Cbs Publisher, Delhi
2. C. L. Liu, "Elements of Discrete Mathematics", Tata Mcgrraw- Hill Publishing Company Limited, New Delhi.
3. Bernard Kolman And Robert C. Busby, "Discrete Mathematical Structures For Computer Science", Prentice- Hall Of India Pvt. Ltd., New Delhi.
4. Kenneth G. Rosen, "Discrete Mathematics And Its Applications", Mcgrraw- Hill International Editions, Mathematics Series, New York.

MCA-104 SOFTWARE ENGINEERING

Maximum marks: 100 **External:** 80
Time: 3 hours **Internal:** 20

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (objective type/short-answer type questions) covering the entire syllabus and will carry 24 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 14 marks.
Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

Unit-I

Introduction: Software Crisis-problem and causes, Software Processes, Software life cycle models: Waterfall, Prototype, Evolutionary and Spiral models, Overview of Quality Standards like ISO 9001, SEI-CMM, CMMI, PCMM, Six Sigma.
Software Metrics: Size Metrics like LOC, Token Count, Function Count, Design Metrics, Data Structure Metrics, Information Flow Metrics, cyclomatic complexity, Halstead Complexity measures.

Unit-II

Software Project Planning: Cost estimation, static, Single and multivariate models, COCOMO model, Putnam Resource Allocation Model, Risk management, project scheduling, personnel planning, team structure, Software configuration management, quality assurance, project monitoring.
Software Requirement Analysis and Specifications: Structured Analysis, Data Flow Diagrams, Data Dictionaries, Entity-Relationship diagrams, Software Requirement and Specifications, Behavioral and non-behavioral requirements.

Unit-III

Software Design: Design fundamentals, problem partitioning and abstraction, design methodology, Cohesion & Coupling, Classification of Cohesiveness & Coupling, Function Oriented Design, and User Interface Design.
Coding: Programming style, structured programming.
Software reliability: metric and specification, Musa and JM reliability model, fault avoidance and tolerance, exception handling, defensive programming.

Unit-IV

Software Testing: Testing fundamentals, Functional testing: Boundary Value Analysis, Equivalence class testing, Decision table testing, Cause effect graphing, Structural testing: Control flow based and data flow based testing, loop testing, mutation testing, load, stress and performance testing, software testing strategies: unit testing, integration testing, Validation testing, System testing, Alpha and Beta testing, debugging.
Static Testing Strategies: Formal Technical Reviews (Peer Reviews), Walk Through, Code Inspection, Compliance with Design and Coding Standards.
Software Maintenance: Management of Maintenance, Maintenance Process, maintenance characteristics, maintainability, maintenance tasks, and maintenance side effects, Reverse Engineering, Software Re-engineering, Configuration Management, Documentation.

Text Books:

1. R. S. Pressman, “Software Engineering – A practitioner’s approach”, Tata McGraw Hill.
2. P. Jalote, “An Integrated approach to Software Engineering”, Narosa.

Reference Books:

1. Sommerville, “Software Engineering”, Addison Wesley.
2. R. Fairley, “Software Engineering Concepts”, Tata McGraw Hill.
3. James Peter, W Pedrycz, “Software Engineering”, John Wiley & Sons.

MCA-105 COMPUTER ORIENTED NUMERICAL AND STATISTICAL METHODS

Maximum marks: 100 **External:** 80
Time: 3 hours **Internal:** 20

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (objective type/short-answer type questions) covering the entire syllabus and will carry 24 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 14 marks.
Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting One question from each Unit.

UNIT-I

Computer Arithmatic: Floating-point representation of numbers, arithmetic operations with normalized floating point numbers and their consequences. Error in number representation - pitfalls in computing.
Iterative Methods: Bisection, False position, Newton-Raphson methods, Discussion of convergences, Graeffe's Root Squaring Method and Bairstow's Method.

UNIT-II

Solution of Simultaneous Linear Equations and ordinary Differential Equations: Gauss elimination method, Ill-conditioned equations, Gauss-Seidal iterative method, Euler method, Euler's Modified Method, Taylor-Series Method, Runge-Kutta method, Predictor-Corrector methods.
Numerical Differentiation and Integration: Differentiation formulae based on polynomial fit, Pitfalls in differentiation, Trapezoidal, Simpson's rules and Gaussian Quadrature.

UNIT-III

Interpolation and Approximation: Polynomial interpolation, Difference tables, Inverse interpolation, Polynomial fitting and other curve fitting. Approximation of functions by Taylor series and Chebyshev polynomials.

UNIT-IV

Statistical methods: Sample distributions, Test of Significance: Chi-Square Test, t and F test.
Analysis of Variance: Definition, Assumptions, Cochran's Theorem (only statement), One-way classification, ANOVA Table, Two-way classification (with one observation per cell).
Time Series Analysis: Components and Analysis of Time Series, Measurement of Trend, Seasonal fluctuations and cyclic movement.

Reference Books:

1. Gupta S.P. and Kapoor, V.K., Fundamentals of Applied statistics, Sultan Chand & Sons.
2. Gupta S.P. and Kapoor, V.K., Fundamentals of Mathematical Statistics, Sultan Chand and Sons.
3. Rajaraman V., Computer Oriented Numerical Methods, Prentice Hall, India.
4. Graybill, Introduction to Statistics, McGraw.
5. Anderson, Statistical Modelling, McGraw.
6. M.K.Jain, S.R.K. Iyengar and R.K.Jain, Numerical Methods for Scientific and Engineering Computation.
7. H.C.Saxena, Finite Differences and Numerical Analysis.
8. Modes A., Numerical Analysis for Computer Science.

MCA-201 DATA STRUCTURE USING C

Maximum marks: 100 **External:** 80
Time: 3 hours **Internal:** 20

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (objective type/short-answer type questions) covering the entire syllabus and will carry 24 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 14 marks.
Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT –I

Introduction to Data Structures: Primitive and Composite, Arrays, Matrices, Sparse Matrices, Linear Search, Binary Search, Insertion Sort, Selection Sort, Bubble Sort, String, Representation and Manipulation, Complexity of Algorithms, Records and Pointers.

UNIT –II

Linked Lists: Searching, Insertion, Deletion, Sorted Linked List, Circular List, Header List, Two – Way List; Stacks, Queues , Recursion, Quick Sort, Linked and Array representation of Stackks, Queues, and Deques, Polish Notation, Priority Queues,

UNIT –III

Trees: Binary Trees, Threaded Binary Trees, Balanced Tree, Different tree traversal algorithms, Binary Search Tree, Huffman Tree, Heap Sort, AVL Search Trees, B Trees, m-way Search Trees.

UNIT –IV

Representation of Graphs and Applications: Adjacency Matrix, Path Matrix, Warshall's Algorithm, Linked Representation of a Graph, Traversing a Graph;
Sorting and Searching: Radix Sort, Merge Sort, Hashing.

Text Books:

1. Seymour Lipschutz, "DATA STRUCTURERS", Tata Mcgrraw- Hill Publishing Company Limited, Schaum's Outlines, New Delhi.
2. Yedidyan Langsam, Moshe J. Augenstein, and Aaron M. Tenenbaum, "DATA STRUCTURES USING C", Prentice- Hall of India Pvt. Ltd., New Delhi.

Reference Books:

1. Trembley, J.P. And Sorenson P.G., "An Introduction to Data Structures With Applications", Mcgrraw-Hill International Student Edition, New York.
2. Mark Allen Weiss Data Structures and Algorithm Analysis In C, Addison- Wesley, (An Imprint Of Pearson Education), Mexico City.Prentice- Hall Of India Pvt. Ltd., New Delhi.

MCA-202 COMPUTER NETWORKS AND DATA COMMUNICATION

Maximum marks: 100 **External:** 80
Time: 3 hours **Internal:** 20

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (objective type/short-answer type questions) covering the entire syllabus and will carry 24 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 14 marks.
Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting One question from each Unit.

UNIT-I

Introduction to Computer Networks and its uses, Network categorization and Hardware: Broadcast and point-to-point networks, Local Area Networks (LAN), Metropolitan Area Networks (MAN), Wide Area Networks (WAN), Internetworks, Topologies, Wireless networks, Network Software: Protocols, Services, network architecture, design issues, OSI Reference model, TCP/IP Reference model, Comparison of OSI and TCP/IP Models. Introduction to Example Networks: Internet, Connection-Oriented Networks – X.25, Frame Relay, ATM.

UNIT-II

Data Communication Model, Digital and Analog data and signals, bit rate, baud, bandwidth, Nyquist bit rate, Guided Transmission Media – Twisted Pair, Coaxial cable, Optical fibre; wireless transmission – Radio waves, microwaves, infrared waves; Satellite communication.

Switching: Circuit Switching, Packet Switching; Multiplexing: Frequency Division Multiplexing Time Division Multiplexity, Synchronous and Asynchronom TDM, Modems, Transmission Impairments, Manchester and Differential Manchester encoching, ADSL Versus Cable.

