HIMACHAL PRADESH UNIVERSITY

MASTER OF COMPUTER APPLICATIONS (MCA)
Effective: MCA I year from 2009
MCA II & III year from2010

Duration: 3 Years (6 Semesters)

Eligibility:
Bachelor's degree in any discipline with at least 50% marks (45% in case of SC/ST) from a University established by law in India, with Mathematics at +2 level.

OR

BCA/B. Sc. (IT)/ B. Sc. (Computer Science)/any graduate with computers as one of the subject in all the three years of graduation with at least 50% marks (45% in case of SC/ST) from a University established by law in India.

Age Limit:
Maximum age limit for admission to MCA course is 26 years for general category, 29 years for SC/ST category and 28 years for girl candidates, as on the 1st July of the year concerned. The Vice-Chancellor may permit age relaxation up to a maximum of three months.

Basis of Admission:
The admission to MCA course will be made on the basis of merit of the Entrance Examination (written test) conducted by H.P. University.

Written Test	**130 Marks**	
Duration	**2:00 hours**	

The written test will consist of one paper of 130 marks and of 2 hours duration and shall include the following four sections:

Section	Contents	Marks
A	General logical ability & aptitude	40
B	Mathematics of +2 level	50
C	Basics of Computers and its Awareness	25
D	General English	15
	Total	**130**

The minimum qualifying marks in the Entrance Examination (written test) for subsidized as well as non-subsidized seats will be 35% i.e. 46 marks out of total of 130 marks.

Reservation for MCA:
(a)   50% seats shall be reserved for the graduates of Himachal Pradesh University or H.P. Krishi Vishvavidyalaya or Dr. Y.S. Parmar University of Horticulture and Forestry and the remaining 50% seats, shall be

filled from the open quota, in which the graduates of this University shall also be eligible to compete through competitive test.

(b)   15% and 7.5% of the seats shall be reserved for bonafide Himachali Scheduled Castes and Scheduled Tribes candidates respectively who have passed the qualifying examination from any University established by law in India which is equivalent to the qualifying examination of H.P. University.

(c)   Non-Subsidized seats will be filled as per details given below:

(i)   The admission to the Non-Subsidized seats provided in the courses of M.C.A will be made out of the application on prescribed form accompanied by attested copies of certificates/testimonials/marks cards etc, received in the office of Chairman, Computer Science Department, by the specified last date.

(ii)   The eligibility for admission to the Courses against these seats will be the same as provided for other candidates.

(iii)   The admission to these seats will be made on the merit of marks obtained in the Entrance Test.

(iv)   The non-subsidized seats will be filled with 75% seats being reserved for graduates of universities located in Himachal Pradesh and 25% seats being open for graduates of any University including universities of Himachal Pradesh.

(v)   In case seats in the category of graduates of university of Himachal Pradesh remain unfilled, these may be filled out of the applicants belonging to the other category.

(vi)   If any non-subsidized supernumerary in any of the courses remains unfilled, it will lapse and will not be merged with the subsidized seats.

The pass marks in each course shall be 40% in each written paper and in the internal assessment separately, and 40% in viva-voce, project work and semester course and 50% in the aggregate subject to the conditions that aggregate shall be determined at the end of the examination.

Other rules shall be as per the rules of the university.

Scheme of Examination:

English shall be the medium of instruction and examination.

Theory Papers:

Each paper will be of 100 marks (75 marks for theory exam and 25 marks for internal assessment) and duration of each paper will be 3 hours.

In each theory paper, nine questions are to be set. Two questions are to set from each Unit and candidate is required to attempt at least one question from each unit. Question number nine will be compulsory, which will be of short answer type with 5-10 parts, out of the entire syllabus. In all, five questions are to be attempted.

Practical Examination

Max. Marks: 100 (50 marks for practical and 50 marks for internal assessment).

Duration: 3 hours.

Conduct: Practical exam will be conducted by the external examiner from the panel submitted by Chairman, Department of Computer Science, Himachal Pradesh University and duly approved by the university authority/evaluation branch, Himachal Pradesh University, Shimla.

Project Work:
In 3rd year (sixth semester) the student has to develop one project, which will be evaluated by the external examiner from the panel submitted by Chairman, Department of Computer Science, Himachal Pradesh University, and duly approved by the university authority/evaluation branch, Himachal Pradesh University, Shimla on the following basis:

    System Development Project

System Design	100 Marks
Log Book and Interim Report	100 Marks
Seminars (2)	100 Marks
Project Report (3 + 1 Copies)	200 Marks
Viva-Voce	100 marks
Total	**600 Marks**

In respect of theory papers 25 marks in each paper shall be reserved for award of internal assessment based on such work as assignments/practical/periodical tests/quiz etc.

In respect of practical papers, 50 marks shall be reserved for internal assessment in similar manner.

The marks awarded by the teacher on account of internal assessment in relation to theory/practical paper as mentioned above shall be submitted to the office of Chairman.

In sixth semester, the Chairman/Head of the Department will assign a guide/supervisor, to each candidate for his/her project work. The candidate shall be required to maintain his/her project diary (logbook) of work in the organization. Each student will be required to give at least two seminars on his/her project work. Each student is required to submit three copies of his/her project reports in the Department after completion of the project work which will be evaluated by external examiner.

S. No	Course No.	Paper	Lecture Hrs/ week	Tutorial Hrs/ week	Univ. Exam Marks	Internal Assess- ment
First Year						
Semester 1						
1	MCA-101	Programming Methodologies Using C	3	1	75	25
2	MCA-102	Digital Organization	3	1	75	25
3	MCA-103	Introduction to Organizational Structure & Personnel Management	3	1	75	25
4	MCA-104	PC Packages	3	1	75	25
5	MCA-105	Effective Communication Skills	3	1	75	25
6	MCA-106	Practical-1(C-Language)	6		50	50
7	MCA-107	Practical-2(PC Packages)	6		50	50
Semester 2						
1	MCA-201	Data Structures	3	1	75	25
2	MCA-202	Computer Architecture	3	1	75	25
3	MCA-203	Programming in Visual Basic	3	1	75	25
4	MCA-204	Discrete Mathematics	3	1	75	25
5	MCA-205	Accounting & Financial Management	3	1	75	25
6	MCA-206	Practical-3(Data Structure)	6		50	50
7	MCA-207	Practical-4(Visual Basic)	6		50	50

S. No	Course No.	Paper	Lecture Hrs/ week	Tutorial Hrs/ week	Univ. Exam Marks	Internal Assess- ment
		Second Year				
		Semester 3				
1	MCA-301	Operating System	3	1	75	25
2	MCA-302	Data Communication & Computer Networks	3	1	75	25
3	MCA-303	Data Base Management System	3	1	75	25
4	MCA-304	Software Engineering	3	1	75	25
5	MCA-305	Object Oriented Programming Using JAVA	3	1	75	25
6	MCA-306	Practical-5(DBMS)	6		50	50
7	MCA-307	Practical-6(JAVA)	6		50	50
		Semester 4				
1	MCA-401	Programming Using C#	3	1	75	25
2	MCA-402	Dot NET Technology	3	1	75	25
3	MCA-403	Computer Oriented Optimization Methods	3	1	75	25
4	MCA-404	Internet Technologies & Web Page Designing	3	1	75	25
5	MCA-E05	Elective – I	3	1	75	25
6	MCA-405	Practical – 7 (C#)	6		50	50
7	MCA-406	Practical – 8 (Internet Technologies & Web page design)	6		50	50

S. No	Course No.	Paper	Lecture Hrs/ week	Tutorial Hrs/ week	Univ. Exam Marks	Internal Assess- ment
		Third Year				
		Semester 5				
1	MCA-501	Data Warehouse & Mining	3	1	75	25
2	MCA-502	Computer Graphics	3	1	75	25
3	MCA-503	Fundamentals of Computer Algorithms	3	1	75	25
4	MCA-E04	Elective – II	3	1	75	25
5	MCA-E01	Elective – III	3	1	75	25
	MCA-504	Practical-9 (Computer Graphics)	6		50	50
	MCA-505	Practical-10 (FOCA)	6	1	50	50

S. No	Course No.	Paper	Univ. Exam Marks	
Semester – 6				
1	MCA-601	System Development Project		
	(a)	System Design	100	
	(b)	Log Book and Interim Report	100	
	(c)	Seminars (2)	100	
	(d)	Project Report (3+1 Copies)	200	
	(e)	Viva-Voce	100	

ELECTIVES

S. No	Course	Paper
1	MCA-E01	Artificial Intelligence & Expert Systems
2	MCA-E02	Software Quality and Testing
3	MCA-E03	Automata Theory & Complier Design
4	MCA-E04	Cyber Law
5	MCA-E05	Distributed Data Base Management System
6	MCA-E06	Management of Software Projects
7	MCA-E07	Open Source Software
8	MCA-E08	Image Processing
9	MCA-E09	Distributed Systems
10	MCA-E10	Object-Oriented Software Engineering
11	MCA-E11	Simulation and Modeling

MCA – 101   **Programming Methodologies Using C**   L   T   P
                                                               3   1   6

UNIT – I

Programming Tools- Problem analysis, Program constructs (sequential, decision, loops), Algorithm, Flowchart, Pseudo code, Decision table, Modular programming, Top Down and Bottom up approaches, Concept of High Level Languages, Low Level Languages, Assembly Languages, Assembler, Compiler, Interpreter, Type of errors.

Overview of C- General Structure of C Program, C compilers, Editing, Compiling & , Running of a C program Data types, Constants and Variables, Operators and expressions, Storage Classes, Different types of expressions and their Evaluation, Conditional Expression, Assignment statement, Enumerated data type, Redefining/ Creating data types, Library functions, Type casting.

UNIT – II

Input/Output- Unformatted and formatted I/O Functions (Character and strings I/O, *Scanf ( ), Printf ( )*)

Control Statements- Decision making using *if, if-else, elseif* and *switch* statements, Looping using *for, while* and *do-while* statements, Transferring Program controlling *break* and *continue* statements, Programming examples to illustrate the use of these control statements.

Functions- Defining a function, Local variables, *return* statement, invoking a Function, specifying and passing arguments to a function, Functions returning non Integer, External, static, and register variable, block structure, initialization and recursion.

UNIT – III

Array & strings- Introduction to arrays, Declaring arrays, Initializing, arrays, Processing arrays, Pointers to arrays, Passing arrays as arguments to functions, Introduction to strings, Pointers to strings, Passing strings and Arrays of strings as arguments to a function, Programming examples to illustrate the use of arrays and strings.

Pointers- Definition, Need of pointers, declaring Pointers, Accessing Values via Pointers, Pointer arithmetic, Types of pointers, Programming examples to illustrate the use of pointers.

UNIT – IV

Structures- Declaring a structure type, Declaring Variables of structure type, Initializing Structures, Accessing Elements of structures, arrays of structures, nested structures, Pointers to structures Programming examples to illustrate the use of Structures.

