VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELGAUM

Master of Computer Applications (MCA)

Scheme and Syllabus
(With effect from 2013-2014)

SCHEME OF TEACHING AND EXAMINATION
MASTER OF COMPUTER APPLICATIONS

I SEMESTER

S. No.	Subject Code	Title	Teaching Hrs / Week		Examination			
			Theory	Practical	Duration	Marks		
						IA	Exam	Total
1	13MCA11	Problem Solving using C	04	-	03	50	100	150
2	13MCA12	Discrete Mathematics Structure	04	-	03	50	100	150
3	13MCA13	Fundamentals of Computer Organization	04	-	03	50	100	150
4	13MCA14	Introduction to Unix	04	-	03	50	100	150
5	13MCA15	Introduction to Web Technologies	04		03	50	100	150
6	13MCA16	C Programming Laboratory	-	03	03	50	50	100
7	13MCA17	Unix Programming Laboratory	-	03	03	50	50	100
8	13MCA18	Web Programming Laboratory	-	03	03	50	50	100
Total			**20**	**09**		**400**	**650**	**1050**

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II SEMESTER

S. No .	Subject Code	Title	Teaching Hrs /		Exami			
			Theory	Practica l	Duration	Mar ks		
						IA	Exam	Total
1	13MCA21	Data Structures Using C	04	-	03	50	100	150
2	13MCA22	Object Oriented Programming using C++	04	-	03	50	100	150
3	13MCA23	Operating Systems	04	-	03	50	100	150
4	13MCA24	System Programming	04	-	03	50	100	150
5	13MCA25	Database Management Systems	04	-	03	50	100	150
6	13MCA26	Data Structures Using C Lab	-	03	03	50	50	100
7	13MCA27	Database Laboratory	-	03	03	50	50	100
8	13MCA28	OOP Using C++ Laboratory	-	03	03	50	50	100
Total			**20**	**09**		**400**	**650**	**1050**

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III SEMESTER

S. No.	Subject Code	Title	Teaching Hrs /		Examinati			
			Theory	Practical	Duration	Mar		
						IA	Exam	Total
1	13MCA31	Computer Networks	04	-	03	50	100	150
2	13MCA32	Programming using Java	04	-	03	50	100	150
3	13MCA33	Software Engineering	04	-	03	50	100	150
4	13MCA34	Computer Graphics	04	-	03	50	100	150
5	13MCA35	Elective-I	04	-	03	50	100	150
6	13MCA36	Java Programming Lab	-	03	03	50	50	100
7	13MCA37	Computer Graphics Lab	-	03	03	50	50	100
8	13MCA38	Computer Networks Lab	-	03	03	50	50	100
TOTAL			20	09		40	650	1050

Elective-1	
13MCA351	UNIX system Programming
13MCA352	Advanced Topics in DBMS
13MCA353	Basics of MIS & E-Commerce
13MCA354	Operations Research
13MCA355	Principles of User Interface Design
13MCA356	Probability Statistics & Numerical Methods

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IV SEMESTER

S. No.	Subject Code	Title	Teaching Hrs /		Examinati			
			Theory	Practical	Duration	Mar		
						IA	Exam	Total
1	13MCA41	Analysis & Design of	04	-	03	50	100	150
2	13MCA42	Advanced Java Programming	04	-	03	50	100	150
3	13MCA43	Advanced Web Programming	04	-	03	50	100	150
4	13MCA44	Elective-2	04	-	03	50	100	150
5	13MCA45	Elective-3	04	-	03	50	100	150
6	13MCA46	Algorithms Lab	-	03	03	50	50	100
7	13MCA47	Advanced Java Lab	-	03	03	50	50	100
8	13MCA48	Mini Project-I	-	03	03	50	50	100
TOTAL			**20**	**09**		**400**	**650**	**1050**

Elective-2		**Elective 3**	
13MCA441	Advanced Computer Networks	13MCA451	Cryptography & Network Security
13MCA442	Data Warehousing & Data Mining	13MCA452	Network Management
13MCA443	Mobile Computing and Wireless Communications	13MCA453	NOSQL
13MCA444	Software Testing and Practices	13MCA454	Software Architectures
13MCA445	Theory of Computation (FAFL)	13MCA455	Enterprise Resource Planning (ERP)
13MCA446	Digital Image Processing	13MCA456	Mobile Applications

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V SEMESTER

S. No.	Subject Code	Title	Teaching Hrs /		Examinatio			
			Theory	Practical	Duration	Marks		
						IA	Exam	Total
1	13MCA51	Object-Oriented Modeling and Design Patterns	04	-	03	50	100	150
2	13MCA52	System Simulation and Modeling	04	-	03	50	100	150
	13MCA53	Programming using C#.& .NET	04	-	03	50	100	150
4	13MCA54	Elective-4	04	-	03	50	100	150
5	13MCA55	Elective-5	04	-	03	50	100	150
6	13MCA56	Software Design Laboratory	-	03	03	50	50	100
7	13MCA57	.Net Laboratory	-	03	03	50	50	100
8	13MCA58	Mini Project -II	-	03	03	50	50	100
Tota			**20**	**09**		**400**	**650**	**1050**

Elective-4		**Elective-5**	
13MCA541	Mobile and Adhoc Sensor Networks	13MCA551	Cloud Computing
13MCA542	Parallel Computing	13MCA552	Web2.0 and Rich Internet Applications
13MCA543	Multimedia systems	13MCA553	Information Retrieval & Search Engines
13MCA544	Pattern Recognition	13MCA554	Soft Computing
13MCA545	Services Oriented Architecture	13MCA555	Storage Area Network
13MCA546	Compiler Design	13MCA556	Software Project Management

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VI SEMESTER

S. No.	Subject Code	Title	Teaching Hrs/Week		Examination				
			Theory	Practical	Duration	Marks			
						IA	Dissertation	Viva	Total
1	13MCA61	Project	-	03	03	50	125	75	250

GENERAL NOTE:

1. **Students have to register for one Elective subject from each of the Five Elective Groups.**

(One elective from III Semester, two electives from IV Semester, two electives from V Semester)

2. **Change of program during lab examinations is not permitted because problems are given from the predefined list only.**

SEMESTER I

Problem Solving Using C

Sub. Code	**:**	**13MCA11**	**IA Marks**	**:**	**50**
Hrs/Week	**:**	**4**	**Exam Hours**	**:**	**03**
Total Hours	**:**	**52**	**Exam Marks**	**:**	**100**

Unit 1 **9 Hours**

Algorithms, Flow Charts, C structure, Variables, Data types, Constants, Declarations, Operators, Precedence, Associativity, Order of evaluation, Type conversion, Storage classes, Programming Examples

Unit 2 **10 Hours**

Input and output statements – scanf, getchar, gets, printf, putchar, puts; Control Statements – if, else-if, switch, Control Structures – while, for, do-while, break and continue, goto, Programming Examples

Unit 3 **8 Hours**

Arrays – Single dimension, Two dimensional, Multi dimensional Arrays, Strings, Programming Examples

Unit 4 **10 Hours**

Functions, Categories of functions, Pointers, Pointer arithmetic, Call by value, Pointer Expression, Pointer as function arguments, , recursion, Passing arrays to functions, passing strings to functions, Call by reference, Functions returning pointers, Pointers to functions, Programming Examples

Unit 5 **5 Hours**

Structures and Unions – defining, declaring, initialization, accessing, comparing, operations on individual members; array of structures, structures within structures, structures and functions, pointers and structures, bit fields, Programming Examples

Unit 6 **10 Hours**

Files – defining, opening, closing, input and output operations, error handling, random access; Command line arguments; Dynamic Memory Allocation –definition, malloc, calloc, realloc, free, dynamic arrays;

Preprocessor – definition, macro substitution, file inclusion, compiler control directives, Programming Examples

Text Books

1. Let us C, Yashwant Kanetkar, BPB Publications
2. Programming with C, Balaguruswamy
3. The C Programming Language, Brian W Kernighan, Dennis M Rtchie, PHI, 2nd Edition

Reference Books

1. Programming with C, Byron Gottfried, Tata McGraw-Hill edition
2. Simplifying C, Harshal Arolkar, Sonal Jain, Wiley Publications
3. Head First C, David Griffiths, & Dawn Griffiths, O'Riley.
4. C Programming, Dr. Vishal M Lichade, Dreamtech press.

Discrete Mathematical Structures

Subject Code	**: 13MCA12**	**I.A. Marks**	**: 50**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

Fundamentals of Logic **14 Hours**

Basic Connectives and Truth Tables, Logic Equivalence :The laws of Logic, Logical Implications: Rules of Inference, The use of Quantifiers, Quantifier Definitions, Proofs of Theorems.

Set Theory **7 Hours**

Sets and Subsets, Set Operations and the Laws of Set Theory, Counting and Venn Diagrams, Principles of Inclusion and Exclusion, The rules of sum and product, Permutations and Combinations with repetition

Properties of Integers and Recurrence **7 Hours**

Mathematical Induction, Recursive definitions, The Greatest Common Divisor Euclidian Algorithms, The first order Linear recurrence relation.

Relations and Functions **14 Hours**

Cartesian products and Relations, Functions-Plain and One-to-One, Onto Functions, Stirling Numbers and the Second Kind, Special functions, The Pigeon-hole principle, Function composition and inverse functions. Properties of Relations, Computer recognition-Zero One Matrices and Directed graphs, Posets and Hasse Diagrams, Equivalence relation and Partitions, lattices.