UNIT-III

Data Link Layer Design issues: Framing, error control, Flow Control, Error Detection and correction;
Elementary Data Link Protocols, Sliding Window Protocols; Medium Access Control: Aloha, CSMA protocols, Collision free protocols, Limited Contention Protocols; Wavelength division Multiple access protocol, Wireless LAN Protocol: MACA; IEEE 802.3 Ethernet, IEEE 802.4 Token Bus; IEEE 802.5 Token ring, Binary Exponential Backcoft algorithm, Digital Cellular, Radio: Global System for Mobile Communication (GSM), Code Division Multiple Access(CDMA), Fiber Distributed Data Interface, Distributed Queue Dual Bus (DQDB).

UNIT-IV

Network Layer, Design issues , Virtual Circuit and Datagram Subnet, Routing Algorithms, Optimality principle, Shortest path Routing, Flooding , Distance Vector Routing, Link State Routing, Hierarchical Routing, Broadcast and Multi Cast Routing, Routing for Mobile hosts, Routing in Adhoc Networks,, congestion Control Algorithms, General Principals Traffic Shaping, Leaky bucket token bucket, choke packets, Load Shedding.

Text Books

(1) Computer Networks - Andrew s. Tanenbaum, PHI.
(2) Introduction to Data communications and Networking- Behrouz A Forouzan, Tata Mc-Graw Hill.

MCA-203 SYSTEM SIMULATION

Maximum marks: 100 **External:** 80
Time: 3 hours **Internal:** 20

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (objective type/short-answer type questions) covering the entire syllabus and will carry 24 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 14 marks.
Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT –I

Systems concepts: System approach to problem solving, Characteristics of Systems, State of the system, System boundaries and environment;
Modeling and Simulation: Need of studying models, Type of Models. Principles and Nature of Computer Modeling and Simulation, When to use simulation, Limitations of Simulation.

UNIT –II

Simulation Concepts: Concepts of Continuous /Discrete System simulations with the help of examples, Numerical Integration vs. Continuous Simulation, Analog vs. Digital Simulation, and Hybrid Simulation.
Generation of Random Numbers: Generation of uniformly / non-uniformly distributed pseudo random numbers, Monte Carlo Computations vs. Stochastic Simulation.
Case Studies: Simulation of Pure Pursuit Problem, Chemical Reactor; Servo System, and Water Reservoir System.

UNIT –III

Simulation of Queuing System: Rudiments of queuing theory, Simulation of Single Server , Two Server and M-Server Queuing Systems.
Simulation in Inventory Control and Forecasting: Elements of Inventory theory, Generation of Poisson and Erlang Variates, Use of Forecasting and Regression analysis in simulation.

UNIT –IV

Design of Simulation Experiments: Run length of Static/Dynamic Simulation Experiments, Variance Reduction Techniques, and Validation.
Simulation Languages: Continuous Simulation Languages – Block Structured Continuous Simulation Languages, Expression Based Languages;
Discrete Simulation Languages- SIMSCRIPT, GPSS, SIMULA; Factors in selection of Discrete Simulation Languages.

Text Books:

1. Narsingh Deo System Simulation with Digital Computer, Prentice- Hall of India Pvt. Ltd., New Delhi.
2. Gordon G. System Simulation, Prentice- Hall of India Pvt. Ltd., New Delhi.
3. Francis Neelamkavil, Computer Simulation and Modelling, John Wiley and Sons, New York.

Reference Books:

1. Averill M. Law And W David Kelton , Simulation Modelling And Analysis, Tata McGraw- Hill Publishing Company Limited, New Delhi.
2. Julian Reitman, "Computer Simulation Applications", John Wiley and Sons, New York.
3. James A Payne, Introduction to Simulation, McGraw- Hill International Editions (Computer Science Series), New York.

MCA-204 COMPUTER ORIENTED OPTIMIZATION TECHNIQUES

Maximum marks: 100 **External:** 80
Time: 3 hours **Internal:** 20

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (objective type/short-answer type questions) covering the entire syllabus and will carry 24 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 14 marks.
Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT-I

Introduction: The Historical development, Nature, Meaning and Management Application of Operations research. Modelling, Its Principal and Approximation of O.R.Models, Main characteristic and phases, General Methods of solving models, Scientific Methods, Scope, Role on Decision Making and Development of Operation Research in India.

UNIT-II

Linear Programming: Formulation, Graphical solution, standard and matrix form of linear programming problems, Simplex method and its flow chart, Two-phase Simplex method, Degeneracy.
Duality: Definition of Dual Problem, General Rules for converting any Primal into its Dual, Dual Simplex method and its flow chart.

UNIT-III

Integer Programming: Importance, Applications and Classification, Gomory's all integer programming problem technique and its flow chart, Branch and Bound Method.
Assignment Models: Formulation of problem, Hungarian Method for Assignment Problems, Unbalanced Assignment Problems.

UNIT-IV

Queuing Models: Introduction, Applications, Characteristic, Waiting and Ideal time costs, Transient and Steady states, Kendall's Notations, M/M/1, M/M/C, M/Ek/1 and Deterministic Models. (No Mathematical derivations included).
PERT and CPM: Basic steps in PERT/CPM, Techniques, Network Diagram Representation, Forward and Backward Pass-computation, Representation in Tabular form, Determination of Critical path, Critical activity, Difference between CPM and PERT, Floats and Slack Times.

Reference Books:

1. Gupta P.K., Hira and D.S., Operation Research, Sultan Chand & Sons, New Delhi.
2. Kanti Swarup, Gupta P.K. & Man Mohan, Operation Research, Sultan Chand & sons, New Delhi.
3. Mittal, K.V., Optimization Methods in Operations Research and System Analysis, New Age International (P) Ltd., New Delhi.
4. Rao S.S., Optimization Theory and Applications, Wiley Eastern Ltd. New Delhi.
5. Sharma, S.D., Operations Research, Kedar Nath and Ram Nath, Meerut.
6. Taha, H.A., Operation Research – An Introduction, McMillan Publishing Co, New York.
7. Bazara, Operation Research & Networking, Wiley.
8. Avieral, Optimization Techniques.

MCA-205 OBJECT-ORIENTED PROGRAMMING WITH C++

Maximum marks: 100 **External:** 80
Time: 3 hours **Internal:** 20

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (objective type/short-answer type questions) covering the entire syllabus and will carry 24 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 14 marks.
Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT-I

Introduction to C++: Object-Oriented features of C++, Comparison of C with C++, Class and Objects, Inline functions, Static data members and member functions, Read-Only objects, Pointers, Dynamic memory allocation and deallocation, constructors and destructors, Dynamic objects, array of pointers to object, local and global class, nested and empty class, preprocessor directives, namespace.
Console I/O: Hierarchy of console stream classes, unformatted and formatted I/O operations, Manipulators

UNIT-II

Operator Overloading: Overloadable operators, overloading unary and binary arithmetic and relational operators, overloading subscript, array, insertion, extraction, new and delete operators.
Friend Function and Type Conversion: Friend function, Function overloading, overloading operators through friend function. Basic type conversion, conversion between Objects and Basic Types, conversion between objects of different classes

UNIT-III

Inheritance: Derivation Rules, Different forms of inheritance, Roles of constructors and destructors in inheritance.
Virtual Functions: Virtual functions and their needs, Pure virtual function, virtual destructor, virtual derivation, abstract class.

UNIT-IV

Generic Programming & Exception Handling: Template functions, Template class, Exception handling features of C++.
File Handling: Hierarchy of File Stream classes, Opening and Closing files, File modes, testing for errors, File pointers and their manipulations, ASCII & Binary files, Sequential and Random access files.

Text Books:

1. Bjarne Stroustrup, The C++ Programming Language, Pearson
2. Herbert Scildt, C++, The Complete Reference, Tata McGraw-Hill

Reference Books:

1. Robert Lafore, Object Oriented Programming in C++,
2. Lippman, C++ Primer, 3/e, Addison-Wesley
3. Balaguruswami, E., Object Oriented Programming In C++, Tata McGraw-Hill

MCA-301 DATABASE SYSTEMS

Maximum marks: 100 **External:** 80
Time: 3 hours **Internal:** 20

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (objective type/short-answer type questions) covering the entire syllabus and will carry 24 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 14 marks.

Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT- I

Basic Concepts: File Systems vs. DMBS, Characteristics of the Data Base Approach, Abstraction and Data Integration, Database users, Advantages and Disadvantages of a DBMS.

Data Base Systems Concepts and Architecture: Data Models, Schema and Instances, DBMS architecture and Data Independence, Data Base languages and Interfaces, DBMS functions and component modules.

Entity Relationship Model: Entity Types, Entity Sets, Attributes & keys, Relationships, Relationships Types, Roles and Structural Constraints, Design issues, E-R Diagrams, Design of an E-R Database Schema, Reduction of an E-R schema to Tables.