Data files- Definition of data files, different ways of file processing (standard I/O and system I/O), description of various library functions for file handling, updating files, Programming examples to illustrate the use of Data Files.

Text books:

1. Mullis Cooper, "Spirit of C", Jacob Publications.

2. Yashwant Kanetkar, "Let us C", BPB Publications.
3. Kerninghan B.W. & Ritchie D. M., "The C Programming Language", PHI Publications.
4. Yashwant Kanetkar, "Pointers in C", BPB Publications.
5. Gotterfied B., "Programming in C", Tata McGraw Hill Publications.

Note: In each theory paper, nine questions are to be set. Two questions are to be set from each Unit and candidate is required to attempt one question from each unit. Question number nine will be compulsory, which will be of short answer type with 5-10 parts, out of the entire syllabus. In all, five questions are to be attempted.

MCA – 102   **Digital Organization**   L T
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UNIT – I
Data representation, number systems, decimal to binary, octal and hexadecimal conversion and vice versa, binary coded decimal numbers, hamming code for error detection, alphanumeric codes, arithmetic operations, binary addition and subtraction, addition/subtraction of numbers in 1's and 2's complement notation for binary numbers and 9's and 10's complement notation for decimal numbers, binary multiplication and division, BCD arithmetic, floating point addition and subtraction.

UNIT – II
Fundamentals of semiconductor physics- Energy bands in solids- pn-junction diode depletion region, forward and reverse bias, diode as switch; Bipolar Junction Transistor, transistor configurations, bipolar junction transistor (CE configuration) as switch, Saturated and non-saturated logic, Integrated Circuits, characteristics of digital logic families-TTL, ECL, CMOS.

UNIT – III
Logic gates, AND, OR, NOT Gates and their Truth Tables, NOR, NAND & XOR gates, Boolean algebra, Basic Boolean Law's, Demorgan's theorem, Boolean function and their truth tables, MAP simplification, Minimization techniques, K-Map, Sum of Product & Product of Sum, Venn diagram.

UNIT – IV
Combinational & Sequential circuits, Half adder & Full adder, BCD adder, Full Subtractor, Flip-flops-RS, D, JK, T & Master-Slave flip-flops, Shift registers, Multiplexer, Encoder, Decoder.
A/D and D/A converters: D/A conversions – Weighted-Register D/A converter, R-2R ladder D/A converter, A/D conversions-Counter type method using D/A, dual slope integrator method, successive approximation method, simultaneous method.

Text & Reference Books:
1. Rajaraman V. & Radhakrishnan, "An Introduction to Digital Computer Design", PHI.
2. Morris M. M., "Digital Logic and Computer Design", PHI
3. Malvino & Leach, "Digital Principles & Applications", TMH Publications.
4. Jain R.P., "Modren Digital Electronics", TMH Publications.
5. Malvino, "Digital Computer Electronics", TMH Publications.
6. Bartee T.C., "Digital Computer Fundamentals", THM Publications.

Note: In each theory paper, nine questions are to be set. Two questions are to set from each Unit and candidate is required to attempt one question from each unit. Question number nine will be compulsory, which will be of short answer type with 5-10 parts, out of the entire syllabus. In all, five questions are to be attempted.

MCA - 103   Introduction To Organizational Structure & Personnel Management.

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UNIT – I

Organizational structure: Forms of Organizations, Classical theory of organization: Functional approach, Division of labor, Lines of authority, Span of control, Authorities and responsibilities, Efficiency of management, MBO.

UNIT – II

Behavioral theory of Organization: Limitations of formal organization, Human relations, Group behavior, Committee and group decision making, Motivation and responsiveness to stimuli.

Decision process approach: Parts of organization system, Development of corporate strategy, Dynamic of Decision, Roll of system.

Types of models: Mathematical planning models, Deterministic and probabilistic models.

UNIT – III

Personnel management: Personnel function: Its evolution, Objectives, Principles, philosophies and policies, duties and responsibilities of the personnel manager, Position of personnel department in the organization, Line and staff relationship and the changing concept of personnel management in India, Challenges of personnel management.

Manpower planning: Its uses and benefits, problems and limitations, manpower inventory, Manpower forecasting, Job descriptions, Manpower skills analysis and practice in the Indian industries.

UNIT – IV

Recruitment: Job specification, Selection process, Psychological testing interviewing techniques, Transfer, Promotions and its policies, Induction placement and exit into view.

Training and development: Its objectives and policies, Planning and organizing the training department, Training manager and his job, On and off the job training, Techniques, Carrier planning, Objective of Performance, appraisal and its methods, Wage and salary administration, workers participation in management.

Text & Reference Books:

1. Monappa Arun and Salyajain M.S, "Personal Management", Tata Mc.Graw-Hill Publications.
2. Rudrabasavaraj M.N., "Dynamic Personnel Administration", Himalaya Publishing House, Bombay.
3. Torrington and Hall, "Personnel Management: A New Approach", Prentice-Hall International Publications.
4. Hellrigel Don, Solum, John W. and Wooden Richard, W., "Oraganisation Behaviour", Web Publishing Company, New York.
5. Mc Cocmio, E.U., "Human Factor in Engineering in Design", McGraw-Hill Publications, New Delhi.

Note: In each theory paper, nine questions are to be set. Two questions are to set from each Unit and candidate is required to attempt one question from each unit. Question number nine will be compulsory, which will be of short answer type with 5-10 parts, out of the entire syllabus. In all, five questions are to be attempted.

MCA - 104   PC Packages   L   T   P
                                                 3   1   6

UNIT – I

Introduction- Characteristics of Computers, Evolution of Computers, Capabilities and limitations of computers, Block diagram of Computer, Basic components of a computer system- Input unit, Output unit, Arithmetic logic Unit, Control unit, central processing unit, Instruction set, registers, processor speed, type of processors, Memory- main memory organization, main memory capacity, RAM, ROM, EPROM, PROM, cache memory, PCs specifications.

DOS commands (internal (DIR, DATE, TIME, CLS, CD, RD, MD, PATH, TYPE, DEL, ECHO, COPY, REN, PROMPT, VOL, VER), external (ATTRIB, CHKDSK, DISKCOPY, DISKCOMP, XCOPY, TREE, DELTREE, DOSKEY, FORMAT, FIND, SORT, FDISK, MORE, SYS)), Concept of files & directories, Wild card characters, Redirection operators.

UNIT – II

Windows XP, Definition, Benefits, Features & uses of Windows XP, Control panel, Accessories, Task bar, My computer uses, Recycle bin.

Common Office 2003 Elements, Introduction to Office 2003, Customizing the Office Environment, Managing Files in Office, Text Tools, Drawing and Graphics Tools.

Word Processing, Definition, Benefits, Features & uses of Word 2003, Menus, Toolbars, Cursor control keys, Short cut keys, Hot keys, Editing Text, Document Formatting, Reusable formatting with Styles and Templates, File handling (opening, creating, saving, printing, editing), Formatting text, Find and replace, Tables and Columns, Advanced Page Layout in Word, Automating Information with Fields, Managing Long Documents, Spell check, Thesaurus, File protection, Mail Merge, Labels, and Envelopes, Macros.

UNIT – III

Spreadsheets, Definition, Benefits, Features & Uses of MS Excel 2003, Menus, Toolbars, Worksheets, Formatting Worksheets and Restricting Data, Calculating with Formulas and Functions, Ranges, Auto fill, Data (sort, filter, validation, subtotal), Viewing and Manipulating Data with charts and PivotTables, Print, Goal seek, Scenario, Macros, Creating Excel Databases.

UNIT – IV

Presentations, Definition, Benefits, Features & Uses of PowerPoint, Menus, Toolbars, Creating and Editing Slides, Adding graphics, Multimedia, and Special Effects to Slides, Insert (picture, slide, text), Master slide, Views, Animation, Action buttons, Macros, Virus working, feature, types of viruses, virus detection prevention and cure.

Text & Reference Books:

1. Jennifer Ackerman Kettell, Guy Hart-Davis, Curt Simmons, "Microsoft Office 2003: The Complete Reference", Tata McGraw Hill Publications.
2. Biswaroop Roy Choudhary, "Computer Course", Fusion Books.

Note: In each theory paper, Nine questions are to be set. Two questions are to set from each Unit and candidate is required to attempt one question from each unit. Question number Nine will be compulsory, which will be, of short answer type with 5-10 parts, out of the entire syllabus. In all, five questions are to be attempted.

MCA – 105 Effective Communication Skills   L   T
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UNIT – I
Grammar: Use of punctuation marks, articles, prepositions, Idioms & phrases and their usage, Phonetics, Spoken English.
Writing Skills: Guide lines for effective writing; writing styles for application, personal resume, business letter, memo, Technical Report: Style, arrangements, illustration, main section and appendices, conclusion, list references, table of contents, synopsis, revision.

UNIT – II
Reading Skills: Model of reading to learn-P.S.O.R.; Reading, Tactics and strategies; Reading purposes: kinds of purposes and associated comprehension; Reading for meaning; reading outcomes structure of meaning technique, Paraphrase, Summary writing.
Listening Skills: Barriers to listening, Effective listening skills, Feedback Skills. Attending telephone calls, Note taking.
Speaking and Discussion Skills: Components of an effective talk/presentation, Planning and organizing content for a talk/presentation, use of visual aids, effective speaking skills, discussion skills

UNIT – III
Communication Process: Concept and Importance, Definitions & kinds of communication.
System of Communication: Formal and Informal, Barrier to effective communication, Grapevine system of Communication.
Principles of Business communication: Planning and conducting conversations, Interviews and discussion, preparation of oral statements, effective listening, Electronic communication.

UNIT – IV
Written communication: Guides to effective writing, correspondence: including letters and job application, Memorandum, office orders, Reports: Types and preparation, Project Reports.
Non-Verbal Communication: Importance and Type, Cluster and congruency, Kinetics Vocal Cues. Modern Forms of Communication: Telegram, Telex, Fax, Tele-conferences, E-Mail.

Reference Books:
1. Collins Cobuild, "English Grammar".
2. L. Gartside, "Model Business Letters".
3. Robert L Shuster, "Written communication in Business".
4. Ragmond & Pettit, "Business Communication".
5. McGrawth, "Basic Managerial Skills for all".
6. Technical Report Writing, "British Association for Commercial and Industrial Education".
7. Chrisitie Wright, "Handbook of practical communication skills".

Note: In each theory paper, nine questions are to be set. Two questions are to set from each Unit and candidate is required to attempt one question from each unit. Question number nine will be compulsory, which will be of short answer type with 5-10 parts, out of the entire syllabus. In all, five questions are to be attempted.

MCA – 201 Data Structures

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UNIT – I

Preliminaries: Concept & notation, common operation on data structures, algorithm complexity, time-space trade off between algorithm, physical & logical representation of different data structures.