Graph Theory and Trees **10 Hours**

Terminology, Definitions, Properties and Examples, Connectivity and Adjacency, Euler and Hamilton, Representation and Isomorphism, Planarity and Chromatic Number, Directed Graphs and Weighted Graphs, Rooted Trees, Trees and Sorting

Text Books

1. Ralph P Grimaldi, B.V.Ramana, “Discrete & Combinatorial Mathematics, An Applied Introduction” 5th Edition, Pearson Education, 2004 (Chapter1: 1.1-1.4, Chapter 2: 2.1-2.5, Chapter 3: 3.1-3.4, Chapter 4: 4.1-4.2,4.4, Chapter 5:5.1-5.6, Chapter 7:7.1-, 7.4,7.6, Chapter 10:10.1, Chapter 12: 12.1-12.4)
2. Eric Gosset “Discrete Mathematics with Proof” Wiley India, 2nd Edition,(Chapter 10:10.1-10.6)

Reference books

1. Kenneth H Rosen, “Discrete Mathematics & its Applications" 7th edition, McGraw-Hill, 2010
2. Y N Singh “Discrete Mathematical Structures" Wiley India, 1st edition, 2010
3. Jayant Ganguly: A Treatise on Discrete Mathematical Structures" Pearson, 2010
4. D.S. Malik & M.K Sen: Discrete Mathematical Structures: Theory & Applications, Cengage Learning, 2004
5. Thomas Koshy: Discrete Mathematics with Applications, Elsevier, 2005, Reprint 2008

Fundamentals Of Computer Organization

Subject Code: 13MCA13	**I.A. Marks : 50**
Hours/Week : 04	**Exam Hours : 03**
Total Hours : 52	**Exam Marks : 100**

Binary Systems **6 Hours**

Digital Computers and Digital Systems, Binary Numbers, Number Base Conversion, Octal and Hexadecimal Numbers, subtraction using r's and r-1 complements, Binary Code, Binary Storage and Registers, Binary Logic, Integrated Circuits.

Combinational Logic and Arithmetic Circuits **14 Hours**

Axiomatic Definition of Boolean Algebra, Basic Theorems and Properties of Boolean Algebra, Boolean Functions, Canonical and Standard Forms, Other Logic Operations, Digital Logic Gates, The map Method, Two – and Three – Variable Maps, Four – Variables Map, Product of Sums Simplification, NAND and NOR Implementation, Other Two- Level Implementations, Don't Care Conditions. Introduction, Adders, Subtractors, Binary Parallel Adder, Decimal Adder, Magnitude Comparator, Decoders, Multiplexers, BOOTH algorithm for signed numbers with example.

Sequential Logic **6 Hours**

Introduction, different types of Flip – Flops, Triggering of Flip- Flops, Registers, Shift Registers, Ripple counter and Synchronous Counter .

Basic Structure of Computers **6 hours**

Computer Types, Functional Units, Basic Operational Concepts, Bus structure, Software, Performance, Multiprocessing and Multicomputers, Introduction to Assemblers and Compilers.

Machine Instruction and Programs **7 Hours**

Memory Locations and Addresses, Memory Operations, Instructions and Instruction Sequencing, Addressing Modes, Examples from Assembly Language Programming.

Input/Output Organization **7 Hours**

Accessing I/O Devices, Interrupts, DMA, Processor Example, Buses. Case study of IA32 Intel processor

The Memory System **6 Hours**

Some Basic Concepts, Semiconductor RAM Memories, Read – Only Memories, Speed, Size, and Cost, Cache Memories, Virtual Memories, Memory Management Requirements, Secondary Storage.

Text Books:

1. M. Morris Mano, "Digital Logic and Computer Design", Pearson, 2012.
2. Carl Hamacher, Zvonko Vranesic Safwat Zaky,"Computer Organization", 5th edition, Tata McGraw-Hill, 2011

Reference Books:

1. John P. Hayes, "Computer Architecture and Organization", Tata McGraw - Hill, 3rd Edition, 2012.
2. Soumitrs Kumar Mandal, "Digital Electronics – Principles and Applications", Tata McGraw - Hill, 2010

Introduction to UNIX

Sub Code :13MCA14		**IA Marks : 50**
Hrs/Week :04		**Exam Hours : 03**
Total Hours :52		**Exam Marks : 100**

Introduction of UNIX **9 Hours**

Introduction, History, Architecture, Experience the Unix environment, Basic commands ls, cat, cal, date, calendar, who, printf, tty, sty, uname, passwd, echo, tput, bc, script, spell and ispell, UNIX File System: The file, what's in a filename? The parent-child relationship, pwd, the Home directory, absolute pathnames, using absolute pathnames for a command, cd, mkdir, rmdir, Relative pathnames, The UNIX file system.

Introduction to the Shell **7 Hours**

Introduction to Shell Scripting, Shell Scripts, read, Command Line Arguments, Exit Status of a Command, The Logical Operators && and ||, exit, if, and case conditions, expr, sleep and wait, while, until, for, $, @, redirection. The here document, set, trap, Sample Validation and Data Entry Scripts.

Basic File Attributes **8 Hours**

Is – l, the –d option, File Permissions, chmod, Security and File Permission, users and groups, security level, changing permission, user masks, changing ownership and group, File Attributes, More file attributes: hard link, symbolic link, umask, find

Simple Filters **9 Hours**

Pr, head, tail, cut, paste, sort, uniq, tr commands, Filters using Regular Expression : grep & sed grep, Regular Expression, egrep, fgrep, sed instruction, Line Addressing, Inserting and Changing Text, Context addressing, writing selected lines to a file, the –f option, Substitution, Prosperities of Regular Expressions Context addressing, writing selected lines to a file, the –f option, Substitution, Properties of Regular Expressions

Awk-Advanced Filters **9 Hours**

Simple awk Filtering, Splitting a Line into Fields, printf, the Logical and Relational Operators, Number Processing, Variables, The –f option, BEGIN and END positional Parameters, get line, Built-in variables, Arrays, Functions, Interface with the Shell, Control Flow, Advanced Shell Programming, The sh command, export, cd, the Command, expr, Conditional Parameter Substitution, Merging Streams, Shell Functions, eval, Exec Statement

The Process **8 Hours**

Process basics, PS, internal and external commands, running jobs in background, nice, at and batch, cron, time commands, Essential System Administration root, administrator's privileges, startup & shutdown, managing disk space, cpio, tar, Customizing the Environment : System Variables, profile, sty, PWD, Aliases, Command History, On-line Command Editing

Advanced System Administration **2 Hours**

Case Study: emacs editor and any one distribution of Linux

Text Book:

1. Your UNIX-The Ultimate Guide, Sumitabha Das, Tata McGraw Hill,

Reference Book:

1. "Unix Shell Programming", Yashwant Kanetkar,
2. "Beginning Shell Scripting", Eric Foster -Johnson, John C Welch, Micah Anderson, Wrox publication.
3. "Introduction to UNIX" by M G Venkatesh Murthy.

Introduction to Web Technologies

Subject Code: 13MCA15	**I.A. Marks : 50**
Hours/Week: 4	**Exam Marks : 100**
Total Hours: 52	**Exam Hours : 3**

Fundamentals **4 Hours**

Internet, WWW, Web Browsers and Web Servers, URLs, MIME, HTTP, Security, the Web Programmers Toolbox**.**

Web Foundations **6 Hours**

Evolution of the Web, Peak into the History of the Web, Internet Applications, Networks, TCP/IP, Higher Level Protocols, Important Components of the Web, Web Search Engines, Application Servers.

Introduction to XHTML **10 Hours**

Basic syntax, Standard structure, Basic text markup, Images, Hypertext Links. Lists, Tables, Forms, Frames. **Cascading Style Sheets:** Introduction, Levels of style sheets, Style specification formats, Selector forms, Property value forms, Font properties, List properties, Color, Alignment of text, The box model, Background images, The <span> and <div> tags, Conflict resolution.

The Basics of JavaScript: **6 Hours**

Overview of JavaScript, Object orientation and JavaScript, Syntactic characteristics, Primitives, operations, and expressions, Screen output and keyboard input, Control statements, Object creation and modification, Arrays, Functions, Constructors, Pattern matching using regular expressions, Errors in scripts, Examples.

JavaScript and HTML Documents **6 Hours**

The JavaScript Execution Environment, The Document Object Model, Elements Access in Java Script, Events and Event Handling, Handling Events from Body Elements, Handling Events from Text Box and password Elements, The DOM2 Event Model, The navigator Object, Dom Tree Traversal and Modification.

Dynamic Documents with JavaScript: **6 Hours**

Introduction, Positioning Elements, Moving Elements, Element Visibility, Changing Colors and Fonts, Dynamic Content, Stacking Elements, Locating the Mouse Cursor, Reacting to a Mouse Click, Slow Movement of Elements, Dragging and Dropping Elements.

Introduction to XML **6 Hours**

Introduction, Syntax, Document structure, Document type definitions, Namespaces, XML schemas, displaying raw XML documents, Displaying XML documents with CSS, XSLT style sheets, XML processors, Web services.

The Basics of Perl **8 Hours**

Origins and uses of Perl, Scalars and their operations, Assignment statements and simple input and output, Control statements, Fundamentals of arrays, Hashes, References, Functions, Pattern matching, File input and output; Examples. **Using Perl for CGI Programming:** The Common Gateway Interface; CGI linkage; Query string format; CGI.pm module; A survey example; Cookies.