Relational Data Model: Relational model concepts, Integrity constraints over Relations, Relational Algebra – Basic Operations.

UNIT- II

SQL: DDL, DML, and DCL, views& Queries in SQL, Specifying Constraints & Indexes in SQL.

Relational Data Base Management System: ORACLE, Basic structure, Date Base Structure & its manipulation in ORACLE, Storage Organization in ORACLE, Programming ORACLE Applications.

Conventional Data Models: An overview of Network and Hierarchical Data Models.

UNIT-III

Relational Data Base Design: Functional Dependencies, Decomposition, Normal forms based on primary keys (1 NF, 2 NF, 3 NF, & BCNF), Multi-valued Dependencies, 4 NF, Join dependencies, 5 NF, Domain key normal form.

Practical Data Base Design: Role of Information systems in Organizations, Database design process, physical database design in Relational Database.

UNIT-IV

Transaction Processing Concepts: Introduction to Transaction Processing, Transaction & System Concepts, Properties of Transaction, Schedules and Recoverability, Serializability of Schedules.

Concurrency Control Techniques: Locking Techniques, Time stamp ordering, Multi-version Techniques, Optimistic Techniques, Granularity of Data items.

Recovery Techniques: Recovery concepts, Recovery Techniques in centralized DBMS.

Data Base Security: Introduction to Data base Security issues.

Text Books:

1. Elmasri & Navathe: Fundamentals of Database systems, 5th edition, Pearson Education.
2. Thomas Connolly Carolyn Begg: Database Systems, 3/e, Pearson Education.

Reference Books:

1. Korth & Silberschatz: Database System Concept, 4th Edition, McGraw Hill International Edition.
2. Raghu Ramakrishnan & Johannes Gehrke: Database Management Systems, 2nd edition, Mcgraw Hill International Edition.
3. Peter Rob, Carlos Colonel: Database system Design, Implementation, and Measurement, Cengage Learning, 2nd Ed.
4. Database Systems: A practical Approach to Design, Implementation and Management, Pearson Education- 3e
5. C.J. Date: An Introduction to Data Bases Systems 7th Edition, Addison Wesley N. Delhi.
6. Bipin C. Desai: An Introduction to Database System, Galgotia Publication, N. Delhi.
7. Abbey, Abramson & Corey: Oracle 8i-A Beginner's Guide, Tata McGraw Hill.
8. Ivan Bayross: SQL, PL/SQL- The Program Language of ORACLE, BPB Publication.

MCA-302 VISUAL PROGRAMMING

Maximum marks: 100 **External:** 80
Time: 3 hours **Internal:** 20

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (objective type/short-answer type questions) covering the entire syllabus and will carry 24 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 14 marks.
Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT-I

Introduction to Visual Basic: VB IDE, An overview of VB project types, VB as event-driven & object-based language, Default controls in Tool Box
Programming with VB: Variables, Constants, Data types, Arithmetic operators, String Operations, Built-in function, I/O in VB, Branching & Looping statements, Procedures, Arrays, collection.

UNIT-II

Menus and Dialog Boxes: Adding menus and manipulating, using Common Dialog Box
Working with Forms: Working with multiple forms, MDI form, loading, showing and hiding forms, drag and drop operation
Advanced Controls in VB: Scroll Bar, Slider Control, TreeView, List View, RichText Box Control, Toolbar, Status Bar, Progress Bar, Cool bar, Image List, Tab Strip.

UNIT-III

File Handling & File Controls: Working with sequential & random files, performing operations on a file
Working with Graphics: Using Paint, Line, Circle, RGB and other related method, manipulating graphics.
Using modules & class modules in VB

UNIT-IV

ActiveX: Creating & using ActiveX Controls, Creating & using ActiveX Documents, ActiveX EXE, and ActiveX DLL
VB & Databases: The Data Controls and Data-Bound Controls, Using DAO, RDO, ADO.
Internet features: Creating & using a Web-Browser, Programming E-Mail, Using the Internet Transfer Control.
Creating & Using OLE.

Text Books:

1. Visual Basic 6 Programming : Black Book By Steven Holzner dreamtech PRESS
2. Mastering Visual Baisc 6 By Evangelos Petroutsos BPB
3. Programming in Visual Basic 6.0 By Julia Case Bradley & Anita C. Millspaugh Tata McGraw-Hill Edition

Reference Books:

1. Step by Step Microsoft Visual Basic 6.0 Professional By Michael Halvorson PHI
2. Visual basic 6 Complete BPB
3. Teach Yourself Visual basic 6 By Scott Warner Tata McGraw-Hill Edition
4. Using Visual Basic 6 Special Edition By Brian Siler and Jeff Spotts PHI

MCA-303 DESIGN AND ANALYSIS OF ALGORITHMS

Maximum marks: 100 **External:** 80
Time: 3 hours **internal:** 20

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (objective type/short-answer type questions) covering the entire syllabus and will carry 24 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 14 marks.
Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT-I

Introductory Concepts: Review of important data structures and programming techniques, analyzing algorithms, asymptotic notation, recurrence relations, introductory concepts in program verification and testing, structured design methodology.

UNIT-II

Design Structures : Outline of the general method, its illustration with several well chosen examples for the following basic algorithm design strategies: Divide & Conquer, Greedy method, Dynamic Programming, Basic search and traversal Techniques, Basic tracking, Branch and Bound.

UNIT-III

Lower Bound Theory : Comparison trees, oracles and adversary arguments, techniques for algebraic problems, lower bounds on parallel computation.

UNIT-IV

NP-Hard and NP-Complete Problems: Basic concepts, Cook's theorem, examples of NP-Hard problems, approximation algorithms.

Text & Reference Books:

1. Horowitz, Ellis and Sahni, Sartaj, Fundamentals of Computer Algorithms, Galgotia Publications.
2. Aho, Hopcroft, and Ullman, The Design and Analysis of Computer Algorithms, Addison Wesley.
3. Horowitz, E. and Sahni, S., Fundamentals of Data Structure, Galgotia Publications.
4. Trembley and Sorenson, An Introduction of Data Structures, with Applications, McGraw Hill.
5. Goodman, S.E., and Hetedniemi, S.T., Introduction to the Design and Analysis of Algorithms, McGraw Hill.

MCA-304 OPERATING SYSTEMS

Maximum marks: 100 **External:** 80
Time: 3 hours **Internal:** 20

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (objective type/short-answer type questions) covering the entire syllabus and will carry 24 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 14 marks.
Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT-I

Introductory Concepts: Operating system functions and characteristics, historical evolution of operating systems, Real time systems, Distributed systems, Methodologies for implementation of O/S service system calls, system programs, Interrupt mechanisms.
CPU Scheduling: Levels of Scheduling, Comparative study of scheduling algorithms, Multiple processor scheduling.

UNIT-II

Concurrent Processes: Critical section problem, Semaphores, Classical process co-ordination problems and their solutions, Inter-process Communications.
Deadlocks: Deadlock characterization, Deadlock prevention and avoidance, Deadlock detection and recovery, practical considerations.

UNIT-III

Storage Management: Storage allocation methods: Single contiguous allocation, Multiple contiguous allocation, Paging; Segmentation combination of Paging and Segmentation, Virtual memory concepts, Demand Paging, Page replacement Algorithms, Thrashing.
File Systems: Functions of the system, File access and allocation methods, Directory Systems: Structured Organizations, directory and file protection mechanisms, implementation issues: hierarchy of file and device management.

UNIT-IV

Hardware Management: Hardware Organization, Device scheduling policies.
Protection: Goals of protection, mechanism & policies implementation dynamic protection structures, revocation protection schemes in UNIX / MULTICS.
Case Studies: Comparative study of DOS, WINDOW, UNIX & LINUX system.

Text Books:

1. Silberschatz A., Galvin P.B.,and Gagne G., Operating System Concepts, John Wiley & Sons, Inc.,New York.
2. Godbole, A.S. Operating Systems, Tata McGraw-Hill Publishing Company, New Delhi.
3. Ritchie, Colin , Operating Systems incorporating UNIX & Windows, BPB Publications, New Delhi.
4. Sumitabha Das, UNIX concepts and Applications, Tata McGraw-Hill Publishing Company, New Delhi.

Reference Books:

1. Deitel, H.M., Operating Systems, Addison- Wesley Publishing Company, New York.
2. Tanenbaum, A.S., Operating System- Design and Implementation, Prentice Hall of India, New Delhi.
3. Stalings William, Operating System, Prentice Hall of India, New Delhi.
4. Thomas Dr. Rebecca, Yates Jean, UNIX, Osborne McGraw-Hill Publishing Company, Berkeley, USA.

MCA-305 PRINCIPLES OF PROGRAMMING LANGUAGES

Maximum marks: 100 **External:** 80
Time: 3 hours **Internal:** 20

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (objective type/short-answer type questions) covering the entire syllabus and will carry 24 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 14 marks.
Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting One question from each Unit.