Arrays: Arrays defined, representing arrays in memory, Various operation (traversal, insertion, deletion), Multidimensional arrays, Sequential allocation, Address calculation, Sparse arrays.

Linked List: Definition, type (linear, circular, doubly linked, inverted), representing linked lists in memory, advantages of using linked list over arrays, various operations on Linked list (traversal, insertion, deletion).

UNIT – II

Stacks: Definition & concepts of stack structure, Implementation of stacks, Operation on stacks (push & pop), Application of stacks (converting arithmetic expression from infix notation to polish and their subsequent evaluation, quick sort technique to sort an array, recursion).

Queue: Definition & concept of queues, implementation of queue, operation on queues (insert & delete), Type of queues (circular queue, priority queue).

UNIT – III

Trees Structures: Tree, Binary Trees, Tree Traversal Algorithms (Pre-Order, In-Order, Post-Order), Threaded Trees, Trees in various Sorting & Searching Algorithms & their Complexity (Heap Sort, Binary Search Trees).

Graphs: Description of graph structure, Implementing graphs in memory, Graph traversals (Depth First Searching, Breadth First Searching, Shortest Paths Problems).

UNIT – IV

Storage Management: Fixed block storage allocation, First-fit Storage Allocation, Storage Release, Buddy System, Garbage Collection.

Sorting & Searching: Selection sort, Bubble sort, Merge sort, Radix sort, Quick sort, Sequential search, Linear search and their complexity.

File Structure: Structure and Processing of Sequential, Indexed Sequential and Direct files.

Text Books:
1. Jean Paul Tremblay & Paul G. Sorenson, "An Introduction to Data Structures with Applications", Tata McGraw Hill Publications.
2. Robert L. Kruse, "Data Structures & Program Design", PHI Publications.
3. Horowitz & Sahni, "Fundamentals of Data Structuresin Pascal", Galgotia Publishers.
4. Aho, Hopcroft & Ullman, "Data Structures and Alogorithms", Addison Wesley.
5. Aaron M. Tenenbaum, Yedidyah Langsam, Moshe J. Augenstein, "Data Structures using C", PHI.

6. Nell Dale & Susan C. Lilly, "Pascal Plus Data Structures, Algorithms and Advanced Programming", Galgotia Publications.

Note: In each theory paper, nine questions are to be set. Two questions are to set from each Unit and candidate is required to attempt one question from each unit. Question number nine will be compulsory, which will be of short answer type with 5-10 parts, out of the entire syllabus. In all, five questions are to be attempted.

MCA - 202 Computer System Architecture   L   T
                                                               3   1

UNIT – I
Digital components: integrated circuits, decoders, multiplexers, registers, shift resisters, binary counters, memory unit.
Register transfers & micro-operations: Register Transfer Language, Register transfer, Bus & memory transfers, Arithmetic loops, Logic loops, Shift loops, Arithmetic, logic, shift unit.
Basic computer organization & design: Instruction codes, Computer registers, Computer Instructions, Timing & Control, Instruction cycle, memory reference instruction, I-O interrupt, Design of basic computer, Design of accumulator logic.

UNIT – II
Programming the basic computer: Machine language, Assembly language, Assembler, program loops, programming arithmetic and logic operations, subroutines, input-output programming.
Micro-programmed Control: Control Memory, Address sequencing, Design of control unit.
Central Processing Unit: General Register Organization, Stack organization, Instruction formats (zero, one, two, three), Address Instructions, Addressing Modes (direct, indirect, Immediate, relative, indexed), Data transfer & manipulation, Program control, RISC.

UNIT – III
Pipeline and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline, Vector Processing, Array Processors.
 Computer Arithmetic: Addition & Subtraction, Multiplication algorithms, Division Algorithms, Floating point arithmetic operations, Decimal Arithmetic unit, Decimal Arithmetic operations.

UNIT – IV
IO Organization: Peripheral devices, I/O interfaces, asynchronous data transfer, Modes of Data transfer, Priority Interrupts, DMA, I-O processors, Serial Communication.
Memory Organization: Memory Hierarchy, Main Memory, Associative Memory, Cache Memory, Virtual Memory, Memory management hardware.
Multiprocessors: Characteristics, Interconnection structures: Time shared, Common bus, Multi-port, Crossbar switch, Multistage, Inter-processor arbitration, Inter-processor communication & synchronization, cache coherence.

Text & Reference Books:
1. Morris M. Mano, "Computer System & Architecture", PHI Publications.
2. Stallings & Williams, "Computer Organization & Architecture", Maxwell Macmillan.
3. V.Rajaraman & Radhakrishnan, "Introduction to Digital Computer Design", PHI Publications.

4. P.Pal Chowdhary, "Computer Organization & Design", PHI Publications.

Note: In each theory paper, nine questions are to be set. Two questions are to set from each Unit and candidate is required to attempt one question from each unit. Question number nine will be compulsory, which will be of short answer type with 5-10 parts, out of the entire syllabus. In all, five questions are to be attempted.

MCA – 203 Programming in Visual Basic   L   T   P
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UNIT – I

Visual Basic Overview: Creating a project in visual basic the parts of a visual basic project, visual basic programming conventions-variable scope prefixes, variable prefixes, control prefixes menu and constant prefixes, best coding practices in visual Basic- program design language, coding to get the most from visual basic.

Visual Basic Language: Declaring constants, variable selecting variable types, converting between data types, setting variable scope, verifying data types declaring arrays and dynamic arrays,

UNIT – II

Declaring subroutines, functions, preserving variable values between calls to their procedures, Handling strings, operators and operator precedence, if-else statements, select case, switch ( ) and choose, Looping. Managing forms in Visual Basic: The parts of a form the part of an MDI form Adding toolbar, status bar to the forms, working with multiple form loading, showing and hiding forms, setting the start up form, arrays of forms.

UNIT – III

Coordinating data between MDI child from visual basic menus, command buttons, check boxes, List boxes and combo boxes, scroll bars and sliders, picture boxes and Image control. (**In depth**)

File handling and file control, working with graphics, working with images, creating Active X controls and documents (**In depth**)

UNIT – IV

Visual basic and internet- web browsing, Email, HTTP, FTP and DHTML, creating a web browser, creating a dynamic HTML page, using FTP, using HTTP, creating DHTML pages, (**In depth**)

Multimedia, connecting to the windows API and visual C^{++}, Databases using DAO, RDO, ADO, (**In depth**)

Text & Reference Books:
1. Steven Holzner, "Visual Basic 6 programming", Black Book.
2. Anne Boehm, Mike Murach and Associates, "Murach's Visual Basic 2008", Publisher of Professional Programming.

Note: In each theory paper, nine questions are to be set. Two questions are to set from each Unit and candidate is required to attempt one question from each unit. Question number nine will be compulsory, which will be of short answer type with 5-10 parts, out of the entire syllabus. In all, five questions are to be attempted.

MCA – 204   Discrete Mathematics   L   T
                                                               3   1

UNIT – I

Mathematical Logic: Statements and Notation, Connectives: negation conjunction, disjunction, statement formulas & truth tables, logical capabilities of programming languages, conditional & bi-conditional, well-formed formulas, tautologies, equivalence of formulas, duality law, tautological implications, formulas with distinct truth tables, functionally complete set of connectives, other connectives, two state devices and statement logic; Normal forms: disjunctive normal forms, connective normal forms, principal disjunctive normal forms, principal conjunctive normal forms, ordering and uniqueness of normal forms, completely parenthesized infix notation and polish notation, Theory of inference for the statement calculus; Validity using truth tables, rules of inference, consistency of premises, automatic theorem proving; predicate calculus; predicates, statement function, variables and quantifiers, predicate formulas, free and bound variables, universe of discourse; Inference theory of the predicate calculus; Valid formulas and equivalence, some valid formulas over finite universe, special valid formulas involving quantifiers, theory of inference for the predicate calculus, formulas involving more than one quantifier.

UNIT – II

Relations and Functions: A relational model for databases, properties of binary relations, equivalence relations and lattices, chains and anti-chains
Boolean Algebra: Lattices and algebraic systems, principle of quality, basic properties of algebraic systems defined by lattices, distributive and complimented lattices, Boolean lattices and Boolean algebra, Boolean function and Boolean expressions, switching circuits.

UNIT – III

Trees and Cut-Sets: Trees rooted trees; path lengths in rooted trees; prefix codes; binary search trees; spanning trees and cut-sets; Minimum spanning trees.
Discrete Numeric Functions and Generating Functions: Manipulation of numeric functions, asymptotic behavior of numeric functions, generating functions, combinatorial problems.
Graphs and Planar Graphs: Basic terminology; Multi-graphs and weighted graphs; Paths and circuits; Eulerian paths and circuits; Hamiltonian paths and circuits,

UNIT – IV

Recurrence relations and Recursive algorithms: Recurrence relations, linear recurrence relation with constant coefficients, homogeneous solutions, particular solutions, total solutions, solution by method of generating functions, sorting algorithms
Groups and Rings: Groups, sub-groups, generators and evaluation of powers, co-sets and Lagranges' theorem, permutation groups and Burnsides' theorem, codes and group codes, isomorphism and automorphism,

homomorphism and normal sub-groups, rings, internal domains, fields, definitions and examples of groups, rings and fields.

Text & Reference Books:
1. Tremblay J.P. & Manohar R, "Discrete Mathematical Structure with Applications to Computer Science" (Topics: Mathematical Logic)
2. Liu C.L., "Elements of Discrete Mathematics" (Topics: Graphs and Plainer graphs, Trees & Cut sets, Discrete Numeric functions and generating functions, Recurrence relations and Recursive algorithms, Groups and Rings, Boolean algebra)

Note: In each theory paper, nine questions are to be set. Two questions are to set from each Unit and candidate is required to attempt one question from each unit. Question number nine will be compulsory, which will be of short answer type with 5-10 parts, out of the entire syllabus. In all, five questions are to be attempted.

MCA – 205 Accounting & Financial Management   L   T
                                                           3   1

UNIT – I
Accounting: Principles, concepts and conventions, double entry system of accounting, introduction of basic books of accounts (Journal, Ledger, Cash Book and Subsidiary books), Preparation of trial balance, Bank Reconciliation statements.

UNIT – II
Final Accounts: Trading, profit and loss accounts and balance sheet. Accounting errors and their rectification, Role of computer in accountancy.

UNIT – III
Financial Management: Meaning and role.
Ratio Analysis: meaning, advantages, limitations, type of ratios and their usefulness.
Fund Flow Statement: meaning of the terms- fund flow and fund working capital cycle, preparation and interpretation of the fund flow statement.