Text Books:

1. Robert W. Sebesta: Programming the World Wide Web, 4th Edition, Pearson education, 2012. Chapters 1, 2, 3, 4, 5, 6, 7, 8, 9, 11 & 13
2. M. Srinivasan: Web Technology Theory and Practice, Pearson Education, 2012. Chapter 1, 2, 3 & 4

Reference Books:

1. Jeffrey C. Jackson: Web Technologies- A Computer Science Perspective, Pearson Education, Eleventh Impression, 2012.
2. Chris Bates: Web Programming Building Internet Applications, 3rd Edition, Wiley India, 2009.
3. Internet Technology and Web Design, Instructional Software Research and Development (ISRD) Group, Tata McGraw Hill, 2011.

C Programming Laboratory

Sub. Code	**: 13MCA16**		**IA Marks**	**:**	**50**
Hrs/Week	**: 4**		**Exam Hours**	**:**	**03**
Total Hours	**: 42**		**Exam Marks**	**:**	**100**

1. a. Convert degrees into Fahrenheit and vice versa
   b. Calculate the salary of an employee given his basic pay, HRA = 10% of basic pay, TA=5% of his basic pay and deductions IT = 2.5% of his basic pay

2. a. Check whether the given number is perfect number
   Defn: A perfect number is a positive integer that is equal to the sum of its proper positive divisors, that is, the sum of its positive divisors excluding the number itself.
   Example - The first perfect number is 6, because 1, 2, and 3 are its proper positive divisors, and 1 + 2 + 3 = 6.
   b. Solve quadratic equations for the given values of a,b,c.

3. a. Generate all Amstrong numbers upto n.
   Defn: An Armstrong number of three digits is an integer such that the sum of the cubes of its digits is equal to the number itself.
   Example - 371 is an Armstrong number, since 3**3 + 7**3 + 1**3 = 371.
   b. Convert a decimal number to a hexadecimal number.

4. Write a menu driven C program to
   a. Insert an element into an array
   b. Delete an element from the array (first occurrence)

5. Write a Menu Driven C Program to
   a. Accept a string from the user
   b. Encode the string.
   c. Decode the string

   Apply the following procedure to encode it.
   1. Convert each character in a string to its ASCI value.
   2. Add an integer value to it and display the encoded string
   3. Decode the string using reverse procedure and display.
6. Write a C program to multiply two matrices that satisfy the constraint of matrix multiplication

7. Write a C program to find the saddle point of a matrix.
   Defn: Given a RxC Matrix, A, i.e. R rows and C columns we define a Saddle-Point as Saddle_Pt (A) for a row I and column j is that A(i,j) that is the minimum of Row i and the maximum of Col j.

8. Write a C program to implement a magic square of size n.
   Defn: A magic square is an arrangement of numbers (usually integers) in a square grid, where the numbers in each row, and in each column, and the numbers that run diagonally in both directions, all add up to the same number.

9. Write a Menu driven C program to
    a. Accept two numbers n and m
    b. Sum of all integers ranging from n to m
    c. Sum of all odd integers ranging from n to m
    d. Sum of all even integers ranging from n to m

    Display an error message if n > m. Create functions for each of the options

10. Write a Menu Driven C Program to implement the following using recursion
    a. Factorial of a number
    b. Fibonacci series

11. Create a structure Complex Number having real and imaginary part as properties. Write functions to add and subtract the two complex numbers.

12. Define a structure called student having the properties of student_id, student name and branch of the student with a sub structure of marks of 3 subjects. Write a Menu Driven C Program to
    a. Add new student detail
    b. Delete a student detail
    c. Display all student details
    d. Display the name of the student with the best mark
    e. Display the name of the student with the worst mark
    f. Display the average marks scored by the students

13. a. Write a C Program to remove all white spaces and newline characters from a file.

    b. Find whether a given word exists in the file. If it exists display the location of the word

14. Write a C program to copy one file content to another file without using inbuilt functions.

Note: In the examination each student should do one question out of the above 14 questions

UNIX Programming Laboratory

Sub Code : 13MCA17 **I.A. Marks : 50**
Hours/Week : 3 **Exam Hours : 3**
Total Hours : 42 **Exam Marks : 50**

A. Explore the unix environment.

B. Explore vi editor with vim tutor. Perform the following operations using vi editor, but not limited to:

1 insert character, delete character, replace
2. Save the file and continue working
3. save the file a exit the editor
4. quit the editor
5. quit without saving the file
6. rename a file
7. insert lines, delete lines,
8. set line numbers
9. search for a pattern
10. move forward and backward

1a. Write a shell script that takes a valid directory name as an argument and recursively descend all the sub-directories, finds the maximum length of any file in that hierarchy and writes this maximum value to the standard output.
b. Write a shell script that accepts a path name and creates all the components in that path name as directories. For example, if the script is named mpc, then the command mpc a/b/c/d should create directories a, a/b, a/b/c, a/b/c/d.

2a. Write a shell script that accepts two file names as arguments, checks if the permissions for these files are identical and if the permissions are identical, output common permissions and otherwise output each file name followed by its permissions.
b. Write a shell script which accepts valid log-in names as arguments and prints their corresponding home directories, if no arguments are specified, print a suitable error message.

3a. Create a script file called file-properties that reads a file name entered and outputs it properties.
b. Write shell script to implement terminal locking (similar to the lock command). It should prompt the user for a password. After accepting the password entered by the user, it must prompt again for the matching password as confirmation and if match occurs, it must lock the keyword until a matching password is entered again by the user, Note that the script must be written to disregard BREAK, control-D. No time limit need be implemented for the lock duration.

4a. Write a shell script that accept one or more filenames as argument and convert all of them to uppercase, provided they exist in current directory.
b. Write a shell script that displays all the links to a file specified as the first argument to the script. The second argument, which is optional, can be used to specify in which the search is to begin. If this second argument is not present, the search is to begin in current working directory. In either case, the starting directory as well as all its subdirectories at

all levels must be searched. The script need not include any error checking.

5a. Write a shell script that accepts as filename as argument and display its creation time if file exist and if it does not send output error message.
b. Write a shell script to display the calendar for current month with current date replaced by * or ** depending on whether the date has one digit or two digits.

6a. Write a shell script to find a file/s that matches a pattern given as command line argument in the home directory, display the contents of the file and copy the file into the directory ~/mydir
b. Write a shell script to list all the files in a directory whose filename is at least 10 characters. (use expr command to check the lenght)

7a. Write a shell script that gets executed displays the message either "Good Morning" or "Good Afternoon" or "Good Evening" depending upon time at which the user logs in.
b Write a shell script that accept a list of filenames as its argument, count and report occurrence of each word that is present in the first argument file on other argument files.

8a. Write a shell script that determine the period for which a specified user is working on system and display appropriate message.
b Write a shell script that reports the logging in of a specified user within one minute after he/she log in. The script automatically terminate if specified user does not log in during a specified period of time.

9a. Write a shell script that accept the file name, starting and ending line number as an argument and display all the lines between the given line number.
b. Write a shell script that folds long lines into 40 columns. Thus any line that exceeds 40 characters must be broken after 40th, a "\" is to be appended as the indication of folding and the processing is to be continued with the residue. The input is to be supplied through a text file created by the user.

10a. Write an awk script that accepts date argument in the form of dd-mm-yy and displays it in the form if month, day and year. The script should check the validity of the argument and in the case of error, display a suitable message.
b. Write an awk script to delete duplicated line from a text file. The order of the original lines must remain unchanged.

11a. Write an awk script to find out total number of books sold in each discipline as well as total book sold using associate array down table as given below.

Electrical	34
Mechanical	67
Electrical	80
Computer Science	43
Mechanical	65
Civil	98
Computer Science	64

b. Write an awk script to compute gross salary of an employee accordingly to rule given below.

If basic salary is < 10000 then HRA=15% of basic & DA=45% of basic
If basic salary is >=10000 then HRA=20% of basic & DA=50% of basic.

Note: In the examination *each* student picks one question from a lot of *all the* 11

questions. ***Question A & B Not to be included for examination***

Web Programming Laboratory

Subject Code	**: 13MCA18**	**I.A. Marks**	**: 50**
Hours/Week	**: 3**	**Exam Hours**	**: 3**
Total Hours	**: 42**	**Exam Marks**	**: 50**

1. Create an XHTML page to demonstrate the usage of a. Text Formatting tags,
b. Links
c. Images d. Tables

2. Develop and demonstrate the usage of inline and external style sheet using CSS

3. Develop and demonstrate a XHTML file that includes JavaScript script for the following problems:
a) Input: A number n obtained using prompt
Output: The first n Fibonacci numbers
b) Input: A number n obtained using prompt
Output: A table of numbers from 1 to n and their squares using **alert**

4. Develop and demonstrate using JavaScript, a XHTML document that displays random numbers (integers).

5. a) Develop and demonstrate, using JavaScript script, a XHTML document that collects the USN (the valid format is: A digit from 1 to 4 followed by two upper-case characters followed by two digits followed by two upper-case characters followed by three digits; no embedded spaces allowed) of the user. Event handler must be included for the form element that collects this information to validate the input. Messages in the alert windows must be produced when errors are detected.

b) Modify the above program to get the current semester also (restricted to be a number from 1 to

6. a) Develop and demonstrate, using JavaScript script, a XHTML document that contains three images, stacked on top of each other, with only enough of each showing so that the mouse cursor can be placed over some part of them. When the cursor is placed over the exposed part of any paragraph, it should rise to the top to become completely visible.

b) Modify the above document so that when an image is moved from the top stacking position, it returns to its original position rather than to the bottom.

7. Develop using JavaScript script, an XHTML document that use of onload and onfocus events

8. a) Design an XML document to store information about a student in an engineering college affiliated to VTU. The information must include USN, Name, Name of the College, Brach, Year of Joining, and e-mail id. Make up sample data for 3 students. Create a CSS style sheet and use it to display the document.

b) Create an XSLT style sheet for one student element of the above document and use it to create a display of that element.