UNIT-I

Preliminaries - language paradigms, language criteria, language design trade-offs, influences on language design, bindings, type checking, and scopes, variables and data types: primitive data types, variables, structured data types. Abstraction: data abstraction, control abstraction, procedural abstraction.

UNIT-II

Formal languages and automata - The Chomsky hierarchy of formal languages, regular grammars, regular expressions, finite automata, Context-free grammars: pushdown automata, ambiguous grammars.
Imperative programming - structured programming, procedure activations: parameter passing methods, scope rules, and activation records.

UNIT-III

Object oriented programming - messages, methods and encapsulation, classes and polymorphism, inheritance and object orientation, design issues for object oriented languages.
Functional programming - Features of functional languages, implementing functional languages, applications of functional languages.

UNIT-IV

Logic programming - Formal logical systems, implementations and applications.
Languages for databases - manipulating relational databases using SQL.
Language constructs for parallel processing - the paradigm, multiple processes, synchronization of cooperating processes.

Text Books:

1. Pratt E. Terrence & Zelkowitz V. Marvin, Programming Languages – Design & Implementation, Prentice Hall of India.
2. Appleby Doris & VandeKopple J. Julius, Programming languages-Paradigm and practice 2nd ed. (Tata McGraw Hill - 1999)

Reference Books:

1. Sebesta W. Robert, Concepts of programming languages 4th ed.,(Addison Wesley - 2000)
2. Sethi Ravi, Programming languages 2nd ed. (Addison Wesley - 2000)

MCA-401 WEB ENGINEERING

Maximum marks: 100 **External:** 80
Time: 3 hours **internal:** 20

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (objective type/short-answer type questions) covering the entire syllabus and will carry 24 marks. In addition to this there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit and each question will carry 14 marks.
Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT-I

Role of Information Architect, Collaboration and Communication, Organizing Web Site parameters, Navigation Systems, Designing Search Interface for web-site, Conceptual Design, High-Level Design, Architectural Page Mockups, Design Sketches, good & bad web design, Process of Web Publishing, Phases of Web Site development, enhancing your web-site, web security.

UNIT-II

HTML Basic Concepts, Static and dynamic HTML, Structure of HTML documents, HTML Elements, Linking in HTML, Anchor Attributes, Image Maps, Meta Information, Image Preliminaries, Layouts, Backgrounds, Colors and Text, Fonts, Tables, Frames and layers, Audio and Video Support with HTML, Database integration with HTML, CSS, Positioning with Style sheets. Forms Control, Form Elements.

UNIT-III

Introduction to CGI, PERL, URL, HTTP, Browser Requests, Server Responses, Proxies, Firewalls, CGI Environment Variables. Forms and CGI, Sending Data to the Server, Architectural Guidelines, Coding Guidelines, Efficiency and Optimization. Java Server Pages, Active Server Pages, Integrating Scripts in JSP, JSP Objects and Components, JSP: Request and response objects.

UNIT-IV

PHP, PHP variables, ASP .NET, Cookies, Creating and Reading Cookies, Relationship between HTML, SGML, and XML, XML Basics, XML for Data Files, Embedding XML into HTML documents, Converting XML to HTML and HTML to XML. Displaying XML using CSS and XSL, The future of XML.

Text-Books

1. Internet & World Wide Web How to Program, Pearson education, 3rd edition, by: H.M. Deitel, P.J. Deitel, A.B. Goldberg.
2. Web- Technologies, TCP/IP and Java Programming, McGraw-Hill Companies.

References-Books

1. Programming with World Wide Web, Pearson education, 4th edition, by: Sebesta.
2. Thomas A Powell, HTML-The Complete Reference, Tata McGraw Hill.
3. Scott Guelich, Shishir Gundavaram, Gunther Birzniek; CGI Programming with Perl 2/e. O'Reilly.
4. Doug Tidwell, James Snell, Pavel Kulchenko; Programming Web Services with SOAP, O'Reilly.

MCA-402 DATA WAREHOUSING AND DATA MINING

Maximum marks: 100 **External:** 80
Time: 3 hours **internal:** 20

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (objective type/short-answer type questions) covering the entire syllabus and will carry 24 marks. In addition to this there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit and each question will carry 14 marks.
Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT-I

Introduction: The Evolution of Data Warehousing (The Historical Context), The Data Warehouse - A Brief History, Characteristics, Operational Database Systems and Data Warehouse (OLTP & OLAP), Today's Development Environment, Data Marts, Metadata.
Multidimensional Data Models: Types of Data and their Uses, from Tables and Spreadsheets to Data Cubes, Identifying Facts and Dimensions, Designing Fact Tables, Designing Dimension Tables, Data Warehouse Schemas, OLAP Operations.
Principles Of Data Warehousing (Architecture And Design Techniques): System Processes, Data Warehousing Components, Architecture for a Data Warehouse, Three-tier Data Warehouse Architecture, Steps for the Design and Construction of Data Warehouses.
Implementation: Methods for the Implementation of Data Warehouse Systems.

UNIT-II

Data Mining: Introduction: Motivation, Importance, Knowledge Discovery Process, KDD and Data Mining, Data Mining vs. Query Tools, Kind of Data, Functionalities, Interesting Patterns, Classification of Data Mining Systems, Major issues, From Data Warehousing to Data Mining.
Data Preparation: Preprocess, Data Cleaning, Data Integration and Transformation, Data Reduction.
Data Mining Primitives, Languages, and System Architectures.
Concept Description: An Overview of Descriptive Data Mining, Predictive Data Mining, Methods for Concept Description.

UNIT-III

Mining Association Rules: Association Rule Mining, Market Basket Analysis, Types of Association Rules, Methods for Mining Association Rules in Transaction Databases, Relational Databases and Data Warehouses.
Classification and Prediction: Methods for Data Classification and Prediction.

UNIT-IV

Cluster Analysis Introduction: Types of data in Cluster Analysis, A categorization of major Clustering Methods, Density-based methods, Grid-based methods, Model-based clustering methods, Outlier Analysis.
Applications of Data Mining.
Tools for Data Mining.

Reference Books:

1. J Hanes, M. Kamber, "Data Mining Concepts and Techniques", Morgan Kaufmann Publishers, 2002.
2. Glenn J. Myatt, "Making Sense of Data", Wiley 2007.
3. Adriaans, "Data Mining", Pearson Education.
4. Paolo Giudici, "Applied Data Mining – Statistical Methods for Business and Industry", Wiley 2003.

MCA-403 PROGRAMMING IN JAVA

Maximum marks: 100 **External:** 80
Time: 3 hours **Internal:** 20

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (objective type/short-answer type questions) covering the entire syllabus and will carry 24 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 14 marks.
Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting One question from each Unit.

UNIT-I

Features of Java, Data types, operators & expressions, control structures, arrays, Class, objects & methods, constructors, garbage collection, access qualifiers, string handling – string operations, character extraction, string comparison, searching and modifying strings, StringBuffer, packages and interfaces, Wrapper classes.

UNIT-II

Inheritance: single and multilevel inheritance, method overriding, abstract class, use of super and final keywords.
Exception Handling: Exception types, uncaught exceptions, multiple catch clauses, nested try statements, built-in exceptions, creating your own exceptions.
Multithreading: Java thread model, creating multiple threads, thread priorities, synchronization, interthread communication, suspending, resuming and stopping threads.

UNIT-III

Applets: Local & Remote Applets, Applet Architecture, Passing Parameters to Applets.
I/O Streams: Console I/O – reading console input, writing console output, Files I/O – Byte Streams, Character Streams.
Collection Interfaces & Classes, Delegation Event Model

UNIT-IV

AWT Classes: Window fundamentals, working with graphics, working with color & fonts. AWT controls, layout managers & menus
Swing Classes, Java Beans, Servlet classes & Life Cycle

Text Books:

1. The Complete Reference Java 2, Fourth Edition, Herbert Schildt, Tata McGraw Hill-2001
2. Introduction to Java Programming (7^{th} Edition), Liang Y.Daniel, 2009, Pearson Education.

Reference Books:

1. Java 1.2, Steven Holzner, BPB-1998
2. Programming with Java - E. Balaguruswami, Second Edition, Tata McGraw Hill-1998.
3. A Programmer's Guide to Java Certification, Mughal K.A., Rasmussen R.W., Addison-Wesley, 2000

MCA-404 OBJECT ORIENTED METHODOLOGY

Maximum marks: 100 **External:** 80
Time: 3 hours **Internal:** 20

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (objective type/short-answer type questions) covering the entire syllabus and will carry 24 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 14 marks.
Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting One question from each Unit.

UNIT-I

UML: Principles of modeling, UML Things – Structural, Behavioral, Grouping, Annotational. Relationships in UML – Dependency, Association, Generalization, Realization. Diagrams in UML – Class diagram, Object diagram, Use-Case diagram, Sequence diagram, Collaboration diagram, Statechart diagram, Activity diagram, Component diagram, Deployment diagram. UML Semantic Rules – Names, Scope, Visibility, Integrity, Execution. Mechanisms in the UML – Specifications, Adornments, Common Divisions, Extensibility Mechanisms.