UNIT – IV
Costing: Nature, Importance and Basic principles.
Budget and budgetary control: nature and scope, importance, method of finalization of master budget and functional budgets.
Marginal costing: nature, scope and importance, break-even analysis, its uses and limitations, construction of break-even chart, practical application of marginal costing.
Standard costing: Nature and scope, computational and analysis of variances with reference to material cost, labor cost and overhead cost, interpretation of the variances.

Text & Reference Books:
1. Kellock J., "Elements of Accounting", Heinemann.
2. Rockely L.E., "Finance for the Non-Accountant".

Note: In each theory paper, nine questions are to be set. Two questions are to set from each Unit and candidate is required to attempt one question from each unit. Question number nine will be compulsory, which will be of short answer type with 5-10 parts, out of the entire syllabus. In all, five questions are to be attempted.

MCA – 301   Operating System   L   T
                                                           3   1

UNIT – I

Introduction: Definition Of The Operating System, Functions Of An Operating System, Different Types Of Systems - Simple Batch System, Multi-Programmed Batched System, Time Sharing System, Personal Computer Systems, Parallel Systems, Distributed Systems, Real Time Systems, Computer System Structure- operation, I/O structure, storage structure, hardware protection, Operating System Services.

UNIT – II

Process Management: Process- Process Concept, Process Scheduling, Operation On Processes, Cooperating Processes, Threads, Inter-Process Communication, CPU Scheduling–scheduling criteria, scheduling algorithms – FCFS, SJF, priority scheduling, round robin scheduling, multilevel queue scheduling, multilevel feedback queue scheduling, multiple processor scheduling, real time scheduling.
Process Synchronization: The Critical Section Problem, Synchronization Hardware, Semaphores, Classical Problems of Synchronization, Critical Regions.
Deadlocks: Deadlock Characterization, Methods For Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery From Deadlock.

UNIT – III

Memory Management: Logical & physical address space, Swapping, Continuous Allocation (single partition, multiple partition), internal , external fragmentation, Paging, Segmentation, Segmentation With Paging, Virtual Memory, Demand Paging, Performance Of Demand Paging, Page Replacement, Page Replacement Algorithms– FIFO, optimal, LRU, LRU approximation algorithms, counting algorithms Thrashing, Demand Segmentation.
File System Interface: File Concept, Access Methods–sequential, direct, index, Directory Structure–single-level, two–level, tree-structured, acyclic-graph, general graph.

UNIT – IV

File System Implementation: File System Structure, Allocation Methods-contiguous allocation, linked allocation, indexed allocation, Free Space Management-bit vector, linked list, grouping, counting, Directory Implementation–linear list, hash table, Efficiency And Performance, Recovery – consistency checking, backup and restore.
Secondary Storage Structure: Disk Structure, Disk Scheduling, FCFS, SSTF, SCAN, C-SCAN, Look Scheduling, Selection of A Scheduling Algorithm, Disk Management-disk formatting, boot block, bad blocks.
Security: problem, authentication–passwords, program threats, system threats- worms, viruses, threat monitoring, encryption.

Text Books:
1. Silberschatz, Galvin, "Operating System Concepts", Addison Wesley Publishing Company, 1989.

Reference Book:
1. William Stallings, "Operating Systems", Macmillan Publishing Company.
2. Deitel H.M., "An Introduction To Operating System", Addison Wesley Publishing Company, 1984.
3. Tanenbaum, A.S., "Modern Operating System", Prentice Hall of India Pvt. Ltd. 1995.

Note: In each theory paper, nine questions are to be set. Two questions are to set from each Unit and candidate is required to attempt one question from each unit. Question number nine will be compulsory, which will be of short answer type with 5-10 parts, out of the entire syllabus. In all, five questions are to be attempted.

MCA – 302 DATA COMMUNICATION & COMPUTER NETWORKS

L T
3 1

UNIT – I

Data Communication, Network Components, Protocol & Standards, Standard Organization, Topologies, Transmission modes, Categories of Networks, Uses, Applications. The OSI Reference Model: Layered architecture, Functions of layers, TCP/IP reference model, Comparison of OSI & TCP/IP models. Internet, frame relay, ATM, Ethernet, Wireless LAN. Physical layer: Theoretical basis for data communications-Fourier analysis, bandwidth limited signals, maximum data rate of a channel, Guided and wireless transmission media, Communication satellites, Public switched telephone networks, mobile telephone system, Cable television.

UNIT – II

Data Link and Mac Layer: Design issues, Framing techniques, Flow control, Error Control, Error Detecting code and Error Correcting codes, Data link Control and Protocols-- For noiseless Channel – Simplest Protocol, Stop-and-Wait Protocol, For Noisy Channel-- Stop-and-Wait ARQ, Go-Back-N ARQ, and Selective-Repeat ARQ Protocol, HDLC Protocol, and PPP Protocol, Multiple Access-- Random Access-- MA, CSMA, CSMA/CD, CSMA/CA, Controlled Access—Reservation, Polling, Token passing, Channelization-- FDMA, TDMA, CDMA, and IEEE standards-- 802.3 (Ethernet), 802.4 (Token Bus), 802.5 (Token Ring), 802.11(Wireless LAN), 802.15 (Bluetooth).

UNIT – III

Network and transport Layer: Network layer design issues, Addressing, Routing algorithms-shortest path routing, flooding, distance vector routing, link state routing, hierarchical routing, broadcast routing, multicast routing, routing for mobile hosts, Congestion Control algorithms – congestion prevention policies, congestion control in virtual circuit & datagram sub-networks, definition of quality of service, Internetworking – Tunneling, internet-work routing, fragmentation, Network layer in Internet –IP protocol, IP Address, OSPF, BGP, Internet multicasting, Mobile IP, Ipv6,Transport Layer: Concept of transport service, elements of transport protocols, A simple transport protocol, Remote procedure call, Performance issues in computer networks.

UNIT – IV

Application layer services protocols & Network Security: DNS, SMTP, FTP, TELNET, HTTP,WWW, Attacks on Computers & Computer security-- Need for security, approaches, principles, types of attacks, Cryptography concept and techniques, Symmetric Key algorithms-- (DES), Asymmetric key algorithms-- RSA, Digital signature , Firewalls. Internet radio, VoIP, E-mail security, Web security, social issues in network security,

Reference Books:
1. B.A. Forouzan, "Data Communication & Networking", 4th Edition Tata Mcgraw Hill.
2. A.S. Tanenbaum, "Computer Networks", Prentice Hall, 1992, 4th

edition.

3. William Stallings, "Data & Computer Communication", McMillan Publishing Co.
4. Black, "Data Networks", PHI, 1988.
5. Fred Halsall, "Data Communications, Computer Networks", Pearson Education.

MCA – 303   Data Base Management System   L   T   P
                                                      3   1   6

UNIT – I

Basic Concepts, Data Modeling for a Database, Records and Files, Abstraction and Data Integration, The Three-Level Architecture Proposal for DBMS, Components of a DBMS, Advantages and Disadvantages of a DBMS.
Data Models, Data Associations, Data Models Classification, Entity Relationship Model, Relational Data Model, Network Data Model, Hierarchical Model.
File Organization, Serial Files, Sequential Files, Index-Sequential Files, Direct File, Secondary Key Retrieval, Indexing Using Tree Structures.

UNIT – II

The Relational Model, Relational Database, Relational Algebra, Relational Calculus.
Relational Database Manipulation, SQL, Data Manipulation, Basic Data Retrieval, Condition Specification, Arithmetic and Aggregate Operators, SQL Join: Multiple Tables Queries, Set Manipulation, Categorization, Updates, Views: SQL, QUEL, Data Definition, Data Manipulation; QUEL, Condition Specification, Renaming, Arithmetic Operators, Multiple Variable Queries, Aggregation Operators in QUEL, Retrieve into Temporary Relation, Updates, Views.

UNIT – III

Relational Database Design, Relational Scheme and Relational Design, Anomalies in a Database: A Consequence of Bad Design, Universal Relation, Functional Dependency, Relational Database Design.
The Network Model, The Network Data Model, DBTG Set Construct and Restrictions, Expressing an M: N Relationship in DBTG, Cycles in DBTG, Data Description in the Network Model, Schema and Sub schema, DBTG Data Manipulation Facility.
The Hierarchical Data Model, The tree Concept, Hierarchical Data Model, Data Definition, Data Manipulation, Updates, Implementation of the Hierarchical Database.

UNIT – IV

Concurrency Management, Serializability, Concurrency Control, Locking Scheme, Timestamp-Based Order, Optimistic Scheduling, Multiversion Techniques, Deadlock and Its Resolution.
Database Security, Integrity, and Control, Security and Integrity, Threats, Defense Mechanisms, Integrity .

Text Books:
1. Desai, B., "An Introduction To Database Concepts", Galgotia Publications, New Delhi.

Reference Books:
1. Date C.J., "An Introduction to Database Systems", Narosa Publishing House, New Delhi.

2. Elimsari And Navathe, "Fundamentals of Database Systems", Addison Wesley, New York.
3. Ullman, J.D, "Principals of Database Systems", Galgotia Publications, New Delhi.

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MCA – 304   Software Engineering   L   T
                                                        3   1

UNIT – I

Evolving Role of Software, Software Engineering, Changing nature of Software, Software Myths, Terminologies, Role of management in software development

Software Process and desired Characteristics, Software Life Cycle Models: Build & Fix Model, Water Fall Model, Incremental Process Model, Evolutionary Process Models, Unified Process, Comparison of Models, Other Software Processes, Selection of a Model

Software Requirements Analysis & Specifications: Requirements Engineering, Types of Requirements, Feasibility Studies, Requirements Elicitation, Requirements - Analysis Documentation, Validation and Management

UNIT – II

Software Architecture: Its Role, Views, Component & Connector View and its architecture style, Architecture Vs Design, Deployment View & Performance Analysis, Documentation, Evaluation

Software Project Planning: Size estimation, Cost Estimation, COCOMO, COCOMO – II, Software Risk Management

UNIT – III

Function Oriented Design: Design principles, Module level Concepts, Notation & Specification, Structured Design Methodology, Verification

Object-Oriented Design: OO Analysis & Design, OO Concepts, Design Concepts, UML – Class Diagram, Sequence & Collaboration Diagram, Other diagrams & Capabilities, Design Methodology – Dynamic and Functional Modeling, Internal Classes & Operations

Detailed Design: PDL, Logic/Algorithm Design, State Modeling of Classes, Verification – Design Walkthroughs, Critical Design Review, Consistency Checkers

UNIT – IV

Coding: Programming Principles & Guidelines, Coding Process, Refactoring, Verification

Software Metrics: What & Why, Token Count, Data Structure Metrics, Information Flow Metrics, Object-Oriented Metrics, Use Case Oriented Metrics, Web Engineering Project Metrics, Metric Analysis

Software Maintenance & Certification: Maintenance, Maintenance Process and Models, Estimation of Maintenance Costs, Regression Testing, Reverse Engineering, Software Re-engineering, Configuration Management, Documentation, Requirements of Certification, Types

Text Books:
1. Pankaj Jalote, "An Integrated Approach to Software Engineering", 3rd Edition, Narosa Publishing House, 2005.
2. K.K. Aggrawal and Yogesh Singh, "Software Engineering", 3rd Edition, New Age International (P) Ltd, 2008.