9. Write a Perl program which demonstrates the usage of scalar variables and arrays

10. Write a Perl program to display various Server information like Server Name, Server
Software, Server protocol,CGI Revision etc.

11. Write a Perl program to display a digital clock which displays the current time of the server

12. Write a Perl program to accept the User Name and display a greeting message randomly chosen from a list of 4 greeting messages.

13. Write a Perl program to keep track of the number of visitors visiting the web page and to display this count of visitors, with proper headings.

14. Write a CGI-Perl program to use a cookie to remember the day of the last login from a user and display it when run

Note: In the examination *each* student picks one question from the lot of *all* 14 questions.

SEMESTER II
Data Structures Using C

Sub Code : 13MCA21	**IA Marks : 50**
Hrs/Week : 4	**Exam Hours : 3**
Total Hours : 52	**Exam Marks : 100**

Introduction to Data Structures **10 Hours**

Information and its meaning: Abstract Data Types, Sequences as Value Definitions, ADT for Varying length character Strings, Data Types,Pointers and review of Pointers, Data Structures. Arrays : Array as an ADT, Using One-dimensional Arrays, Implementing One-Dimensional Arrays, Arrays as Parameters, Handling of Character Strings and Character Strings

The Stack **8 Hours**

Definition and examples , Primitive operations, Example, The stack as an ADT, Representing stacks ,Implementing the pop operation, Testing for exceptional conditions , Implementing the push operations , Examples for infix , postfix, and prefix expressions, Basic definition and Examples ,Program to evaluate a postfix expression ,Converting an expression from infix to postfix, Program to convert an expression from infix to postfix, Applications of Stacks: Expression Evaluations, Recursion etc.

Recursion **4 Hours**

Recursive definition and processes, Factorial function, Multiplication of natural numbers, Fibonacci sequence, Binary search, Properties of recursive definition or algorithm. Binary search, Towers of Hanoi problem.

Queues and Lists **12 Hours**

The queue and its sequential representation, the queue as ADT, Insert operation, Priority queue, Array implementation of a priority queue. Linked lists, Inserting and removing nodes from a list, Linked implementations of stacks, getnode and Freenode operations, Linked implementation of queues, Linked list as a data Structure, Example of list operations, Header nodes, Array implementation of lists, Limitations of array implementation, allocating and freeing dynamic variables, Linked lists using dynamic variables, Non integer and non-homogenous lists, Other list structures: Circular lists, Stack as a circular lists, doubly linked lists, Application of Linked Lists: Stacks, Queues, Double-ended Queues, Priority Queues.

Sorting **8 Hours**

Bubble sort, Quick sort, Selection sort, Tree Sorting: Binary Tree Sort, Heap Sort, Insertion Sorts: Simple Insertion, Shell Sort, Address Calculation Sort, Merge and Radix Sort.

Searching **5 Hours**

Basic Search Techniques: Algorithmic Notations, Sequential searching, Searching an ordered table, Indexed sequential search, Binary search, Interpolation search, Tree searching: Inserting into a Binary Search Tree ,Deleting form a binary search tree, Hashing : Resolving hash clashes by open addressing, Choosing a hash Function.

Binary Trees **5 Hours**

Tree traversals, Binary Search Tree and Operations, AVL Tree and Operations, Red-Black Tree, Threaded binary trees and operations.

Text Books:

1. **Data Structures Using C and C++** by Yedidyah Langsam and Moshe J. Augenstein

and Aaron M Tenanbanum, 2nd Edition, Pearson Education Asia, 2002.

Reference Books:

1. Data Structures and Algorithm Analysis in C, Mark Allen Weiss, 2nd Edition, Pearson Education Aisa, 1997.
2. Richard F Giberg and Behrouz A Forouzan: Data Structures – A Pseudo code Approach with C, 2nd Edition, Cengage Learning
3. Robert Kruse, C L Tondo, Bruce Leung and Shashi Mogalla: Data Structures and Program Design in C, 2nd Edition, Pearson Education

Object Oriented Programming Using C++

Sub Code : 13MCA22	**IA Marks : 50**
Hours/Week : 4	**Exam Hours: 3**
Total Hours : 52	**Exam Marks: 100**

Introduction **6 Hours**

Object Oriented paradigm, Structured vs. Object Oriented Paradigm. Elements of Object Oriented Programming: Object, Classes, Encapsulation & data abstraction, Inheritance, Polymorphism etc., C++ Overview, different data types, operators, expressions, const & volatile qualifiers, arrays and strings, reference variables.

Modular Programming with Functions **7 Hours**

Function Components, argument passing, inline functions, function overloading, function templates, recursive functions.

Classes & Objects **14 Hours**

Introduction, Class Specification, Class Objects, access members, defining member functions, data hiding, constructors, destructors, parameterized constructors, static data members, functions, scope resolution operator, passing objects as arguments, returning objects, friend functions & classes, arrays of objects, Dynamic objects – Pointers to objects, Class members, Operator overloading using friend functions such as ++, --, [ ] etc. Class templates.

Inheritance Virtual functions & Polymorphism **12 Hours**

Base Class, Inheritance & protected members, protected base class inheritance, inheriting multiple base classes, Constructors, Destructors & Inheritance. Passing parameters to base Class Constructors, Granting access, Virtual base classes, Virtual function -Calling a Virtual function through a base class reference, Virtual attribute is inherited, Virtual functions are hierarchical, pure virtual functions, abstract classes, using Virtual functions, Early & late binding.

I/O Streams **5 Hours**

IO Stream basics, output operator <<, input >>, additional I/O operators, overloading the output operator <<, overloading the input operator >>, file input & output, manipulators.

Exception Handling, STL **8 Hours**

Exception handling fundamentals, Exception handling options, STL: An overview, containers, vectors, lists, maps.

Text Books:

1. Herbert Schildt: C++ The Complete Reference, 4th Edition, Tata McGraw Hill, 2007.

Reference Book:

1. Stephen Prata : C++ Primer Plus, 6th Edition, Person Education.
2. Al Stevens: C++ Programming, 7th Edition, Wiley India Publications
3. Stanley B.Lippmann, Josee Lajore: C++Primer, 4th Edition, Addison Wesley, 2005.
4. Object oriented programming with C++, E. Balaguruswamy, TMH.

Operating Systems

Subject Code: 13MCA23	**I.A. Marks : 50**
Hours/Week : 4	**Exam Hours : 3**
Total Hours : 52	**Exam Marks : 100**

Introduction: Computer and Operating Systems **6 Hours**

Basic Elements, Processor Registers, Instruction Execution, Interrupts, The Memory Hierarchy, Cache Memory, I/O Communication Techniques, Introduction to Operating System, Mainframe Systems, Desktop Systems, Multiprocessor Systems, Distributed Systems, Clustered Systems, Real - Time Systems, Handheld Systems, Feature Migration, Computing Environments.

Operating System Structures: System Structures **5 Hours**

System Components, Operating – System Services, System Calls, System Programs, System Structure, Virtual Machines, System Design and Implementation, System Generation.

Process Management **6 Hours**

Process, Process States, Process Description, Process Control, Execution of the Operating System, Security Issues, Processes and Threads, Symmetric Multiprocessing(SMP), Micro kernels, CPU Scheduler and Scheduling.

Mutual Execution and Synchronization **6 Hours**

Principles of Concurrency, Mutual Exclusion: Hardware Support, Semaphores, Monitors, Message Passing, Readers/Writes Problem

Deadlock and Starvation **4 Hours**

Principles of Deadlock, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, An Integrated Deadlock Strategy, Dining Philosophers Problem

Memory Management **8 Hours**

Swapping, Contiguous Memory Allocation, Paging, Segmentation, Segmentation with Paging, Demand Paging, Process Creation, Page Replacement, Allocation of Frames, Thrashing

File – System Interface and Implementation **7 Hours**

File Concept, Access Methods, Directory Structure, File – System Mounting, File Sharing, Protection, File – System Structure, File – System Implementation, Directory Implementation, Allocation Methods, Free – Space Management.

Secondary Storage, Computer Security **4 Hours**

Disk Structure, Disk Scheduling, Disk Management, The Security Problem, User Authentication, Program Threats, System Threats.

Case study of Linux Operating system: **6 Hours**

Linux System , Linux history , Design Principles, Kernel modules, Process management, scheduling, Memory management, File systems, Input and output, Inter-process communications.

Text Books

1. Silberschatz, Galvin, Gagne, “Operating System Concepts” John Wiley, Sixth Edition, 2004
2. William Stallings, “Operating Systems – Internals and Design Principles” Pearson, 6th edition, 2012

Reference Books

1. Chakraborty , “Operating Systems” Jaico Publishing House, 2011.
2. Dhananjay M. Dhamdhere, “Operating Systems – A Concept – Based Approach”, Tata McGraw – Hill, 3rd Edition, 2012
3. Elmasri, Carrick, Levine, “Operating Systems – A spiral Approach”, Tata McGraw – Hill, 2012

System Software

Subject Code: 13MCA24	**I.A. Marks : 50**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks : 100**

Machine Architecture **6 Hours**

Introduction, System Software and Machine Architecture, Simplified Instructional Computer (SIC) - SIC Machine Architecture, SIC/XE Machine Architecture, SIC Programming Examples.

Assemblers **12 Hours**

Basic Assembler Function - A Simple SIC Assembler, Assembler Algorithm and Data Structures, Machine Dependent Assembler Features - Instruction Formats & Addressing Modes, Program Relocation. Machine Independent Assembler Features – Literals, Symbol-Definition Statements, Expression, Program Blocks, Control Sections and Programming Linking, Assembler Design Operations - One-Pass Assembler, Multi-Pass Assembler, Implementation Examples - MASM Assembler.