UNIT-II

Object-Orientation: Object, Class, Abstraction, Encapsulation, Modularity, Hierarchy, Typing, Concurrency, Persistence of objects. Purpose of modeling, Object Modeling Technique (OMT) methodology, Object Model – Links and Associations, Link attributes & Link class, Multiplicity, Role names, Ordering, Qualification, Aggregation, Generalization & Inheritance, Abstract class, Metadata, Constraints. Constructing object model.

UNIT-III

Dynamic Modeling: Event, State, Activity, Action, Conditions, Scenario, Event Trace diagram, Statechart, Nested state diagrams, event generalization, concurrency, entry & exit actions, internal actions, synchronization of concurrent activities.
Functional Modeling: Data Flow Diagram (DFD), nested DFD, control flows. Adding operations, Relationships between object model, dynamic model and functional model.

UNIT-IV

System Design: Breaking a system into subsystem, identifying concurrency, allocating subsystems to processors and tasks, management of data stores, handling global resources, choosing software control implementation, handling boundary conditions, setting trade-off priorities.
Object Design: Combining object, dynamic and functional models, Designing algorithms, design optimization, implementation of control, adjustment of inheritance, design of associations, object presentation, physical packaging, object-oriented style guidelines – reusability, extensibility, robustness, programming-in-the-large.

Text Books:

1. The Unified Modeling Language User Guide, Grady Booch, James Rumbaugh, Ivar Jacobson, Pearson education, 2007
2. Object-Oriented Modeling and Design with UML, M. Blaha, J. Rumbaugh, Pearson Education-2007

Reference Books:

1. Object-Oriented Modeling and Design, J. Rumbaugh, M. Blaha, W. Premerlani, F. Eddy, W. Lorensen, Prentice Hall of India-1998
2. Object-Oriented Analysis & Design with the Unified Process, Satzinger, Jackson, Burd, Thomson-2007
3. Object Oriented Analysis & Design, Grady Booch, Addison Wesley-1994

MCA-405 (ELECTIVE-I) MICROPROCESSORS AND INTERFACES

Maximum marks: 100 **External:** 80
Time: 3 hours **Internal:** 20

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (objective type/short-answer type questions) covering the entire syllabus and will carry 24 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 14 marks.
Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT-I

Microprocessor and Its Architecture: Internal microprocessor architecture, real mode memory addressing, protected memory addressing, memory paging. Data, Program Memory and Stack Memory addressing modes. 8086/8088 Microprocessors – pinouts and pin functions, clock generator (8284A), Bus buffering and latching, Bus timing, ready and wait state, minimum and maximum mode.

UNIT-II

Memory Interface: Memory Devices, Address Decoding, 8-bit, 16-bit, 32-bit and 64-bit memory interfaces, Dynamic RAM.
Basic I/O Interface: I/O Interface, I/O Port Address Decoding, Programmable Peripheral Interface, 8279 Programmable Keyboard/Display Interface, 8254 Programmable Interval Timer, 16550 Programmable Communication Interface, RS232C, SCSI adapter.

UNIT-III

Interrupts: Basic Interrupt Processing, Hardware Interrupts, Expanding the Interrupt Structure, 8259A Programmable Interrupt Controller.
Direct Memory Access (DMA): Basic DMA Operations, 8237 DMA Controller, Shared Bus Operations.

UNIT-IV

Bus Interface: ISA, EISA, VESA Buses, PCI, USB Bus.
386, 486, Pentium, Pentium Pro Microprocessors and Pentium IV: Register Configuration & Memory Management, Introduction to Core 2 Duo & Quadcore Processors.

Text Books:

1. The Intel Microprocessors 8086/8088, 80186/80188,80286, 80386, 80486, Pentium, Pentium Pro Processors, Pentium II, Pentium III, Pentium 4 and Core2 with 64-bit Extensions: Architecture, Programming and Interfacing, Barry B. Brey, 8th Edition, Pearson Education-2009.

Reference Books:

1. The 80386, 80486, and Pentium Processors: Hardware, Software, and Interfacing, Walter Tribel, Prentice Hall, 1998, ISBN #0-13-533225-7
2. Microcomputer Systems: Architecture, Programming, and Design. By Liu and Gibson (PHI).

MCA-405(ELECTIVE-II) MANAGEMENT INFORMATION SYSTEM

Maximum marks: 100 **External:** 80
Time: 3 hours **Internal:** 20

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (objective type/short-answer type questions) covering the entire syllabus and will carry 24 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 14 marks.
Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting One question from each Unit.

UNIT-I

Fundamental of Management Information systems: The Fundamental Roles of Information System in business, Trends in Information Systems, Types of Information Systems, Managerial Challenges of Information Technology.
The Components of Information Systems: System Concept, Components of an Information System, Information System Resources, Information System Activities, Recognizing Information Systems

UNIT-II

IT Infrastructure and Emerging Technologies: - IT Infrastructure, Infrastructure Components, Software/Hardware Platform Trends and Emerging Technologies, Management Issues.
Foundation of Business Intelligence: Databases and Information Management: Organizing Data in a Traditional File Environment, The Database Approach to Data Management, Using Database to Improve Business Performance and Decision Making, Managing Data Resources.

UNIT-III

Securing Information Systems: - System Vulnerability and Abuse, Business Value of Security and Control, Establishing a Framework for Security and Control, Technologies and Tools for Security.
Key System Applications for the Digital Age
Enterprise Applications: - Enterprise Systems, Supply Chain Management Systems, Customer Relationship Management Systems, Enterprise Applications: New Opportunities and Challenges.

UNIT-IV

Managing Knowledge: - The Knowledge Management Landscape, Enterprises-Wide Knowledge Management Systems, Knowledge Work Systems, Intelligent Techniques.
Enhancing Decision Making: - Decision Making and Information Systems, Systems for Decision Support, Executive Support Systems (ESS), Group Decision-Support Systems (GDSS).

Text Books:

1. Management Information Systems Managing the Digital Firm, Kenneth C.Laudon, Jane P.Laudon, 10th Edition, Pearson Education.
2. Management Information Systems, James A O'Brien, George M Marakas, 7th Edition, Tata McGraw-Hill.

Reference Books:

1. Essentials of Management Information Systems, 8/e Laudon & Laudon, Pearson Education.
2. Management Information Systems, 10/e, McLeod & Schell, Pearson Education.
3. Management Information Systems: Learning Exercises and Applications, 1/e Rahmatian, Pearson Education.
4. Management Information Systems, 2/e, Jawadekar, W.S., Tata McGraw-Hill.
5. Robert G.Mudrick, Coel E.Ross, James R.Claggett,Information Systems for Modern Management.
6. James A.O'Brien, Management Information Systems.

MCA-405 (ELECTIVE-III) ARTIFICIAL INTELLIGENCE

Maximum marks: 100 **External:** 80
Time: 3 hours **internal:** 20

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (objective type/short-answer type questions) covering the entire syllabus and will carry 24 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 14 marks.
Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting One question from each Unit.

UNIT-I

Introduction: Background and history, Overview of AI applications areas.
The predicate calculus: Syntax and semantic for propositional logic and FOPL, Clausal form, inference rules, resolution and unification.
Knowledge representation: Network representation-Associative network & conceptual graphs, Structured representation- Frames & Scripts.

UNIT-II

Search strategies: Strategies for state space search-data driven and goal driven search; Search algorithms-uninformed search (depth first, breadth first, depth first with iterative deepening) and informed search (Hill climbing, best first, A* algorithm, mini-max etc.), computational complexity, Properties of search algorithms-Admissibility, Monotonicity, Optimality, Dominance, etc.

UNIT-III

Production system: Types of production system-commutative and non-commutative production systems, Decomposable and non-decomposable production systems, Control of search in production system.
Rule based expert systems: Architecture, development, managing uncertainty in expert systems - Bayesian probability theory, Stanford certainty factor algebra, Nonmonotonic logic and reasoning with beliefs, Fuzzy logic, Dempster/Shaffer and other approaches to uncertainty.

UNIT-IV

Knowledge acquisition: Types of learning, learning automata, genetic algorithms, intelligent editors, learning by induction.
AI Programming Language: PROLOG: Introduction, Clauses: Facts, goals and rules. Prolog unification mechanism, arithmetic operator, list manipulations, Fail and Cut predicates.

Text Books:

1. George F. Luger, Artificial Intelligence, 5th edition, Pearson Education.
2. Dan W. Patterson Introduction to Artificial Intelligence and Expert system PHI.

Reference Books:

1. Ben Coppin, Artificial Intelligence Illuminated, Narosa Publishing House – 2005.
2. Eugene Charniak, Drew McDermott Introduction to Artificial Intelligence Addison Wesley-2000.
3. Nils J. Nilsson Principles of Artificial Intelligence Narosa publishing house.
4. Jackson Peter, Introduction to Expert systems, 3rd ed., (Addison Wesley -2000).