Reference Books:
1. Pressman, R.S., "Software Engineering – A Practitioner's Approach", Third Edition, McGraw Hills, 2008.
2. Mall Rajib, "Fundamentals of Software Engineering", PHI, New Delhi, 2005.

Note: In each theory paper, nine questions are to be set. Two questions are to set from each Unit and candidate is required to attempt one question from each unit. Question number nine will be compulsory, which will be of short answer type with 5-10 parts, out of the entire syllabus. In all, five questions are to be attempted.

MCA – 305   Object Oriented Programming with JAVA   L T P
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UNIT – I
Introduction To Object Oriented Programming: Data Abstraction, Encapsulation, Inheritance (Public, Protected And Private), Polymorphism, Information Hiding.
Java Elements: Data Types, Literal and Variables, Operators–Arithmetic, Bit-wise, Relational, Boolean Logical, Assignment, The '?' Operator, Operator Precedence, Control Statements–Selection (if, switch), Iteration Statements (while, do-while, for) Jump Statements (break, continue, return), Arrays (One-dimensional, Multi-Dimensional).

UNIT – II
Introducing Classes: Class Fundamentals, Declaring Objects, Methods, Constructors, 'This' Keyword, Over loading Methods.
Inheritance: Inheritance Basics, Protected Members, Method Overriding, Multiple Inheritance, Template Classes and Functions.
Exception Handling: Fundamental, Exception Types, Uncaught Exceptions, Try And Catch, Dealing With Exceptions (try, throw, throws, finally).

UNIT – III
Java Applets: Applet Basics, The Applet Class, Applet Architecture, An Applet Skeleton, Applet Display Methods, Handling Events.
Advanced Java Programming: Multithreading–Java Thread Model, The Main Thread, Creating a Thread, Creating Multiple Threads, Thread Priorities, Synchronization, Inter-thread Communication, Multithreading.

UNIT – IV
Abstract Window Toolkit (AWT): Introduction, AWT classes, Window fundamentals, Working with frame windows, Creating frame window in an applet, Working with graphics, Working with colours, Working with fonts, Managing text output using FontMetrics.
AWT Controls: Introduction, Adding & removing Controls, Responding to controls, The HeadlessException, Labels, Buttons, Checkboxes, Choice Controls, Lists, Scroll Bar, TextField, TextArea, Layout Managers, Menu Bars And Menus, Dialog Boxes, FileDialog, Event handling by extending AWT Components.

Text Book:
1. Patrick Naughten & Herbert Schildt, "The Complete Reference Java", Seventh Edition, Tata McGraw Hill.

Reference Books:
1. Gilbert, Stephan D. And William B. Hccarthy, "Object Oriented Programming in Java", 1997, The Waite Group Press.
2. Mary Compoine And Kathy Walrath, "The Java Turtorial", Addison-Wesley, 1996.
3. Horstmann, Cay S. And Gary Cornell, "Core Java 1.1: Fundamentals", Addison – Wesley, 1997.

Note: In each theory paper, nine questions are to be set. Two questions are to set from each Unit and candidate is required to attempt one question from each unit. Question number nine will be compulsory, which will be of short answer type with 5-10 parts, out of the entire syllabus. In all, five questions are to be attempted.

MCA – 401   Programming Using C#   L   T   P
                                                      3   1   6

UNIT – I
Introducing C#
Understanding .NET: The C# Environment
Overview of C#
Literals, Variables and Data Types
Operators and Expressions

UNIT – II
Decision Making and Branching
Decision Making and Looping
Methods in C#
Handling Arrays
Manipulating Strings
Structures and Enumerations

UNIT – III
Classes and Objects
Inheritance and Polymorphism
Interfaces: Multiple Inheritance
Operator Overloading
Delegates and Events

UNIT – IV
Managing Console I/O Operations
Managing Errors and Exceptions
Multithreading in C#
Windows and Web-based Application Development on .NET

Text Book:
Patrick
1. E. Balagurusamy, "Programming in C#", ISBN: 9780070667570, Tata McGraw Hill, 2007.

Reference Books:
1. Herbert Schildt, "C# 3.0: A Beginner's Guide", ISBN: 9780070248946, Tata McGraw Hill, 2008.
2. Herbert Schildt, "C# 3.0: The Complete Reference", 3rd Edition, ISBN: 9780070140806, Tata McGraw Hill, 2008.

Note: In each theory paper, nine questions are to be set. Two questions are to set from each Unit and candidate is required to attempt one question from each unit. Question number nine will be compulsory, which will be of short answer type with 5-10 parts, out of the entire syllabus. In all, five questions are to be attempted.

MCA – 402   Dot Net Technologies   L   T
                                                                     3   1

UNIT – I:

Introducing .NET: Microsoft web development, Move from workstation to distributed computing, Internet factor, importance of.net platform- OS neutral environment, device independence, wide language support, internet based component services.

.NET framework: Common language runtime(CLR), code management and execution, security support, error handling and garbage collection,.net framework class libraries-System classes, data and XML classes, windows form and drawing classes, web classes.

Features of .NET framework: ASP.NET web forms and web services- Web page authoring & server controls, ASP.NET infrastructure.

UNIT – II:

VB.NET : Introduction, statement, lines, comments, operators, procedures, variables- implicit, explicit, constants, parameters, arrays,   branching, looping, objects, classes, inheritance, accessibility of inherited properties and methods, overriding methods.

System class, working with numbers, manipulating strings, DateTime arithmetic, converting values, formatting values, managing arrays.

Namespace and assemblies, Relating namespaces and DLL assemblies, creating assemblies, importing assemblies, using imported assemblies, compiling with imported namespace.

UNIT – III:

ASP.NET Web Forms: Web forms code model, In-page vs. Code-behind format, web form object life cycle, handling client side events on the server, web form event handling, define and respond web form control events, AutoPostBack property, automatic state management with web forms.

HTML sever control: definition, RunAt sever attribute, HTML control class, General controls-Anchor, image, form, division, span, Table control, Input Control.

Web server Control: Web Control class, General control- Hyperlink, link button, image, label, Panel, Form Controls, Table controls.

UNIT – IV:

Web form List Control: Simple List controls, Template List controls.

Validation Controls: Definition, properties and methods of validation controls, validation controls - RequiredFieldValidator, CompareValidator, RangeValidator,   RegularExpressionValidator,   CustomValidator, ValidationSummary.

User Controls: Definition, Markup-Only User Control, Custom properties, handling events and loading user controls dynamically.

Text Book:

1. Michael Amundsen, Paul Litwin, "ASP.NET for developers", SAMS Publishing.

Reference Books:
1. Bill Evjen, Scott Hanselman, Devin Rader, Farhan Muhammad, S. Srinivas Sivakumar, "Professional ASP.Net 2.0", Wiley India Edition.
2. Joe Duffy, "Professional .Net Framework 2.0", Wiley India Edition.

Note: In each theory paper, nine questions are to be set. Two questions are to set from each Unit and candidate is required to attempt one question from each unit. Question number nine will be compulsory, which will be of short answer type with 5-10 parts, out of the entire syllabus. In all, five questions are to be attempted.

MCA – 403   Computer Oriented Optimization Methods   L   T
                                                          3   1

UNIT – I

Introduction to O.R. – Definition, Uses and Limitations of Optimization method.The Linear Programming Problem: Introduction, Formulation Of LPP, Graphical Solution And Some Exceptional Cases, Canonical And Standard Form Of LPP.

The Simplex Method: Solution of LPP By Simplex Method, Exceptional Cases, Artificial Variable Techniques (Big M), Two Phase Of Simplex Method, Problem of Degeneracy.

UNIT – II

The Dual Simplex Method: Dual And Primal Problem, Duality And Simplex Method, dual simplex method,Revised Simplex Method, Solution Of LPP Using Revised Simplex Method. Networking Scheduling By PERT/CPM: Introduction, Basic Concepts, Constraints In Network, Construction Of The Network, Time Calculation In Networks, Critical Path Method (CPM), PERT, PERT Calculation, Advantage Of Network (PERT/CPM).

UNIT – III

The Transportation Problem: Introduction, Basic Feasibility Solution, Standard Transportation Problem, Balanced Transportation Problem, Multicommodity Transportation Problem, Row Minimum, Column Minimum, Matrix Minimum Method, Vogel Approximation Method (VAM), Optimality In Transportation Problem,(stepping stone and modified distribution methods) Degeneracy In Transportation Problem, Assignment And Routing Problem.

UNIT – IV

Game theory: Significance, essential features and limitations; Maximax and minimax principle, Game with pure & mined strategies, sul-game method (caseof 2xn or mx2 methods), Probability method, graphic method, algebraic method

Inventory Control: Introduction, Inventory Control, Selective Control Techniques, ABC Analysis Procedure, Economics Lot Size Problems, Problem of EQQ With shortage, Inventory Control Techniques Uncertain Demand, Stochastic Problems.

Text Book:
1. Kanti Swarup, P.K. Gupta and Manmohan, "Operations Research", Sultan Chand & Sons.New Delhi.

Reference Books:
1. H.A. Taha, "Operation Research - An Introduction", Macmillan Publications.
2. S.D. Sharma, "Operation Research", Kedar Nath Ram Nath & Company, Meerut.
3. K.K. Chawla, Vijay Gupta, Bhushan K Sharma, "Operations Research: Quantization Analysis for Management", Kalyani Publishers, Kolkata.
4. V.K. Kapoor, "Operation Research", Sultan Chand & sons, New Delhi.

Note: In each theory paper, nine questions are to be set. Two questions are to set from each Unit and candidate is required to attempt one question from each unit. Question number nine will be compulsory, which will be of short answer type with 5-10 parts, out of the entire syllabus. In all, five questions are to be attempted.

MCA – 404   Internet Technologies & Web Page Designing   L T P
                                                               3 1 6

Unit – I

Introduction: Internet, World Wide Web, Web Browser, Web Server, Uniform Resource Locator, Multipurpose internet mail extension, Hypertext Transfer Protocol, Security.

XHTML: History of HTML & XHTML, XHTML- Syntax, Document structure, Text mark-up, Images, Hypertext links, Lists, Tables, Forms, Frames.

Cascading Style Sheets: Introduction, Levels of style sheets, Style specification format, Selector, Forms, Property value form, Font properties, List properties, Colour, Alignment, Box model, Background Images, <span> & <div> tags.

Unit – II

JavaScript: Introduction, Object orientation and JavaScript, Syntactic features, Primitives, Operations & Expressions, Output & Input, Control statements, Object creation and modification, Arrays, Functions, Constructors, Pattern matching using regular expressions.