Loaders and Linkers **8 Hours**

Basic Loader Functions - Design of an Absolute Loader, A Simple Bootstrap Loader, Machine- Dependent Loader Features – Relocation, Program Linking, Algorithm and Data Structures for a Linking Loader; Machine-Independent Loader Features - Automatic Library Search, Loader Options, Loader Design Options - Linkage Editor, Dynamic Linkage, Bootstrap Loaders, Implementation Examples - MS-DOS Linker.

Editors And Debugging Systems **6 Hours**

Text Editors - Overview of Editing Process, User Interface, Editor Structure, Interactive Debugging Systems - Debugging Functions and Capabilities, Relationship With Other Parts Of The System, User-Interface Criteria

Macro Processor **8 Hours**

Basic Macro Processor Functions - Macro Definitions and Expansion, Macro Processor Algorithm and Data Structures, Machine-Independent Macro Processor Features – Concatenation of Macro Parameters, Generation of Unique Labels, Conditional Macro Expansion, Keyword Macro Parameters, Macro Processor Design Options - Recursive Macro Expansion, General- Purpose Macro Processors, Macro Processing Within Language Translators, Implementation Examples - MASM Macro Processor, ANSI C Macro Processor.

Compilers **12 Hours**

Basic Compilers Functions- Grammars, Lexical Analysis, Syntactic Analysis, Code Generation. Machine Dependent Compiler Features- Intermediate Form of the Program, Machine dependent code Optimization. Machine Independent Compiler Features- Structured variables, Machine Independent code Optimization. Compiler Design Options- Division into passes, Interpreters, P-code Compilers, Compiler-Compilers.

Text Books:

1. Leland.L.Beck: System Software, 3rd Edition, Addison-Wesley, 1997.
   (Chapters 1.1 to 1.3, 2 (except 2.5.2 and 2.5.3), 3 (except 3.5.2 and 3.5.3), 4 (except 4.4.3,) 5.1, 5.2, 5.3 (except 5.3.3, 5.3.4), 5.4)

Reference Books:

1. D.M.Dhamdhere: System Programming and Operating Systems, 2nd Edition, Tata McGraw - Hill, 1999

Database Management Systems

Subject code : 13MCA25	**I.A.Marks : 50**
Hours/Week : 04	**Exam Hours : 03**
Total Hours : 52	**Exam Marks : 100**

Unit-1: Introduction **7 Hours**

An example; Characteristics of Database approach; Actors on the screen; Workers behind the scene; Advantages of using DBMS approach; A brief history of Database Applications; When not to use a DBMS. Data Models, Schemas and Instances; Three-Schema Architecture and Data Independence; Database Languages and Interfaces; The Database System Environment; Centralized and Client-Server Architectures for DBMSs; Classification of Database Management Systems

Unit-2: Entity-Relationship Model **7 Hours**

Using High-Level Conceptual Data Models for Database Design; An Example Database Application; Entity Types, Entity Sets, Attributes and Keys; Relationship Types, Relationship Sets, Roles and Structural Constraints; Weak Entity Types; Refining the ER Design for COMPANY Database; ER Diagrams, Naming Conventions and Design Issues; Relationship Types of Degree Higher than Two, Relational Database Design Using ER- to-Relational Mapping

Unit-3: Relational Model and Relational Algebra **12 Hours**

Relational Model Concepts; Relational Model Constraints and Relational Database Schemas; Update Operations, Transactions and Dealing with Constraint Violations; Unary Relational Operations: SELECT and PROJECT; Relational Algebra Operations from Set Theory; Binary Relational Operations: JOIN and DIVISION; Additional Relational Operations; Examples of Queries in Relational Algebra;

Unit-4: SQL **12 Hours**

SQL Data Definition and Data Types; Specifying Constraints in SQL; Schema Change Statements in SQL; Basic Queries in SQL; More Complex SQL Queries, Insert, Delete and Update Statements in SQL; Specifying Constraints as Assertions and Triggers; Views (Virtual Tables) in SQL; Additional Features of SQL; Database Programming: Issues and Techniques; Embedded SQL, Dynamic SQL; Database Stored Procedures and SQL / PSM.

Unit-5: Database Design **8 Hours**

Informal Design Guidelines for Relation Schemas; Functional Dependencies; Normal Forms Based on Primary Keys; General Definitions of Second and Third Normal Forms; Boyce-Codd Normal Form

Unit-6: PL/SQL **6 Hours**

Introduction, Language fundamentals, conditional and sequential control, Iterative processing and loops. Exception handlers, triggers. Functions, procedures. Creating and planning PL/SQL.

Text Books:

1. Elmasri and Navathe: Fundamentals of Database Systems, 5th Edition, Pearson Education, 2007. (Chapters 1, 2, 3 except 3.8,5, 6.1 to 6.5, 7.1, 8, 9.1, 9.2 except SQLJ, 9.4, 10, 17, 18 except 18.6, 18.7, 19)

Reference Books:

1. Raghu Ramakrishnan and Johannes Gehrke: Database Management Systems, 3rd Edition, McGraw-Hill, 2003
2. Silberschatz, Korth and Sudharshan: Data base System Concepts, 5th Edition, Mc-GrawHill, 2006.
3. Database Principles Fundamentals of Design, Implementation and Management by Coronel, Morris, Rob- Cengage Learning 2012

Data Structures Using C Laboratory

Sub. Code: 13MCA26	**IA Marks : 50**
Hours/Week : 3	**Exam Hours : 03**
Total Hours : 42	**Exam Marks : 100**

Write a C program to

1. Convert a prefix notation to postfix notation.
2. Evaluate a given postfix expression and its values for the variables.
3. Simulate the working of circular queue providing the following operations–Insert, Delete and Display.
4. Demonstrate recursion
   a. Calculate GCD and LCM of 3 integer numbers
   b. Solve Towers of Hanoi Problem
   c. Calculate the sum for a given number ‘n’ from 1 to n.
5. Simulate the working of a linked list providing the following operations
   a. Insert at the beginning
   b. Insert at the end
   c. Insert before a given element
   d. Insert at the position
   e. Display
6. Simulate the working of a circular linked list providing the following operations
   a. Delete from the beginning
   b. Delete from the end
   c. Delete a given element
   d. Delete every alternate element
   e. Display

   Insert is mandatory.
7. Simulate the working of a dequeue.
8. Simulate the working of a double linked list to implement stack and queue.
9. Create a binary tree and implement the tree traversal techniques of inorder, preorder and postorder.
10. Implement quick sort.
11. Implement Heap sort.
12. Implement the search techniques of
    a. Linear Search
    b. Binary Search

13 Write a Program to
   a) Create AVL Tree
   b) Insert element to AVL tree
   c) Find the height of the AVL tree

Database Laboratory

Sub code	**: 13MCA27**	**lA Marks: 50**
Hours/week	**: 3**	**Exam Hours: 3**
Total hours	**: 42**	**Exam Marks: 50**

Instructions for the Exercises:

1. Draw ER diagram based on given scenario with various Constraints.
2. Create Relational Database Schema based on the above scenario using Mapping Rules.
3. Perform the given queries using any RDBMS Environment.
4. Suitable tuples have to be entered so that queries are executed correctly
5. The results of the queries may be displayed directly

Exercise: 1

Notown Records has decided to store information about musicians who perform on its albums. Each musician that records at Notown has an SSN, a name, an address, and a phone number. No musician has more than one phone. Each instrument used in songs recorded at Notown has a unique identification number, a name (e.g., guitar, synthesizer, flute) and a musical key (e.g., C, B-flat, E-flat). Each album recorded on the Notown label has a unique identification number, a title, a copyright date and a format (e.g., CD or MC). Each song recorded at Notown has a title and an author. Each musician may play several instruments, and a given instrument may be played by several musicians. Each album has a number of songs on it, but no song may appear on more than one album. Each song is performed by one or more musicians, and a musician may perform a number of songs. Each album has exactly one musician who acts as its producer. A musician may produce several albums.

Queries

a) List musician name, title of the song which he has played, the album in which song has occulted.
b) List the details of songs which are performed by more than 3 musicians.
c) List the different instruments played by the musicians and the average number of musicians who play the instrument.
d) Retrieve album title produced by the producer who plays guitar as well as flute and has produced no of songs greater than the average songs produced by all producers.
e) List the details of musicians who can play all the instruments present.

Exercise: 2

Professors have a PROFID, a name, an age, a rank, and a research specialty. Projects have a project number, a sponsor name (e.g. UGC/AICTE/...), a starting date, an ending date, and a budget. Graduate students have an USN, a name, an age, and a degree program (e.g. MCA/ MPhil/BE/ME ..). Each project is managed exactly by one professor (known as the project's principal investigator). Each project is worked on by one or more professors (known as the project's co-investigators). Professors can manage/work on multiple projects. Each project is worked on by one or more graduate students (known as the project's research assistants). Graduate students can work on multiple projects. Each professor can supervise many students. A student who is working on a project can be supervised by only one professor.

Queries

a) Retrieve the names of all professors who do not have an ongoing project of more than 1 lakh.
b) Retrieve the names of all graduate students along with their professors under whom they work and project sponsor.
c) List the professors and sum of the budget of their projects started after 2005 but ended in 2010.
d) List the names of professors who has a total worth of project greater than the average budget of projects sanctioned
e) List the professors who work on all the projects.