MCA-405 (ELECTIVE – IV) THEORY OF COMPUTATION

Maximum marks: 100 **External:** 80
Time: 3 hours **Internal:** 20

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (objective type/short-answer type questions) covering the entire syllabus and will carry 24 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 14 marks.
Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT-I

Theory of Computation: Formal Language, Need for formal computational models, Non-computational problems, diagonal argument and Russel's paradox.

UNIT-II

Deterministic Finite Automaton (DFA), Non-deterministic Finite Automaton (NFA), Regular Languages and regular sets, Equivalence of DFA and NFA, Kleen's characterization theory for sets accepted by finite automata, Minimizing the number of states of a DFA, Non-regular languages and pumping lemma.

UNIT-III

Pushdown Automaton (PDA), Deterministic Pushdown Automaton (DPDA), Non-equivalence of PDA and DPDA.
Context Free Grammars: Greibach Normal Form (GNF) and Chomsky Normal Form (CNF), Ambiguity, Parse Tree Representation of Derivations, Equivalence of PDA's and CFG's, Parsing techniques for parsing of general CFG's-Early's, Cook-Kassami-Younger (CKY), and Tomita's parsing.

UNIT-IV

Linear Bounded Automata (LBA): Power of LBA, Closure properties.
Turing Machine (TM), One tape, multitape, the notion of time and space complexity in terms of TM, construction of TM for simple problems, Computational complexity.
Chomsky Hierarchy of languages: Recursive and recursive-enumerable languages.

Reference Books:

1. Lewis, H.R. & Papadimitrious, C.H. Elements of the theory of computation. PHI
2. Salomma, A.K. Formal languages, Academic press.
3. Hopcroft, J. E. & Ullman, J. D. Formal languages and their relation to Automata Addison-Wasley
4. E. V. Krishnamurthy, Introductory theory of computer science East-West press Pvt. Ltd.
5. Zoha Mauna, Mathematical theory of computation, Wiley inter-science.
6. John Minsky, Theory of computation, PHI.
7. Greenberg M., Introduction to Automata Theory, Addison Wesley.

MCA-405 (ELECTIVE – V) SOFTWARE QUALITY MODELS

Maximum marks: 100 **External:** 80
Time: 3 hours **Internal:** 20

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (objective type/short-answer type questions) covering the entire syllabus and will carry 24 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 14 marks.
Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT-I

Software Quality concepts: Meaning and scope, software quality factors, software quality metrics, relationship between quality factors and quality metrics, quality management system,
Concepts of Quality Control, Quality Assurance, Quality Management - Total Quality Management; Cost of Quality; QC tools, Business Process Re-engineering - Zero Defect, Six Sigma, Quality Function Deployment, Benchmarking, Statistical process control.

UNIT-II

Software measurement: Fundamentals of measurement, Measurements in Software Engineering, Measurement of internal product attributes - size and structure, External product attributes - measurement of quality, Software quality metrics - Software Process, Project and Product Metrics, metrics for software maintenance.

UNIT-III

Software Reliability: Meaning and its relation with software quality, reliability modeling - Jelinski Moranda model, Musa's basic execution time model.
Software Testing: Meaning, scope and relationship with software quality; Functional and structural testing, Ticking Box testing; mutation testing, software testing strategies, alpha, Beta testing etc. Object Oriented Testing: Class Testing, GUI Testing, Object Oriented Integration and System Testing.

UNIT-IV

Quality assurance models: ISO-9000 Series and SEI-CMM standards of software quality assurance. People Capability Maturity Model, Capability Maturity Model Integration, Malcolm Baldrige Award.
Software Quality Assurance related topics
Software Process - Definition and implementation; internal Auditing and Assessments; Software testing - Concepts, Tools, software reviews, formal technical reviews, Inspections & Walkthroughs; correctness proof, statistical quality assurance, clean room software engineering.

Reference Books:

1. Software Quality: Concepts and Plan, By Robert H Dunn, Prentice Hall International.
2. Software Reliability: Measurement, Prediction and Applications, By John D Musa, McGraw Hill.
3. Foundations of Software Testing, Mathur Aditya P., 2008, Pearson Education.
4. Software Reliability Engineering by Michele R Lyu, McGraw Hill.
5. Effective Methods of Software Testing, By William E Perry, Wiley.
6. Concepts of Reliability, By L Srinath.
7. Reliability Engineering, By K K Aggarwal Kluwer Academic Publishers.
8. Software Reliability, By H Koptez.
9. Software testing by Boris Beizer, Academic Press.
10. The Art of Software Testing, 2e, by G.J.Myers, Wiley India Pvt. Ltd.
11. Software Quality by Robert H.Dunn, Prentice Hall.
12. Software Reliability by J. D. Musa, Okumota, Janino, McGraw Hill.

MCA – 501 COMPUTER GRAPHICS

Maximum marks: 100 **External:** 80
Time: 3 hours **Internal:** 20

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (objective type/short-answer type questions) covering the entire syllabus and will carry 24 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 14 marks.
Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT – I

Introduction: Survey of Computer Graphics and its applications, Components and working of Interactive Graphics, Display Processors;
Graphic Devices: Raster scan and Random Scan displays, Resolution, Aspect Ratio, Refresh CRT, Color CRT monitors, LookUp tables, Plasma Panel and LCD monitors, interlacing, grey shades; Interactive Input Devices: keyboard, mouse, trackball, joystick, light pen, digitizing tablet, image scanners, voice system; Hard Copy Devices: printers, plotters;

UNIT – II

Drawing Geometry: Coordinate Systems; Output Primitives: symmetrical and simple DDA line drawing algorithm, Bresenham's line drawing, loading frame buffer; symmetrical DDA for drawing circle, Polynomial method for circle drawing; circle drawing using polar coordinates, Bresenham's circle drawing; generation of ellipse; parametric representation of cubic curves, drawing Bezier curves;
Filling: Stack-based seed fill algorithm, Scan-line seed fill algorithm

UNIT – III

2-D Transformations: translation, rotation, scaling, matrix representations and homogeneous coordinates, composite transformations, general pivot point rotation, general fixed point scaling, shearing; reflection about X Axis and Y Axis; Reflection about Straight lines;, Reflection through an Arbitrary Line;
2-D Viewing: window, viewport; 2-D viewing transformation, zooming, panning; Clipping operations: point and line clipping, Cohen-Sutherland line clipping, mid-point subdivision line clipping, Liang-Barsky line clipping, Sutherland-Hodgman polygon clipping;
Interactive input techniques; pointing and positioning; rubber band technique; dragging;

UNIT – IV

3-D Graphics: 3-D modeling of objects, 3D transformation matrices for translation, scaling and rotation, parallel projection: Orthographic and oblique projection; perspective projection; Hidden surface removal: Z-buffer, scan line, depth-sorting, area subdivision;
Shading: Modelling light intensities, Gouraud shading, Phong shading;
Introduction to animation; Tweening; Morphing;

Text books:

1. Donald Hearn, M. Pauline Baker, Computer Graphics, PHI.

Reference books:

1. D.P. Mukherjee, Fundamentals of Computer Graphics and Multimedia, PHI.
2. Newmann & Sproull, Principles of Interactive Computer Graphics, McGraw Hill.
3. Foley etc., Computer Graphics Principles & Practice, Addison Wesley.
4. Rogers, Procedural Elements of Computer Graphics, McGraw Hill.
5. Anirban Mukhopadhyay, Arup Chattopadhyay, Introduction to Computer Graphics and Multimedia, Vikas.
6. Zhigang Xiang, Roy Plastock, Computer Graphics, Tata McGraw Hill.

MCA-502 LINUX & SHELL PROGRAMMING

Maximum marks: 100 **External:** 80
Time: 3 hours **Internal:** 20

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (objective type/short-answer type questions) covering the entire syllabus and will carry 24 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 14 marks.
Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT – I

Introduction to Linux: Linux distributions, Linux/Unix operating system, Linux/Unix architecture, Features of Linux/Unix, Accessing Linux system, Starting and shutting down system, Logging in and Logging out
Commands in Linux: General-Purpose commands, File oriented commands, directory oriented commands, Communication-oriented commands, process oriented commands, etc.
Regular expressions & Filters in Linux: Simple filters viz. more, wc, diff, sort, uniq, etc., grep, sed. introducing regular expressions.

UNIT – II

Linux/Unix file system: Linux/Unix files, inodes and structure and file system, file system components, standard file system, file system types, file system mounting and unmounting.
Processes in Linux : starting and stopping processes, initialization Processes, mechanism of process creation, rc and init files, job control - at, batch, cron, time, Signal handling.

UNIT – III

Shell Programming: vi editor, shell variables, I/O in shell, control structures, loops, subprograms, creating shell scripts.
Basic system administration in Linux/Unix.