JavaScript execution environment, Document Object Model, Element access in JavaScript, Event, Event handling- Body elements, Button elements, Textbox, Password elements. DOM2 event model.

Dynamic documents- Positioning elements, Moving elements, Element visibility, Changing colours & fonts, Dynamic content, Stacking elements, Locating the mouse cursor, Reacting to a mouse click, Dragging & doping elements.

Unit – III

XML: Introduction, Syntax, Document structure, Document type definition, Namespaces, XML schemas, Displaying raw XML documents, Displaying XML documents with CSS, XSLT style sheets, XML processor.

Perl: History, Applications, Scalars, Assignment statement, Control statements, Arrays, Hashes, References, Functions, Pattern matching, File input & output.

Using Perl for CGI programming: Common Gateway Interface, Linkage, Query string format, CGI.pm module, Cookies.

Unit – IV

Servlets & Java Server Pages: Introduction, Servlet details, Storing information on clients, Java Server Pages.

PHP: History, Applications, Syntactic features, Primitives, Operations & Expressions, Output, Control statements, Arrays, Functions, Pattern matching, Form handling, Files, Cookies.

Text Book:

1. Robert W. Sebesta, "Programming with World Wide Web", Pearson Education.

Reference Books:

1. Jamsa, "Html & Web Design: Tips & Techniques", Tata McGraw Hill.

2. Karl Barksdale, E. Shane Turner, "HTML, JavaScript, and advanced Internet technologies BASICS", Cengage Learning.

Note: In each theory paper, nine questions are to be set. Two questions are to set from each Unit and candidate is required to attempt one question from each unit. Question number nine will be compulsory, which will be of short answer type with 5-10 parts, out of the entire syllabus. In all, five questions are to be attempted.

MCA – 501   Data Warehousing and Data Mining   L   T

                                                          3   1

UNIT – I

Introduction: DSS, Data warehouse Architecture, Data Staging & ETL, Multidimensional Model, Meta data, Accessing data warehouse, ROLAP, MOLAP, HOLAP

System Lifecycle: Risk factors, Top-down, Bottom-up, Data mart design phases, Methodological framework, Testing data marts

Data Sources: Inspecting and normalizing schemata, Integration problems, Integration phases, Mapping

User Requirements & Conceptual Modeling: Glossary based requirements analysis, Goal-oriented requirements analysis, Dimensional Fact Model, Advanced modeling, Events and Aggregation, Time, Formalizing the dimensional fact model

Conceptual Design: ER schema based design, Relational schema based design, XML schema based design, Mixed approach design

UNIT – II

Logical Modeling & Design: MOLAP, HOLAP & ROLAP systems, Views, Temporal scenarios, Fact schemata to star schemata, View materialization, View Fragmentation, Populating - reconciled databases, dimension tables, fact tables & materialized views, Cleansing data

Data Warehouse Components: Overall architecture, database, Sourcing, acquisition, cleanup and transformation tools, Metadata, Access tools, Administration and management, Info delivery System

Building a Data Warehouse: Considerations - business, design, technical & implementation, Integrated solutions, Benefits

UNIT – III

Mapping Data Warehouse to a Multiprocessor Architecture: Relational database technology, Database architectures for parallel processing, Parallel RDBMS features and vendors

DBMS Schemas & Decision Support: Data layout for best access, Multidimensional data models, Star schema

Data Tools and Metadata: Tool requirements, Vendor approaches, Access to legacy data, Transformation engines, Metadata - definition, interchange initiative, repository, trends, Reporting & Query Tools – categories

OLAP: Need, Multidimensional data model, guidelines, Multidimensional Vs multirelational OLAP, Categorization of OLAP tools

UNIT – IV

Introduction: Data mining, Measuring effectiveness, Discovery Vs prediction, Overfitting, Comparing the technologies, Decision trees, Where to use them, General idea, How do they work, Strengths and weaknesses

Techniques and Algorithms: Neural networks - uses, making predictions, different kinds, Kohonen feature map, their working, Nearest Neighbour & Clustering – uses, predictions and differences, their working, Genetic Algorithms – uses, cost minimization, cooperative strategies, their working,

Rule Induction – uses, evaluation of rules, rules Vs decision trees, their working, Using the right technique, Data mining & business process

Text Books:
1. Data Warehousing, Data Mining & OLAP, Alex Berson & Stephen J. Smith, Tata McGraw-Hill, 2009.
2. Data Warehouse Design: Modern Principles and Methodologies, Matteo Golfarelli, Stefand Rizzi, Tata McGraw-Hill, 2009.

Reference Books:
1. Decision support and data warehouse systems, Efrem Mallach, Tata McGraw-Hill, 2009.
2. The Data Warehouse Lifecycle Toolkit: Practical Techniques for Building Data Warehouse and Business Intelligence Systems, John Wiley & Sons, 2008

Note: In each theory paper, nine questions are to be set. Two questions are to set from each Unit and candidate is required to attempt one question from each unit. Question number nine will be compulsory, which will be of short answer type with 5-10 parts, out of the entire syllabus. In all, five questions are to be attempted.

MCA – 502   **Computer Graphics**   L   T   P
                                                        3   1   6

UNIT – I
Introduction: Definition Of Computer Graphics And Its Applications, Video Display Devices- Raster-Scan Displays, Random-Scan Displays, Color CRT Monitors, Direct View Storage Tubes, Flat Panel Displays Input Devices: Keyboard, Mouse, Trackball and Spaceball, Joysticks, Digitizers, Image Scanners, Touch Panels, Light Pens, Voice Systems.

UNIT – II
Output Primitives: Line Drawing Algorithms (DDA, Bresenhaum's Circle) Generating Algorithm: Midpoint Circle Drawing Algorithm, Ellipse Generating Algorithm, Midpoint Ellipse Generating Algorithm, Character Generation, 2D Transformations: Translation, Rotation, Scaling, Reflection, Shear, Composite Transformation-Translation, Rotations, Scaling.

UNIT – III
Two Dimensional Viewing: Window-To-Viewport Coordinate Transformation, Clipping Operations, Point Clipping, Line Clipping–(Cohen-Sutherland Line Clipping, Liang-Barsky Line Clipping, Nicholl-Lee-Nicholl Line Clipping), Polygon Clipping–(Sutherland-Hodgeman Polygon Clipping, Weiler-Atherton Polygon Clipping), Curve Clipping, Text Clipping.
Three Dimensional Concepts: Three Dimensional Display Methods–Parallel Projection, Perspective Projection, Surface Rendering.
Three Dimensional Transformations: Translation, Rotation, Scaling, Reflection, Shear.

UNIT – IV
Curves and Surfaces: Bezier Curves, B-Spline Curves, Fractal Geometory Methods, Octrees.
Visible-Surface Detection Methods: Back Face Detection, Depth Buffer Method, A-Buffer Method, Scan Line Method, Depth Sorting Method.
Concept of Shading: Modeling Light Intensity, Diffuse And Specular Reflection, Refracted Light, Concept Of Shading Methods.

Text Book:
1. Donald Hearn & M. Pauline Baker, "Computer Graphics." Prentice Hall India.

Reference Books:
1. F. S. Hill Jr., "Computer Graphics", Macmillan Publishing Company.
2. David F. Rogers, "Procedural Elements for Computer Graphics", Tata MacGraw Hill.

Note: In each theory paper, nine questions are to be set. Two questions are to set from each Unit and candidate is required to attempt one question from each unit. Question number nine will be compulsory, which will be of short answer type with 5-10 parts, out of the entire syllabus. In all, five questions are to be attempted.

MCA – 503   Fundamentals of Computer Algorithm   L T P
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UNIT – I

Introduction: Definition, How to Analyze Algorithms, Elementary Data Structures-Stacks and Queues, Trees, Heaps and Heap Sort, Sets and Disjoint Set Union Graphs, Hashing.

UNIT – II

Divide and Conquer: The General Method, Merge Sort, Quick Sort, Finding the Maximum and Minimum, Selection sort.
The Greedy Method: The General Method Knapsack Problem, Job Sequencing With Deadlines, Minimum Spanning Trees, Single Source Shortest Paths.

UNIT – III

Dynamic Programming: The General Method Multistage Graphs, All Pairs Shortest Paths, Optimal Binary Search Trees, 0/1 Knapsack, Reliability Design, Traveling Salesperson Problem, Flow Shop Scheduling.
Basic Search and Traversal Techniques: The Techniques Code Optimization and/or Graphs, Game Trees, Bi-Connected Components And Depth First Search.

UNIT – IV

Back Tracking: The General Method, The 8 Queens Problem, Sum Of Subsets, Graph Coloring, Hamiltonian Cycles.
NP Hard And NP Complete Problems- Basic Concepts , Cooks Theorem NP Hard Graph Problems , NP Hard Scheduling Problems , NP Hard Code Generation Problems.

Text Book:
1. Ellis Horowitz, Sartaj Sahni, "Fundamental Of Computer Algorithms".

Reference Books:
1. Aho, Hopcroft, Ullman", The Design And Analysis Of Computer Algorithms".
2. Sara Basse, "Computer Algorithms – An Introduction to Design and Analysis".

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Electives

MCA - E01   Artificial Intelligence and Expert Systems   L   T
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UNIT – I
Overview Of A.I.: Definition Of AI, The Importance Of AI, Previous Works In The History Of AI, AI And Related Fields, Problems, Problem Spaces And Search. Knowledge: General Concepts –Definition and Importance of Knowledge, Knowledge-Based Systems, Representation Of Knowledge, Knowledge Organization, Knowledge Manipulation, Acquisition Of Knowledge.

UNIT – II
Formalized Symbolic Logics – Syntax And Semantics For Propositional Logic, Properties of Wffs, Conversion To Clausal Form, Inference Rules, Resolution. Dealing With Inconsistencies - Truth Maintenance Systems, Symbolic Reasoning under Uncertainty, Statistical Reasoning. Structural Knowledge – Graph, Frames and Related Structures.

UNIT – III
Natural Language Processing: Overview of Linguistics, Grammer and Languages, Syntactic Processing, Semantic Analysis, Morphological, Discourse and Pragmatic Processing, Natural Language Generation, Natural Language Systems.

UNIT – IV
Pattern Recognition: Introduction, Recognition and Classification Process, Learning Classification Pattern, Recognizing and Understanding Speech. Expert Systems: Definition, Rule Based System Architecture, Non-Production System Architecture, Basic Components of E.S.

Text Book:
1. Dan W. Patterson, "Introduction to Artificial Intelligence and Expert Systems." Prentice-Hall, India.

Reference Books:
1. A.Rich and K. Knight, "Artificial Intelligence", Tate McGraw Hill.
2. E. Charnaik And D.Mcdermott, "Introduction To Artificial Intelligence ", Addison-Wesly Publishing Company.