Exercise: 3

A bank has many branches and a large number of customers. Bank is identified by its code. Other details like name, address and phone for each bank are also stored. Each branch is identified by its bank. Branch has name, address and phone. A customer can open different kinds of accounts with the branches. An account can belong to more than one customer. Customers are identified by their SSN, name, address and phone number. Age is used as a factor to check whether customer is a major. There are different types of loans, each identified by a loan number. A customer can take more than one type of loan and a loan can be given to more than one customer. Loans have a duration and interest rate. Make suitable assumptions and use them in showing maximum and minimum cardinality ratios.

Queries:

a) List the details of customers who have joint account and also have at least one loan.
b) List the details of the branch which has given maximum loan.
c) List the details of saving accounts opened in the SBI branches located at Bangalore.
d) List the name of branch along with its bank name and total amount of loan given by it.
e) Retrieve the names of customers who have accounts in all the branches located in a specific city.'

Exercise: 4

Patients are identified by an SSN, and their names, addresses, and ages must be recorded. Doctors are identified by an SSN. For each doctor, the name, specialty, and years of experience must be recorded. Each pharmaceutical company is identified by name; it has an address and one phone number. For each drug, the trade name and formula must be recorded. Each drug is sold by a given pharmaceutical company, and the trade name identifies a drug uniquely from among the products of that company. Each pharmacy has a name, address, and phone number. Each patient is checked up by some doctor. Every doctor has at least one patient. Each pharmacy sells several drugs and has a price for each. A drug could be sold at several pharmacies, and the price could vary from one pharmacy to another. Doctors prescribe drugs for patients. A doctor could prescribe one or more drugs for several patients, and a patient could obtain prescriptions from several doctors. Each prescription has a date and a quantity associated with it. Pharmaceutical companies have long-term contracts with pharmacies. A pharmaceutical company can contract with several pharmacies, and a pharmacy can contract with several pharmaceutical companies. For each contract, you have to store a start date, an end date, supervisor and the text of the contract.

Queries:

a) List the details of patients who are 20 years old and have been checked by eye-specialist.
b) List the details of doctors who have given the prescription to more than 20 patients in year 2013.
c) List the details of pharmaceutical companies who supply drug to more than 10 pharmacies in the same city where company is located.
d) List the details of drug supplied by only one pharmaceutical company.
e) List the details of drug supplied by all pharmaceutical companies.

Exercise; 5

Data requirements of movie industry are captured. Each movie is identified by title and year of release. Each movie has length in minutes and classified under one genres (like action, horror etc.). Each movie has a plot outline. Production companies are identified by name and each has an address. A production company produces one or more movies. Actors are identified by id. Other details like name and date of birth of actors are also stored. Each actor acts in one or more movies. Each actor has a role in movie. Directors are identified by id. Other details like name and date of birth of directors are also stored. Each director directs one or more movies. Each movie has one or more actors and one or more directors and is produced by a production company.

Queries:

a) List the details of horror movies released in 2012 and directed by more than 2 directors.
b) List the details of actors who acted in movies having same titles but released before 2000 and after 2010.
c) List the details of production companies producing maximum movies.
d) List the details of movies where director and actor have same date of birth.
e) Retrieve the names of directors directed all the movies produced by any one production company.

Note: In the examination each student picks one question from a lot of 5 exercises.

OOP Using C++ Laboratory

Subject Code: 13MCA28	**I.A Marks :50**
Hours/Week : 3	**Exam Hours : 3**
Total Hours : 42	**Exam Marks : 50**

1. Define a STUDENT class with USN, Name, and Marks in 3 tests of a subject. Declare an array of 10 STUDENT objects. Using appropriate functions, find the average of the two better marks for each student. Print the USN, Name and the average marks of all the students.

2. Write a C++ program to create a class called COMPLEX and implement the following overloading functions ADD that return a complex number:
(i) ADD (a, s2) – where 'a' is an integer (real part) and s2 is a complex number
(ii) ADD (s1, s2) – where s1 and s2 are complex numbers

3. Write a C++ program for scalar multiplication of two vectors using operator overloading.

4. Write a C++ program to create a template function for Bubble Sort and demonstrate sorting of integers and doubles.

5. Write a C++ program to create a class called LIST (linked list) with member functions to insert an element at the front and delete an element from the front of the list. Demonstrate all the functions after creating a LIST object.

6. Write a C++ program to create a class called STACK using an array of integers. Implement the following operations by overloading the operators '+' and '--':

(i) s1 = s1 + element; where s1 is an object of the class STACK and element is an integer to be pushed on the top of the stack

(ii) s1 = --s1 ; where s1 is an object of the class STACK. '--'operator pops the element. Handle the STACK empty and full conditions. Also display the contents of the stack after each operation, by overloading the << operator.

7. Create a class called MATRIX using two-dimensional array of integers. Implement the following operations by overloading the operator ++ which checks the compatibility of two matrices to be added and subtracted. Perform the addition and subtraction by overloading the + and – operators respectively. Display the results by overloading the operator <<. If (m1==m2) then m3 = m1+m2 and m4 = m1-m2 else display error.

8. Write a C++ program to create a class called OCTAL which has the characteristics of an octal number. Implement the following operations by writing an appropriate constructor and an overloaded operator +.

(i) OCTAL h = x; where x is an integer.
(ii) int y = h + k; where h is an OCTAL object and k is an integer
Display the OCTAL result by overloading the operator <<. Also display the values of h and y.

9. Write a C++ program to create a class template called QUEUE with member functions to add an element and to delete an element from the queue. Using the member functions, implement a queue of integers and double. Demonstrate the operations by displaying the

contents of the queue after every operation.

10. Define a class SET with Data members: array of int, int variable to indicate number of elements in a SET object; and Member functions: to read element of a SET object, to print elements of a SET object, to find union of 2 objects of SET using operator overloading (S3=S1+S2), to find intersection of 2 objects of SET using operator overloading (S4= S1*S2). S1, S2, S3 and S4 are objects of SET. Use this class in a main function to show the above operations.

11. Write a C++ program to create a class called STUDENT with data members USN, Name and Age. Using inheritance, create the classes UGSTUDENT and PGSTUDENT having fields as Semester, Fees and Stipend. Enter the data for at least 5 students. Find the semester-wise average age for all UG and PG students separately.

12. Write a C++ program to create a class called STRING and implement the following operations. Display the results after every operation by overloading the operator <<.
(i) STRING s1 = “VTU”
(ii) STRING s2 = “BELGAUM”
(iii) STRING s3 = s1 + s2 (Use copy constructor)

13. Define a base class STACK1 which performs only push, pop, display operations. Override the above operations through a derived class STACK2 which takes care of STACK FULL & STACK EMPTY situations. Show how the objects of these classes use the above functions in a main function.

14. Create an abstract base class EMPLOYEE with data members: Name, EmpID and BasicSal and a pure virtual function Cal_Sal().Create two derived classes MANAGER (with data members: DA and HRA) and SALESMAN (with data members: DA, HRA and TA). Write appropriate constructors and member functions to initialize the data, read and write the data and to calculate the net salary. The main() function should create array of base class pointers/references to invoke overridden functions and hence to implement run-time polymorphism.

Note: In the examination each student has to pick one question from a lot of *all* the 14 questions.

SEMESTER III

Computer Networks

Subject Code: 13MCA31 **IA.Marks : 50**
Hours/Week : 4 Hrs. **Exam Duration : 3 Hrs**
Total Hours : 52 Hrs. **Examination Marks : 100**

Introduction to Computer Networks **3 Hours**
Networking Devices ,Classification of Computer Networks ,Network Protocol Stack (TCP/IP and ISO-OSI),Network Standardization and Examples of Networks.

Physical Layer **10 Hours**
Data Transmission Concepts, Analog and Digital Data Transmission ,Transmission Impairments and Channel Capacity, Guided and Wireless transmission, communication media, Digital modulation techniques (FDMA,TDMA,CDMA) and mobile telephone systems (1G,2G,3G and 4G).

Data Link layer **5 Hours**
Error Detection and Correction Codes,Data Link Protocols and Sliding window protocols.

Medium Access Sub Layer **4 Hours**
Multiple access protocols and Examples : Ethernet, Wireless LAN, Broadband Wireless and bluetooth, Data Link Layer Switching.

Network Layer **14 Hours**
Network Layer Design issues, Routing algorithms, Congestion Control Algorithms, Quality of Service, Internetworking and The Network Layer in the Internet

The Transport Layer **12 Hours**
The Transport Service, Elements of Transport Protocols, Congestion Control, The Internet Transport Protocol: UDP,The Internet Transport Protocols – TCP, Performance Issues.

The application Layer **4 Hours**
DNS, Email,WWW,Streaming audio and Video and Content Delivery

Text Books
1. “Computer Networks” by Andrew S Tanenbaum, David J Wetheral, 5th Edition, Pearson 2012
Chapter 1, 2.2, 2.3, 2.5, 2.7, 3.1, 3.2, 3.3, 3.4, 4.2, 4.3, 4.4, 4.5, 4.6, 4.8 Chapter 5, Chapter 6 (excluding 6.7)
2 “Data and Computer Communications” by William Stallings , Above 7th edition , 2004 Chapter 3

Reference Books
1. “Computer Networks” Principles,Technologies and Protocols for Network Design, by NATALA OLIFER and VICTOR OLIFER , 2010
2. http://www.ietf.org/rfc.html relevant RFC document could be used to get more detailed information about any of the concepts prescribed in the syllabus like RFC 2460 can be referred to get a detailed information about IPV6

Programming using JAVA

Subject Code : 13MCA32	**I.A. Marks: 50**
Hours/Week : 4	**Exam Hours : 3**
Total Hours : 52	**Exam Marks : 100**

Java Programming Fundamentals **2 Hours**

The Java Language, The Key Attributes of Object-Oriented Programming, The Java Development Kit, A First Simple Program, Handling Syntax Errors, The Java Keywords, Identifies in Java, The Java Class Libraries.