UNIT – IV

The C Environment
The C compiler, compiler options, managing projects, memory management, use of makefiles, dependency calculations, memory management - dynamic and static memory, building and using static and dynamic libraries, using ldd, soname, dynamic loader, debugging with gdb.

Text Books:

1. John Goerzen: Linux Programming Bible, IDG Books, New Delhi.
2. Sumitabha Das, Your Unix - The Ultimate Guide, Tata McGraw-Hill.

Reference Books:

1. Yashwant Kanetkar, Unix & Shell programming – BPB.
2. Richard Petersen, The Complete Reference – Linux, McGraw-Hill.
3. M.G.Venkateshmurthy, Introduction to Unix & Shell Programming, Pearson Education.
4. Stephen Prata, Advanced UNIX-A programmer's Guide, SAMS.

MCA-503 COMPUTER ARCHITECTURE AND PARALLEL PROCESSING

Maximum marks: 100 **External:** 80
Time: 3 hours **Internal:** 20

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (objective type/short-answer type questions) covering the entire syllabus and will carry 24 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 14 marks.
Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT – I

Computer Arithmetic: Hardware implementation and algorithms for addition and subtraction with signed-magnitude data, signed 2's complement data, multiplication for signed-magnitude data, Booth multiplication algorithm, array multiplier, division for signed magnitude data, divide overflow. Hardware implementation and algorithms for floating point addition, subtraction, multiplication and division.
Control Design: Hardwired Control – classical method, one-hot method; Microprogrammed Control – basic concepts and structure of a microprogrammed control unit, horizontal versus vertical microinstruction formats, microinstruction addressing.

UNIT – II

Computational Model: Basic computational models, evolution and interpretation of computer architecture, concept of computer architecture as a multilevel hierarchical framework. Classification of parallel architectures, Relationships between programming languages and parallel architectures
Parallel Processing: Types and levels of parallelism, Instruction Level Parallel (ILP) processors, dependencies between instructions, principle and general structure of pipelines, performance measures of pipeline, pipelined processing of integer, Boolean, load and store instructions, VLIW architecture, Code Scheduling for ILP-Processors - Basic block scheduling, loop scheduling, global scheduling

UNIT – III

Superscalar Processors: Emergence of superscalar processors, Tasks of superscalar processing – parallel decoding, superscalar instruction issue, shelving, register renaming, parallel execution, preserving sequential consistency of instruction execution and exception processing, comparison of VLIW & superscalar processors
Branch Handling: Branch problem, Approaches to branch handling – delayed branching, branch detection and prediction schemes, branch penalties and schemes to reduce them, multiway branches, guarded execution

UNIT – IV

Distributed Memory MIMD Architectures: Solution for memory and synchronization latency, direct interconnection networks, Multicomputer architectures
Shared Memory MIMD Architectures: Dynamic interconnection networks, cache coherence problem and H/W & S/W based protocols, UMA, NUMA, CC-NUMA & COMA models

Text Books:

1. M. Morris Mano, Computer System Architecture, PHI, 2001.
2. Sima, Fountain, Kacsuk, Advanced Compter Architecture, Pearson Education, 1997.

Reference Books:

1. J.P.Hayes, Computer Architecture and Organization, MGH, 1998.
2. Harry F. Jordan, Gita Alaghband, Fundamentals of Parallel Processing, Pearson Education, 2003.
3. D. A. Patterson and J. L. Hennessey, Computer Organization and Design, Morgan Kaufmann, 2002.
4. Hwang & Briggs, Computer Architecture and Parallel Processing, MGH, 1984.

MCA-504 SYSTEM PROGRAMMING AND COMPILER CONSTRUCTION

Maximum marks: 100 **External:** 80
Time: 3 hours **Internal:** 20

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (objective type/short-answer type questions) covering the entire syllabus and will carry 24 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 14 marks.
Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT – I

System Software: Definition, evolution of System Software.
Assemblers: Elements of Assembly language programming, overview of assembly process, design options- one pass assembler & multi pass assembler.
Macro processors: Basic functions, Design options-Recursive macro expansion, General purpose macro processors, Macro processing within language translators.
Loaders & Linkage Editors: Loading, Linking & Relocation, Program relocatibility, Overview of Linkage editing, linking for program overlays.

UNIT – II

Compilers: Phases and passes, analysis-synthesis model of translation, compiler construction tools.
Lexical Analysis: Process of lexical analysis, finite state automata, DFA and NFA, recognition of regular expressions, LEX.
Formal grammars and their application to syntax analysis, BNF notation, ambiguity, YACC. The syntactic specification of programming languages: Context free grammars, derivation and parse trees, capabilities of CFG.

UNIT – III

Parsing Techniques: top down & bottom-up parsing, Shift reduce parsing, operator precedence parsing, predictive parsers Automatic Construction of efficient Parsers: LR parsers, the canonical Collection of LR(0) items, constructing SLR parsing tables, constructing Canonical LR parsing tables, Constructing LALR parsing tables, using ambiguous grammars, an automatic parser generator, implementation of LR parsing tables, constructing LALR sets of items.

UNIT – IV

Intermediate Code Generation: Issues in the design of a code generator, Intermediate languages, generating intermediate code for declarative statement, assignment statement, Boolean expression, and case statement.
Code Optimization: potential cases of code optimization, optimization of basic blocks, loops in flow graphs, code improving transformation.

Text books:

1. Alfred V Aho and Jeffery D Ullman, Principles of Compiler Design, Narosa/Addison Wesley.
2. Dhamdhere D.M, System programming and operating system, (Tata Mc-Graw-Hill).
3. Beck L. Leland, System Software, 3/e, Addison Wesley - 2000.

Reference Books:

1. Aho, Sethi, & Ullman, Compilers Principles, Techniques and Tools, Addison Wesley.
2. Jean Paul Tremblay and Sorenson, The Theory and Practice of Compiler Writing, McGraw Hill.
3. Donovan J. John, System Programming, Tata McGraw Hill.

MCA – 505 (I) CURRENT TRENDS AND TECHNOLOGY

Maximum marks: 100 **External:** 80
Time: 3 hours **Internal:** 20

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (objective type/short-answer type questions) covering the entire syllabus and will carry 24 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 14 marks.
Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT – I

Cluster Computing: Towards low cost computing & motivations, a cluster computer and its architecture, clusters classifications, commodity components for clusters, network services and communication SW, cluster middleware & single system image, resource management & scheduling, cluster applications.
Cloud Computing: Introduction to cloud computing, evolution of cloud computing, architecture, storage & services of cloud computing, pros and cons of cloud computing.

UNIT – II

Mobile Communications: Overview and Architecture; Cellular Network: Components, Architecture, CallSet-Up, Frequency Reuse, Cell Design, Interference, Channel Allocation, Handoff, Mobility Management;
Cellular Network Standards: GSM, CDMA, GPRS; Wireless Application Protocol(WAP); Mobile Ad-hoc and Sensor Networks; WiFi Architecture; Bluetooth Architecture; Mobile IP; Mobile Agents; History and Features of 3G Cellular Network;

UNIT – III

Data warehousing and data mining concepts, Active databases concepts, Temporal database concepts, Spatial Databases, Deductive Databases; Emerging Database technologies : Mobile database, Multimedia databases, Geographic information systems(GIS); XML and Internet Databases: Structured, Semi-structured and Unstructured Data, Introduction to web databases and XML, Structure of XML data.

UNIT – IV

E-Technologies: Ecommerce, Electronic Payment System – digital token, smart cards, credir cards, risks in E-payment systems, Electronic Data Interchange (EDI) – Concepts, Applications, Legal, Security and Privacy issues, EDI and Electronic Commerce, standardization and EDI, EDI software implementation, EDI envelope for message transport, Internet-based EDI.

Text Books:

1. Rajkumar Buyya, High Performance Cluster Computing, Architectures & Systems, Vol.I, Prentice Hall, 1999.
2. Michael Miller, Cloud Computing: Web-based Applications, Que, 2008.
3. Raj Kamal, Mobile Computing, Oxford Higher Education, 2008.
4. Sipra DasBit, Biplab K. Sikdar, "Mobile Computing", PHI, 2009.
5. Elmasri & Navathe: Fundamentals of Database systems, 5th edition, Pearson Education.
6. Korth & Silberschatz: Database System Concept, 4th Edition, McGraw Hill International Edition.
7. Bidgoli Hossein, Electronic commerce: Principles and Practice, Academic Press, 2002.

Reference Books:

1. Jochen Schiller, Mobile Communications", Second Edition, Pearson Education, 2004.
2. William C.Y.Lee, Mobile Cellular Telecommunications", Second Edition, Tata McGraw, 2006.
3. Theodore S. Rapparort, Wireless Communications- Principles and Practice", Second Edition, Pearson Education, 2002.
4. Stomenovic and Cacute, Handbook of Wireless Networks and Mobile Computing", Wiley, 2002.
5. W. Stallings, Wireless Communications and Networks", Pearson Education, 2002.