Note: In each theory paper, nine questions are to be set. Two questions are to set from each Unit and candidate is required to attempt one question from each unit. Question number nine will be compulsory, which will be of short answer type with 5-10 parts, out of the entire syllabus. In all, five questions are to be attempted.

MCA - E02   Software Quality & Testing   L T
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UNIT – I

Software and Quality Concept: Objectives, overview, Software perspective, Software Quality, Software Quality Assurance, Software Quality models, Software Quality measurement and metrics.

Assuring Software Quality Assurance (SQA): Objectives, goals, responsibilities, life cycle, SQA planning, SQA monitoring and controlling, testing, setting standards and procedures, Developing and controlling relevant metrics, SQA activities- revision, process evaluation, software standards.

UNIT – II

Software Quality Meterics: Objectives, Software metrics, Software Quality metrics framework, Software Quality metrics features, Development of software quality metrics- SATC's approach, Kitchenham's approach, Abreu's approach, Victor's approach, Selection of Software Quality metrics- Size related metrics, complexity metrics, Halstead metrics, quality metrics.

Software Quality Models: Objectives, Hierarchical model- factor-criteria-metrics model, McCall's model, Boehm model, ISO 9126 model, Dromey's Quality model, Non-hierarchical model-Bayesian belief networks, star model, capability maturity models.

UNIT – III

Software Testing: Introduction, Definition (testing, fault, error, failure, bug, mistake), test oracle, test case, Process, Limitations of Testing.

Functional Testing: Boundary Value Analysis- Introduction & Definition, Generalising, limitations, Robustness testing, Worst case testing, Test cases.

Equivalence Class Testing - Introduction & Definition, Weak normal, strong normal, Weak robust, Strong robust, Test cases.

Decision Table Based Testing- Introduction & Definition, technique, test cases.

UNIT – IV

Structural Testing: Path testing - Introduction & definition, DD-path, Test coverage metrics, McCabe's basis path method, its observations and complexity.

Data Flow Testing: Definition, data flow graphs, data flow model, Data flow testing strategies.

Levels of Testing: Traditional view of testing levels, Integration Testing (Decomposition based integration), Unit Testing, System Testing.

Metrics and Complexity: Metrics definition, objectives, Linguistic Metrics: definition, LOC, Statement counts, Related metrics, Halstead's Metrics, Token count. Structural Metrics -Definition, Cyclomatic complexity, Hybrid Metrics.

Text Books:
1. R A Khan, K Mustafa, SI Ahson, "Software Quality- Concepts and Practices", Narosa Publishing House,

2. Boris Beizer, "Software Testing Techniques", Dreamtech press.
3. Paul C. Jorgensen. "Software Testing- A Craftsman Approach", CRC Press

Reference Books:
1. Alan C Gillies, "Software Quality: Theory and Management", Cengage Learning, India.
2. Nina S Godbole, "Software Quality Assurance: Principles and Practice", Narosa Publishing House.
3. K.K. Aggarwal & Yogesh Singh, "Software Engineering", New Age International Publishers.
4. Bharat Bhushan Aggarwal & Sumit Prakash Tayal, "Software Engineering", University Science Press.
5. Aditya P. Mathur, "Fundamentals of Software Testing", Pearson Education.

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MCA - E03   **Automata Theory & Compiler Design**   L   T
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UNIT – I

Finite Automata and Regular Expression: Finite State System, Basic Definition, Deterministic and Non-Deterministic Finite Automata (Only Definition), Finite Automata With Output, Regular Expression.

Turing Machines: Definition Of Various Version Of Touring Machines, Deterministic, Non-Deterministic, Two-Way, Infinite Tape, Multi Tape, Multi Head, Statements Of Their Equivalence (Without Proof), Construction Of Turing Machines (Any Model) For Log N; N! , N2;

UNIT – II

Context Free Grammars: Context Free Grammars, Derivation Trees, Simplification of Context-Free Grammars, Chomsky Normal Form, Greibach Normal Form.

Properties Of Context -Free Languages : The Pumping Leema For CFL'S Closure Properties Of CFL'S , Decision Algorithms For CFL'S.

UNIT – III

Introduction To Compiling: Compilers, Analysis Of Source Program, The Phases Of A Compiler, One Pass Compiler, Overview, Syntax Definition, Syntax-Directed Translation, Parsing, Lexical Analysis, Role of The Lexical Analyzer.

Syntax Analysis, The Role Of Parser, Context Free Grammars, Writing A Grammer, Top-Down Parsing (Recursive-Descent Parsing, Predictive Parsing, Transition Diagram For Predictive Parsing,

UNIT – IV

Non Recursive Predictive Parsing, First And Follow, Ll(1) Grammers, Error Recovery In Predictive, Parsing .

Bottom-Up Parsing: Handles, Handle Pruning, Stack Implementation In Shift Reduce Parsing, Conflicts In Shift Reducing Parsing, LR-Parsers, LR Algorithm, LR Grammars, Constructing SLR Parsing Tables, Using Ambiguous Grammars, Error Recovery In LR Parsing.

Text Book:
 1. Johan E. Hopcroft, Jeffery D. Ullman, "Introduction To Automata Theory Languages Computation", Narosa Publishing House.

Reference Books:
1. Alfred V.Aho, Ravi Sethi, Jeffery D. Ullman, "Compilers Principles, Techniques and Tools", Addison-Wesley Publishing Company.
2. William A. Barrett, Bates, John D. Couch", Compiler Construction Theory and Practice.

Note: In each theory paper, nine questions are to be set. Two questions are to set from each Unit and candidate is required to attempt one question from each unit. Question number nine will be compulsory, which will be of short

answer type with 5-10 parts, out of the entire syllabus. In all, five questions are to be attempted.

MCA - E04 **Cyber Law**   L   T
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UNIT – I

Cyber Law: Introduction, Definition, nature & Scope of Cyber Laws. Sociolegal Implications of Computer Science, Cyber Laws.

Cyber Crimes: Definition & Kinds of Cyber Crimes. International and Foreign Developments. Common Cyber Offences: Pheakering, Internet Frauds, Hackers, Stalking, E-Mail, Security Invasion, Money Laundering, Data-Diddling, Theft of Information.

UNIT – II

Contractual Aspects: Hardware Contracts: User Requirement Specification, Negotiation, Sales & Leases, Delivery & Payment, Seller's Obligations, Buyer's Remedies. Software Contract: Selecting Software, Types of Software, What is Software, Software License, Principal Commercial Terms, Warranties, Software Maintenance.

Liability: Contractual Liability, Strict Liability, Negligence, Criminal.

Miscellaneous (Briefly); Copyright & Patent Protection, Evidence, Protecting Confidential Information.

UNIT – III

The Information Technology Act, 2000:

Introduction: Definition, A Brief Summary of the Act.

Digital Signature & Electronic Governance (Sections 3 to 10)

Secure Electronic Records & Secure Digital Signatures (Sections 14 to 16).

UNIT – IV

Regulation of Certifying Authorities (Sections 17 to 34).

Digital Signature Certificates (Sections 35 to 39).

Duties of Subscribers (Sections 40 to 42).

Penalties, Adjudication Offences (Sections 45 to 47 & Sections 65 to 78).

Cyber Regulations Appellate Tribunal (Sections 48 to 64).

Text and Reference Books:

1. The Information Technology Act, 2000.
2. Chris Reed (Ed.), Computer Law, 1996: Universal Law Publishing Co. Pvt. Ltd.
3. Mittal D.P., Law of Information Technology (2000): Taxmann's.

Note: In each theory paper, nine questions are to be set. Two questions are to set from each Unit and candidate is required to attempt one question from each unit. Question number nine will be compulsory, which will be of short answer type with 5-10 parts, out of the entire syllabus. In all, five questions are to be attempted.

MCA - E05 Distributed Data Base Management System

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3 1

UNIT – I

Distributed Data Processing: Introduction, Fundamentals of Distributed Data Base Management System (Transparent management of distributed & replicated data, Reliability, Improved performance, System expansion), Disadvantages of Distributed Data Base Management System (Complexity, Cost, Distribution of control, Security, Distributed database design, Query processing, Directory Mgmt, concurrency control, Deadlock Mgmt, Reliability, OS support, Heterogeneous databases, Relationship).

Relational Data Base Management System: Basic Concepts, Data Modeling for a Database, Records and Files, Abstraction and Data Integration, The Three-Level Architecture Proposal for DBMS, Components of a DBMS, Advantages and Disadvantages of a DBMS. Data Models, Data Associations, Data Models Classification, Entity Relationship Model, Relational Data Model. Normalization: Dependency structures, Normal forms.

UNIT – II

Distributed Data Base Management System Architecture: Architectural models for distributed DBMS (Autonomy, Distribution, Heterogeneity, Architectural alternatives), Client/server systems, Peer-to-peer Distributed Systems.

Distributed Database Design: Design Strategies (Top-Down Design & Bottom-Up design process), Design issues (reasons for fragmentation, alternatives, Degree & Correctness rules of fragmentation, Allocation alternatives, Information requirement. Fragmentation: Horizontal, Vertical, Hybrid Fragmentation. Allocation: Problem, Information requirement, Allocation model, Solution methods.

UNIT – III

Query Processing: Problem, objectives, Complexity of Relational Algebra operations, Characterization of query processing (Language, Types of Optimization, Optimization timing, Statistics, Decision sites, Exploitation of network topology & Replicated fragments, Use of semijoins), Layers of Query processing (Query decomposition, Data localization, Global & Local query optimizations).

Distributed Concurrency Control: Serializability theory, Taxonomy of concurrency control mechanism, Locking based concurrency control algorithm (centralized 2pl, primary copy 2pl, distributed 2pl), Timestamp based concurrency control algorithm (conservative & multiversion TO algorithm), Optimistic concurrency control algorithm, Deadlock management, prevention, avoidance, detection & resolution.

UNIT – IV

Distributed DBMS Reliability: Reliability concepts & measures (system, state & failures, reliability & availability, mean time between failures/repair), Failures & fault tolerance in distributed system (reason for failures, fault tolerance approaches & techniques), Failures in Distributed DBMS (transaction, system, media & communication failure), Local reliability

protocols (architectural considerations, recovery, information execution of LRM commands, checkpointing, handling media failure), Distributed Reliability Protocols (Components, Two-Phase commit protocol, Variation of 2PC).

Text Books:
1. M. Tamer Ozsu & Patrick Valduriez, "Principles of Distributed Database Systems", Pearson Education Asia.
2. Desai, B., "An Introduction to Database Concepts." Galgotia Publications, New Delhi.

Reference Books:
1. Date C.J., "An Introduction to Database Systems", Narosa Publishing House, New Delhi.
2. Elimsari and Navathe, "Fundamentals of Database Systems", Addison Wesley, New York.
3. Ullman, J.D, "Principals of Database Systems", Galgotia Publications, New Delhi.