Introducing Data Types and Operators **1 Hour**

Java's Primitive Types, Literals, A Closer Look at Variables, The Scope and Lifetime of Variables, operators, Shorthand Assignments, Type conversion in Assignments, Using Cast, Operator Precedence, Expressions.

Program Control Statements **1 Hour**

Input characters from the Keyword, if statement, Nested ifs, if-else-if Ladder, Switch Statement, Nested switch statements, for Loop, Enhanced for Loop, While Loop, do-while Loop, Use break, Use continue, Nested Loops

Introducing Classes, Objects and Methods **3 Hours**

Class Fundamentals, How Objects are Created, Reference Variables and Assignment, Methods, Returning from a Method, Returning Value, Using Parameters, Constructors, Parameterized Constructors, The new operator Revisited, Garbage Collection and Finalizers, The this Keyword.

More Data Types and Operators **2 Hours**

Arrays, Multidimensional Arrays, Alternative Array Declaration Syntax, Assigning Array References, Using the Length Member, The For-Each Style for Loop, Strings, The Bitwise operators.

String Handling **2 Hours**

String Fundamentals, The String Constructors, Three String-Related Language Features, The Length() Method, Obtaining the characters within a string, String comparison, using indexOf() and lastIndexOf(), Changing the case of characters within a string, StringBuffer and String Builder.

A Closer Look at Methods and Classes **3 Hours**

Controlling Access to Class Members, Pass Objects to Methods, How Arguments are passed, Returning Objects, Method Overloading, Overloading Constructors, Recursion, Understanding Static, Introducing Nested and Inner Classes, Varargs: Variable-Length Arguments.

Inheritance **6 Hours**

Inheritance Basics, Member Access and Inheritance, Constructors and Inheritance, Using super to Call Superclass constructors, Using super to Access Superclass Members, Creating a Multilevel Hierarchy, When are Constructors Executed, Superclass References and Subclass Objects, Method Overriding, Overridden Methods support polymorphism, Why Overridden Methods, Using Abstract Classes, Using final, The Object Class.

Interfaces **3 Hours**

Interface Fundamentals, Creating an Interface, Implementing an Interface, Using Interface References, Implementing Multiple Interfaces, Constants in Interfaces, Interfaces can be extended, Nested Interfaces, Final Thoughts on Interfaces.

Packages **3 Hours**

Package Fundamentals, Packages and Member Access, Importing Packages, Static Import

Exception Handling **4 Hours**

The Exception Hierarchy, Exception Handling Fundamentals, The Consequences of an Uncaught Exception, Exceptions Enable you to handle errors gracefully, using Multiple catch clauses, Catching subclass Exceptions, try blocks can be nested, Throwing an Exception, A Closer look at Throwable, using finally, using throws, Java’s Built-in Exceptions, New Exception features added by JDK 7, Creating Exception Subclasses.

Multithreaded Programming **4 Hours**

Multithreading fundamentals, The Thread Class and Runnable Interface, Creating Thread, Creating Multiple Threads, Determining When a Thread Ends, Thread Priorities, Synchronization, using Synchronization Methods, The Synchronized Statement, Thread Communication using notify(), wait() and notify All(), suspending, Resuming and stopping Threads.

Enumerations, Auto boxing and Annotations **4 Hours**

Enumerations, Java Enumeration are class types, The Values () and Valueof () Methods, Constructors, methods, instance variables and enumerations, Auto boxing, Annotations (metadata)

Generics **2 Hours**

Generics Fundamentals Bounded Types, Generic Methods, Generic Constructors, Some Generic Restrictions.

Applets **2 Hours**

Applet basics, A complete Applet Skeleton, Applet Initialization and Termination, A key Aspect of an Applet Architecture, Requesting Repainting, using the status window, Passing parameters to Applets.

Swing Fundamentals **4 Hours**

The origin and Design philosophy of swing, Components and containers, Layout managers, A first simple swing Example, Event Handling, **Exploring Swing Controls**-JLabel and ImageIcon, The Swing Buttons, Trees.

Networking with Java.net **3 Hours**

Networking fundamentals, The Networking classes and Interfaces, The InetAddress class, The Socket Class, The URL class, The URLConnection Class, The HttpURL Connection Class.

Exploring Collection Framework **3 Hours**

Collections Overview, The Collection Interfaces, The collection Classes. The Arrays Class.

Text Books:

1. J

ava Fundamentals, A comprehensive Introduction by Herbert Schildt, Dale Skrien. Tata McGraw Hill Edition 2013. (Chapters: 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,17,18,22,23,24,25,26)

Reference Books:

1. Programming with Java by T V Suresh Kumar, B Eshwara Reddy and P Raghavan, Sanguine Technical Publishers, 2011.
2. Programming in JAVA2 by Dr K Somasundaram ,Jaico publications
3. Java Programming by Hari Mohan Pandey, Pearson Education, 2012.
4 Java 6 Programming, Black Book, KoGenT , dreamtech Press, 2012.
5. Java 2 Essentials, Cay Hortsmann, second edition, Wiley

Software Engineering

Subject Code: 13MCA33	**I.A. Marks : 50**
Hours/Week: 4	**Exam Hours : 3**
Total Hours : 52	**Exam Marks : 100**

1. Overview **03 hours**

Introduction: Professional Software Development Attributes of good software, software engineering diversity, IEEE/ ACM code of software engineering ethics, case studies

2. Software Process & Agile Software Development **10 hours**

Software Process models: waterfall, incremental development, reuses oriented, Process activities; Coping with change, The rational Unified process. Agile methods, Plan-driven and agile Development, Extreme Programming, Agile project management, Scaling agile methods.

3. Requirements Engineering **06 hours**

Functional and non-functional requirements, The software requirements document, Requirements specification, Requirements engineering processes, Requirement elicitation and analysis, Requirements validation, Requirements management

4. System Modeling, Architectural Design & Design and implementation **16 hours**

Context models, Interaction models, Structural models, Behavioral models, Model-driven engineering, Software architecture: the role of software architecture, architectural views, component and connector view, Architectural styles for C&C view, Documenting architectural design.Design: Design concepts, Function oriented design, detailed design, verification, matrix (Complexity matrix for function oriented design),

5. Component-based software engineering **04 hours**

Components and component model, CBSE process, Component composition

6. Distributed Software engineering **05 hours**

Distributed system issues, Client-server computing, Architectural patterns for distributed systems, Software as a service.

7. Planning a software Project **04 hours**

Process planning, Effort estimation, Project scheduling and staffing, Software configuration management plan, Quality plan, Risk Management, Project monitoring plan.

8. Software Testing **04hours**

Testing fundamentals, Black-box testing, White-box testing, Testing process

Text Books:

1. Ian Sommerville : Software Engineering, 9th edition, Person Education Ltd, 2011. (Chapters-: 1, 2, 3, 4, 5, 17, 18)
2. Pankaj Jalote: Software engineering, Wiley India Pvt Ltd (2010) (Chapters-:4, 6.1, 6.2, 6.5, 6.6)

Reference Books:

1. Roger S Pressman: Software Engineering-A Practitioners approach, 6th edition, McGraw-Hill, 2010.
2. Hans Van Vliet: Software Engineering Principles and Practices, 3rd Edition, Wiley –India, 2010

3 Software Engineering architectural driven software developments by R Schmidt

Computer Graphics

Subject Code : 13MCA34	**I.A. Marks: 50**
Total Hours : 52	**Exam Hours: 3**
Hours/Week : 4	**Exam Marks: 100**

Graphics Output Primitives and Attributes 12 Hours

Introduction to open GL, Coordinate reference frames, Specifying two dimensional world coordinate reference frame in Open GL, Open GL point functions, Open GL line functions, Line drawing algorithms, Circle generation algorithms, Ellipse generation algorithms, Fill area primitives, Polygon fill areas, OpenGL polygon fill area functions, General scan line polygon fill algorithm, Fill methods for areas with irregular boundaries, Open GL fill area attribute functions

Two – Dimensional and Three - Dimensional Geometric Transformations 12 Hours

Basic two dimensional geometric transformations, Matrix representations and homogeneous coordinates, Inverse transformations, Two dimensional composite transformations, Other two dimensional transformations, Three dimensional Translation, Rotation, Scaling, Other three dimensional transformations, Affine transformations, Open GL geometric transformation functions

Two Dimensional Viewing 10 Hours

The two dimensional viewing, Clipping window, Normalization and viewport transformations, Clipping algorithms, Two dimensional point clipping, Two dimensional line clipping algorithms, Polygon fill area clipping, Curve clipping, Text clipping

Three Dimensional Viewing 10 Hours

The three dimensional viewing concepts, Three dimensional viewing pipeline, Three dimensional viewing coordinate parameters, Transformation from world to viewing coordinates, Projection transformations, Orthogonal projections, Oblique parallel projections, Perspective projections, The viewport transformation and three dimensional screen coordinates

Curves and Computer Animation 08 Hours

Bezier spline curves, Raster methods for computer animation, Design of animation sequences, Traditional animation techniques, General computer animation functions

Text book:

Donald Hearn, M.Pauline Baker, Computer Graphics with Open GL, Pearson (Indian Edition), Third Edition. Chapters and topics [2.9, 3.1-3.5, 3.9, 3.10, 3.14-3.16, 4.10, 4.13, 4.14, 5.1-5.5, 5.10-5.15, 5.17, 6.1-6.3, 6.5-6.10, 7.1-7.9, 8.10, 13.1-13.4]

Reference Books:

1. Edward Angel, ‘Interactive Computer Graphics’ – A top down approach using Open GL, Pearson, Fifth Edition
2. Peter Shirley, Steve Marschner, 'Computer Graphics, Cengage Learning (Indian edition), 2009.