MCA-505(II) HIGH PERFORMANCE COMMUNICATION NETWORKS

Maximum marks: 100 **External:** 80
Time: 3 hours **Internal:** 20

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (objective type/short-answer type questions) covering the entire syllabus and will carry 24 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 14 marks.
Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT – I

Brief Networking History: Growth of Internet; The need for speed and Quality of Service; IP-Based Internets; ISPs and Internet Backbone;
TCP/IP Protocol Architecture; Operation of TCP and IP; process-to-process delivery; TCP/IP applications; Client/Server paradigm; Virtual circuit and datagram networks; Internetworking; Routers; TCP services and features; TCP connection; TCP flow and congestion control; UDP operation and uses; Internet Protocol (IP); IPv4 addresses; fragmentation; Type of Service; Classful and classless addressing; CIDR; IPv6 and its comparison with IPv4; Format and Headers of IPv6; traffic class, flow label, IPv6 addresses;

UNIT – II

High-Speed Networks: Frame Relay Networks; ATM protocol architecture and ATM cells; High-Speed LAN's;
Address mapping: Address Resolution Protocol (ARP), Reverse Address Resolution Protocol (RARP); Bootstrap protocol (BOOTP); Dynamic Host Configuration Protocol; Domain Name System: Name space; DNS in Internet; Resolution; DNS messages; Types of Records;
Error Reporting: ICMP and its format; Types of messages; Error reporting; Query; Debugging tools;

UNIT – III

FTP Commands and Replies; NFS; SMTP and its comparison with HTTP; MIME;
Internet Routing: Interior and Exterior routing protocols; Autonomous Systems; RIP; OSPF; BGP;
Multicasting: IGMP; Group management; format and operation of IGMP; IGMP messages; Encapsulation; MOSPF;
Introduction to Sockets; Socket Descriptors; Ports and Connection; The Client/Server Model of Communication;

UNIT – IV

Network Security: Security services; cryptography; Message confidentiality with symmetric and asymmetric- key cryptography; Message Integrity: fingerprint, message digest, hash algorithms; Authentication; Digital Signature; Key management; IPSec; SSL/TLS; PGP; Firewalls; Virtual Private Networks;
Quality of Service in IP Networks: Integrated and Differentiated Services; Resource Reservation:RSVP; Multiprotocol Label Switching; Real-Time Transport Protocol;

Text Books:

1. William Stallings, High-Speed Networks and Internets, Performance and Quality of Service, Pearson Education.
2. James F. Kurose, Keith W. Ross, Computer Networking, A Top-Down Approach Featuring the Internet, Pearson Education.

Reference Books:

1. Behrouz A. Forouzan, Data Communications and Networking, Fourth Edition, McGraw Hill.
2. Douglas E. Comer, Internetworking with TCP/IP Volume – I, Principles, Protocols, and Architectures, Fourth Edition, Pearson Education.
3. Mahbub Hassan, Raj Jain, High Performance TCP/IP Networking, Concepts, Issues, and Solutions, Pearson Education.

MCA-505 (III) WINDOWS PROGRAMMING

Maximum marks: 100 **External:** 80
Time: 3 hours **Internal:** 20

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (objective type/short-answer type questions) covering the entire syllabus and will carry 24 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 14 marks.
Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT – I

Windows Programming: Windows programming environment, Window programming fundamentals, Windows data types, the components of a window.
MFC Fundamentals: The MFC Class hierarchy, MFC member functions, MFC global functions.
Windows and messages: Message processing, Message Boxes, Menus

UNIT – II

Controls in Windows Programming: Dialog boxes, check boxes, radio buttons, scroll bar
Working with Icons, Cursors, and Bitmaps
Managing text, painting and repainting

UNIT – III

Working with graphics: The graphics coordinate system, graphics functions, mapping modes and viewports.
Common controls: Toolbar, Up-down control, Slider control, Progress bar, Status bar, Tab control, Treeview controls.

UNIT – IV

The Document & View Architecture: Document/View architecture, Document storage, Creation of framework, Storing and retrieving documents.
Thread based multitasking, ActiveX control, OLE

Text Books:

1. Herbert Schildt, MFC Programming from the ground up, Tata McGraw Hill
2. Charles Petzold, Windows Programming, Microsoft press
3. Shaw & Osier, Teach Yourself MFC in 21 Days, SAMS

Reference Books:

1. Feuer, MFC Programming, Addison Wesley Developers Press
2. David J.Kruglinski, George Shepherd and Scot Wingo: Programming Visual C++, Microsoft press
3. Steve Holtzner, Visual C++ 6 Programming, Wiley Dreamtech India Pvt. Ltd.

MCA – 505 (IV) NEURAL NETWORKS

Maximum marks: 100 **External:** 80
Time: 3 hours **Internal:** 20

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (objective type/short-answer type questions) covering the entire syllabus and will carry 24 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 14 marks.
Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT – I

Introduction, Overview of Biological neurons, Characteristics of Artificial Neural Networks, Learning in Biological systems and machines, Brain and Computers, Differences in simple neurons.
Perceptron and representation, Learning, Linear separability, Problems with the perceptron training algorithms, Multilayer perceptron,

UNIT – II

Backpropagation training algorithm, application of back propagation, Learning difficulties, Applications.
Counter propagation networks, Normal operation, training, Full counter propagation networks, Applications to data compression, Khonen network algorithm, Neighborhoods. Hopfield Nets, Learning, The energy landscape, Storing and recall of patterns, Learning in Boltzman machines, Learning, Applications.

UNIT – III

Statistical methods, Training, Application to general non-Linear optimization problem. Adaptive Resonance Theory, Architecture, Classification, Implementation, Training aids, Characteristics.

UNIT – IV

Associative memory, Bi-directional associative memory, Structure of types. Optical Neural Networks, Vector matrix multipliers, Holographic correlators, Hopfield net using electro optical matrix multipliers and volume holograms. The cognitron structure, Training, Lateral inhibition, The NeoCognitron structure, Generalization, Training, Application of Neural nets, Pattern Recognition, Decision making system, Medical diagnosis. Recent trends in Neural Nets.

Text Books:

1. Philip D Wasserman, Neural Computing – Theory and Practice, Van Nostrand and Reinhold.
2. James A Freeman and David M Skapura, Neural Networks Algorithms, Application and Programming Techniques, Addison Wesley Publishing Company.

Reference Books:

1. Jock. M. Juroda, Artificial Neural Systems.
2. Kevin Gurney, Introduction to Neural Networks, UCL Press.
3. Philip D. Wasserman, Neural Computing and Practice, ANZA Research Inc.
4. Kumar Satish, Neural Networks, Tata McGraw Hill, 2004.

MCA – 505 (V) SOFTWARE PROJECT MANAGEMENT

Maximum marks: 100 **External:** 80
Time: 3 hours **Internal:** 20

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (objective type/short-answer type questions) covering the entire syllabus and will carry 24 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 14 marks.
Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT – I

Software - characteristics-components - crisis on the horizon-software myths, software process, software process models-linear sequential model-prototyping model- RAD model- incremental, spiral, component, assembly and concurrent development models.
Project Management concept: Project, problems with software projects, activities covered by SPM.

UNIT – II

Project schedule planning: Top down and bottom up planning, initial and final project schedule plans, types of activity relationships, estimating the duration of an activity, critical path, identifying milestones, activity responsibility matrix, project check list.
Project Tracking: Overview of project progress, project outlook, occurrence of tracking, tracking meetings, tracking meeting ground rules, recovery plans, the role of escalations.

UNIT – III

Software process and project metrics: - Metrics and indicators- metrics for software quality- integrating metrics within the software process. Software project planning: Planning objectives - software scope-resources software project estimation- Empirical estimation models-COCOMO model. Risk management: software risks-risk identification-risk projection-risk mitigation, monitoring and management- RMMM plan.

UNIT – IV

Project scheduling and tracking: Basic concepts-relation between people and effort, defining task set for the software project-selecting software engineering task-refinement of major task-defining a task network-scheduling-project plan. Software quality assurance-quality concepts-software reviews-formal technical review-Formal approaches to SQA - the ISO 9000 quality standards. Software configuration management: baselines-software configuration item-the SCM process identification of objects in software configuration-version control-change control configuration audit-status reporting-SCM standards.

Text Books:

1. Walker Royce, Software Project management: A unified framework, Pearson Education.
2. Pankaj Jalote., Software Project management in practice, Pearson Education.

References Books:

1. Kelkar, S.A., Software Project management: A concise study, PHI.
2. Hughes Bob and Cottorell Mike, Software Project management, Tata McGraw-Hill.
3. Sommerville I, Software engineering, Addison Wesley.
4. Robert Futrell, Donald F Shafer and Linda I, Quality software project management, Person Education.
5. Pressman, R. S., Software Engineering, Tata McGraw-Hill.
6. Neal Whitten, Managing Software Development Projects, Formula for Success, John Wiley and sons, 2/e, 1995.
7. Watts Humphrey, Managing the Software Process, Addison Wesley.