Note: In each theory paper, nine questions are to be set. Two questions are to set from each Unit and candidate is required to attempt one question from each unit. Question number nine will be compulsory, which will be of short answer type with 5-10 parts, out of the entire syllabus. In all, five questions are to be attempted.

MCA - E06   **Management of Software Projects**   L   T
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UNIT – I
Introduction to Software Project Management: The Nature of Software Production, Key Objectives of Effective Management, Quality, Productivity, Risk Reduction, The Role of the Software Project Manager
Planning the Project: Business Planning, Determining Objectives, Forecasting demand for the Product, Proposal Writing, Requirements analysis, Legal issues (patent, copyright, liability, warranty).

UNIT – II
Technical Planning: Life-cycle models, Types of Plans, Plan documentation methods, Work breakdown structures, PERT and CPM, Gantt Charts, Standards
Planning for Risk Management and Control, Entry and Exit criteria, Intermediate checkpoints, Performance prediction and analysis People, Prototyping and modeling, Inspections and reviews, Process and process assessment, Development Methods, Metrics, Configuration management, Testing and quality assurance, Capacity Planning

UNIT – III
Estimating – what it takes to do the job, Cost (direct and indirect), Resources, Time, Size and complexity of the product, Risk determination, Role of requirements and design in estimating, Financial planning – budgeting, Resource Allocation, Organizational considerations, (teams, hierarchies, etc.), Technology, Human factors and usability, Tools and environments, Transition of the Product to the user.

UNIT – IV
Managing the Project: Managing the Task, Project Control, Managing to the Plan, Reviews, Feedback and Reporting Mechanisms, Configuration Management, Quality Control and Quality Assurance, Managing Change, Readjusting Goals and Milestones, Risk Management, Testing Phases, Formalized Support Activities, Managing the Team, Team Organizations, Recruiting and Staffing – picking the right people, Technical leadership, Avoiding obsolescence – training, etc.) Managing the Context, Communication Skill, Decision Theory, Business Management, Assessing the Organization's ability to perform the process, Probability and Statistics, Managing Product Support and Maintenance.

Text Books:
1. Tom Gilb, Finzi Susannah, "Principles of Software Engineering Management", Addison-Wesley, 1988.
2. Philip Metzger, "Managing A Programming Project", Prentice Hall, 1981.
Reference Books:
1. Tom Demarco, "Controlling Software Project Management, Measurement", Prentice Hall, New Jersey, 1986.

2. Mark Norris, Peter Rigby, Malcolm Payne, "The Healthy Software Project – A Guide to Successful Development & Management", John Wiley & Sons, 1993
3. Dennis Lock, "Handbook of Project Management", Jaico Publishing House, 1994.
4. Sanjiv Purba, David Sawh & Bharat Shah, "How to Management a Successful Software Project – Methodologies, Techniques, Tools", John Wiley, 1995.

Note: In each theory paper, nine questions are to be set. Two questions are to set from each Unit and candidate is required to attempt one question from each unit. Question number nine will be compulsory, which will be of short answer type with 5-10 parts, out of the entire syllabus. In all, five questions are to be attempted.

MCA – E07   **Open Source Software**   L T
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UNIT – I

Introduction: Definition of Open Source Software(OSS), Definition of free software, Examples of OSS, Need of OSS, OSS characteristics, future of OSS, History of Software.

OSS adoption: Analytical Framework-Disruptive innovations, technology adoption curve, Open source stack, OSS adoption, adoption of specific open source technologies, Usages of OSS, Benefits of OSS, Limitations of OSS, Problems encountered by OSS.

OSS licences: Definition, Need and objectives of OSS licences, Types-GPL, Mozilla Public Licence, BSD Licence.

UNIT – II

OSS opportunities: Creating Open Source Lab, Infrastructure requirement of Samba and Open LDAP7, building LAMP applications, OSS utilization in small businesses, franchise, call centres, retail, food services, government, healthcare, education.

Migrate applications and databases to open source, directory services, email, groupware and collaboration, complex web publishing, manage user desktops.

UNIT – III

OSS operating system: Free BSD-Definition, Characteristics, Linux-Definition, Characteristics, shell, security, Benefits of OSS operating system.

OSS server applications: Infrastructure services- file and print services, directory services, Apache web server, Database servers- classes of database servers, Analysis of database system sizes, OSS database server examples, Evaluation of OSS database server, OSS database sever Vs. Closed code database server, Mail servers.

UNIT – IV

OSS desktop applications: Introduction, Linux desktop share, Limitation of Linux desktop adoption, Graphical desktop, Web browser, OS office suite-Introduction to openoffice.org, Comparison of Microsoft office to Open Office, Migration from Microsoft Office to Open Office, Mail and calendar clients-Professional applications, Drawing and image management, Running windows applications.

OSS development: Methodology- OS compared with Closed Code, OS compared with corporate development, OS development tools.

Text Book:
   1. Paul Kavanagh, "Open Source Software: Implementation and Management", Elsevier Digital Press.

Reference Books:
   1. Joseph Feller, Brian Fitzgerald, "Understanding Open Source Software development", Addison-Wesley.

2. Fadi P. Deek, James A. McHugh , "Open source: technology and policy", Cambridge University Press.

Note: In each theory paper, nine questions are to be set. Two questions are to set from each Unit and candidate is required to attempt one question from each unit. Question number nine will be compulsory, which will be of short answer type with 5-10 parts, out of the entire syllabus. In all, five questions are to be attempted.

MCA – E08   **Image Processing**   L   T
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UNIT – I
Image Digital Representation, Elements of Visual Perception Sampling and Quantitization, Image Processing System Elements.
Fourier Transforms, Extension To 2D, DCT, Walsh, Hadamard Transforms.

UNIT – II
Enhancement And Segmentation: Histogram Modification, Smoothing, Sharpening, Thresholding, Edge Detection, Segmentation, Point And Region Dependent Techniques.

UNIT – III
Image Encoding: Fidelity Criteria. Transform Compression. K.L., Fourier, DCT, Spatial Compression, Run Length Coding, Huffman and Cantour Coding.

UNIT – IV
Restoration: Models, Inverse Filtering Least Squares Filtering, Recursive Filtering.

Text Book:
1. Gonslaez, "Digital Image Processing", Addison Wesley, Reading, M.A.1990.

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MCA – E09   Distributed Systems   L   T
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UNIT – I

Introduction and Architectures: Definition of a Distributed System, Goals and Types of distributed systems, Architecture Styles, System Architectures, Middleware, Self-management in Distributed Systems with examples of Astrolabe, Globule and Jade.
Processes: Threads, Virtualization, Clients, Servers and Code Migration

UNIT – II

Communication: Remote Procedure Call, Message-Oriented, Stream Oriented and Multicast Communication
Naming: Names, Identifiers and Addresses, Flat naming, Structured Naming and Attribute-Based Naming.

UNIT – III

Synchronization: Clock Synchronization, Logical Clocks: Lamport's Logical Clocks and Vector Clocks, General Introduction to the Concepts of Replication and Fault Tolerance
Distributed File Systems: Client-Server Architecture in NFS, Cluster-based Architecture in Google, Symmetric Architectures, RPC in NFS.

UNIT – IV

Distributed Web-Based Systems: Architecture, Processes i.e. clients, Apache Web Server and Web Server Clusters, Communication i.e. HTTP and Simple Object Access Protocol, Web Proxy Caching.
Case studies of Mach, Chorus and Amoeba distributed operating systems

Text Book:
1. Distributed Systems: Principles and Paradigms, 2nd ed by Tanenbaum, A. and van Steen, M., Prentice Hall, 2007.

Reference Books:
1. Distributed Systems: Concepts and Design, 4rd ed by Coulouris, G, Dollimore, J., and Kindberg, T., Addison-Wesley, 2006.
2. Introduction to Reliable Distributed Programming - Rachid Guerraoui and Louis
3. Rodrigues, Springer-Verlag, Berlin, Germany, 2006.
4. Elements of Distributed Computing - Vijay K. Garg, Wiley, 2002.
5. Distrubuted Computing: Principles and Applications by M. L. Liu, Pearson Education, 2008

Note: In each theory paper, nine questions are to be set. Two questions are to set from each Unit and candidate is required to attempt one question from each unit. Question number nine will be compulsory, which will be of short answer type with 5-10 parts, out of the entire syllabus. In all, five questions are to be attempted.

MCA – E10   Object Oriented Software Engineering   L   T
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UNIT – I

Introduction to Software Engineering: Software Engineering Development, Software Engineering Development, Software Life Cycle Models, Standards for developing life cycle models.

UNIT – II

Object Methodology & Requirement Elicitation: Introduction to Object Oriented Methodology, Overview of Requirements Elicitation, Requirements Model-Action & Use cases, Requirements Elicitation Activities, Managing Requirements Elicitation

UNIT – III

Architecture: Model Architecture, Requirements Model, Analysis Model, Design Model, Implementation Model, Test Model
Modeling with UML: Basic Building Blocks of UML, A Conceptual Model of UML, Basic Structural Modeling, UML Diagrams
System Analysis: Analysis Model, Dynamic Modelling & Testing

UNIT – IV

System Design: Design concepts & activities, Design models, Block design, Testing
Testing Object Oriented Systems: Introduction, Testing Activities & Techniques, The Testing Process, Managing Testing
Case Studies

Text Book:
   1. Stephen R. Scach, "Classical & Object Oriented Software Engineering with UML and Java", McGraw Hill, 1999.

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MCA – E11   Simulation and Modeling   L   T
**   3   1**

UNIT – I
Definition of System, types of system : continuous and discrete, modelling process and definition of a model, computer workloads and preparation of its models

UNIT – II
Verification and validation modeling procedures, comparing model data with real system data, differential and partial differential equation models, combining discrete event and continuous models.

UNIT – III
Simulation process: Use of simulation, discrete and continuous simulation procedures, simulation of time sharing computer system

UNIT – IV
Simulation Languages: A brief introduction to important discrete and continuous simulation languages, one language may be studied in detail depending on the availability.

Text Book:
1. Gordon G., "System Simulation", PHI.

Reference Books:
1. Banks J., Carson S., Nelson B.L., "Discrete-Event System Simulation", 2nd Edition, Prentice Hall of India, N. Delhi, 1996.
2. Deo N., "System Simulation with Digital Computers", Prentice Hall of India, 1979.
3. Law A.M., Kelton W.D., "Simulation Modeling and Analysis", 2nd Edition, McGraw Hill, N.Y., 1991.

Note: In each theory paper, nine questions are to be set. Two questions are to set from each Unit and candidate is required to attempt one question from each unit. Question number nine will be compulsory, which will be of short answer type with 5-10 parts, out of the entire syllabus. In all, five questions are to be attempted.