UNIX System Programming

Subject Code :	13MCA351	I.A. Marks	: 50
Hours/Week	: 4	Exam Hours	: 03
Total Hours	: 52	Exam Marks :	100

Introduction **6 Hours**

UNIX and ANSI Standards: The ANSI C Standard, The ANSI/ISO C++ Standards, Difference between ANSI C and C++, The POSIX Standards, The POSIX.1 FIPS Standard, The X/Open Standards. UNIX and POSIX APIs: The POSIX APIs, The UNIX and POSIX Development Environment, API Common Characteristics.

UNIX Files **6 Hours**

File Types, The UNIX and POSIX File System, The UNIX and POSIX File Attributes, Inodes in UNIX System V, Application Program Interface to Files, UNIX Kernel Support for Files, Relationship of C Stream Pointers and File Descriptors, Directory Files, Hard and Symbolic Links.

UNIX File APIs **7 Hours**

General File APIs, File and Record Locking, Directory File APIs, Device File APIs, FIFO File APIs, Symbolic Link File APIs, General File Class, regfile Class for Regular Files, dirfile Class for Directory Files, FIFO File Class, Device File Class, Symbolic Link File Class, File Listing Program.

UNIX Processes **7 Hours**

The Environment of a UNIX Process: Introduction, main function, Process Termination, Command-Line Arguments, Environment List, Memory Layout of a C Program, Shared Libraries, Memory Allocation, Environment Variables, setjmp and longjmp Functions, getrlimit, setrlimit Functions, UNIX Kernel Support for Processes.

Process Control **7 Hours**

Introduction, Process Identifiers, fork, vfork, exit, wait, waitpid, waited, wait3, wait4 Functions, Race Conditions, exec Functions, Changing User IDs and Group IDs, Interpreter Files, system Function, Process Accounting, User Identification, Process Times. Process Relationships: Introduction, Terminal Logins, Network Logins, Process Groups, Sessions, Controlling Terminal, tcgetpgrp, tcsetpgrp, and tcgetsid Functions, Job Control, Shell Execution of Programs, Orphaned Process Groups.

Signals and Daemon Processes **7 Hours**

Signals: The UNIX Kernel Support for Signals, signal, Signal Mask, sigaction, The SIGCHLD Signal and the waitpid Function, The sigsetjmp and siglongjmp Functions, Kill, Alarm, Interval Timers, POSIX.lb Timers. Daemon Processes: Introduction, Daemon Characteristics, Coding Rules, Error Logging, Single- instance daemons; Daemon conventions; Client-Server Model.

Interprocess Communication **6 Hours**

Introduction; Pipes, popen, pclose Functions; Coprocesses; FIFOs; XSI IPC; Message Queues; Semaphores

Network IPC: Sockets **6 Hours**

Introduction; Socket Descriptors; Addressing; Connection establishment; Data transfer; Socket options; Out-of-band data; Nonblocking and asynchronous I/O.

Text Books:

1. Terrence Chan: Unix System Programming Using C++, Prentice-Hall of India / Pearson Education, 1999. (Chapters 1, 5, 6, 7, 8, 9)
2. W.Richard Stevens, Stephen A. Rago: Advanced Programming in the UNIX Environment, 2nd Edition, Pearson Education / Prentice-Hall of India, 2005. (Chapters 7, 8, 9, 13, 15, 16)

Advanced Topics In DBMS

Sub Code	**: 13MCA352**	**IA Marks**	**: 50**
Hrs/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

Over view of Storage and Indexing, Disks and Files 7 Hours

Data on external storage; File organizations and indexing; Index data structures; Comparison of file organizations; Indexes and performance tuning Memory hierarchy; RAID; Disk space management; Buffer manager; Files of records; Page formats and record formats.

Transaction Management 6 Hours

Introduction to Transaction Processing; Transaction and System Concepts; Desirable Properties of Transactions; Characterizing Schedules based on Recoverability; Characterizing Schedules based on Serializability; Two-Phase Locking Techniques for Concurrency Control; Concurrency Control based on Timestamp Ordering; Multiversion Concurrency Control Techniques; Validation Concurrency Control Techniques;. Granularity of Data Items and Multiple Granularity Locking; Recovery Concepts, Recovery Techniques based on Deferred Update; Recovery Techniques based on Immediate Update; Shadow Paging; The ARIES Recovery Algorithms; Recovery in Multidatabase Systems; Database Backup and Recovery from Catastrophic Failures.

Tree Structured Indexing 7 Hours

Intuition for tree indexes; Indexed sequential access method; B+trees, Search, Insert, Delete, Duplicates, B+tress in practice

Hash-Based Indexing 4 Hours

Static hashing, Extendible hashing, Linear hashing, comparisons

Overview of Query Evaluation, External Sorting 5 Hours

The system catalog, Introduction to operator evaluation; Algorithm for relational operations; Introduction to query optimization; Alternative plans; A motivating example; what a typical optimizer does. When does a DBMS sort data? A simple two-way merge sort; External merge sort

Evaluating Relational Operators 4 Hours

The Selection operation; General selection conditions; The Projection operation; The Join operation; The Set operations; Aggregate operations; The impact of buffering.

A Typical Relational Query Optimizer 7 Hours

Translating SQL queries in to Relational Algebra; Estimating the cost of a plan; Relational algebra equivalences; Enumeration of alternative plans; Nested sub-queries; other approaches to query optimization.

Physical Database Design and Tuning 6 Hours

Introduction; Guidelines for index selection ,examples; Clustering and indexing; Indexes that enable index-only plans, Tools to assist in index selection; Overview of database tuning; Choices in tuning the conceptual schema; Choices in tuning queries and views; Impact of concurrency; DBMS benchmarking.

More Recent Applications **6 Hours**

Mobile databases; Multimedia databases; Geographical Information Systems; Genome data management.

Text Books:

1. Raghu Ramakrishnan and Johannes Gehrke: Database Management Systems,3rd Edition, McGraw-Hill,2003, (Chapters 8,9,10,11,12,13.1 to 13.3, 14,15,20)
2. Elmasri and Navathe:Fundamentals of Database Systems,5th Edition, Pearson Education, 2007. (Chapter 30)

Reference Books:

1. Conolly and Begg: Database Systems,4th Edition, Pearson Education,2002.

Basics of MIS and E-Commerce

Subject Code: 13MCA353	**I.A. Marks : 50**
Hours/Week: 4	**Exam Hours : 3**
Total Hours: 52	**Exam Marks : 100**

Information and Knowledge **4 Hours**

Information concepts, classification of information, methods of data and information collection, value of information, information: A quality product, General model of a human as information processor, Knowledge**,**

Introduction of MIS **4 Hour**

MIS: Concept, Definition, Role of the MIS, Impact of MIS, MIS and the user, Management as a control system, MIS support to the management, Management effectiveness and MIS, Organization as system. MIS: organization effectiveness

Decision Making and DSS **4 Hours**

Decision making concepts; decision making process, decision-making by analytical modeling, Behavioral concepts in decision making, organizational decision-making, Decision structure, DSS components, Management reporting alternatives.

Electronic Business systems **5 Hours**

Enterprise business system – Introduction, cross-functional enterprise applications, real world case, Functional business system, - Introduction, marketing systems, sales force automation, CIM, HRM, online accounting system, Customer relationship management, ERP, Supply chain management (real world cases for the above)

Client Server Architecture and E-business Technology **8 Hours**

Client server architecture, implementation strategies, Introduction to E-business, model of E-business, internet and World Wide Web, Intranet/Extranet, Electronic, Impact of Web on Strategic management, Web enabled business management, MIS in Web environment.

E-Commerce Introduction **9 Hours**

Course overview; Introduction to e-commerce, E-commerce Business Models and Concepts, E-Commerce Infrastructure: The Internet and World Wide Web, Web design, JavaScript Internet Information Server (IIS); Personal Web Server (PWS),

E-Commerce techniques and Issues **9 Hours**

Introduction to Active Server Pages (ASP), Building an E-Commerce Web Site, E-Commerce Payment Systems, E-Commerce Marketing Techniques, Building product catalogue, Search product catalogue, Web Spider and search agent, Ethical, Social and Political Issues in E-Commerce

Internet Communication **9 Hours**

Transaction Systems, Shopping Carts, XML, E-Commerce Applications: Business-to-Consumer (B2C), Consumer-to-Consumer (C2C), Business-to-Business (B2B), Digital Government, Marketplaces, and Communities, Security and Encryption, Web Security.

Text Books:

1. Waman S Jhawadekar: Management Information System, 3rd Edition, Tata McGraw Hill

2. James A O’Brien and George M Marakas: Management Information System, 7th Edition, Tata McGraw Hill, 2006,
3. Turban, Rainer, and Potter, Introduction to E-Commerce, second edition, 2003
4. H. M. Deitel, P. J. Deitel and T. R. Nieto, E-Business and E-Commerce: How to Programe, Prentice hall, 2001

Reference Books:

1. Henry Chan, Raymond Lee, Tharam Dillon, Elizabeth Chang: E-Commerce Fundamentals and Applications, Wile India Edition
2. Ralph M Stair and George W Reynolds: Principles of Information Systems, 7th Edition, Thomson, 2010 .
3. Steven Alter: Information Systems - The Foundation of E-Business, 4th Edition, Pearson Education, 2001
4. Rahul De, Managing Information Systems in Business, Government and Society, , Wiley India.

Operations Research

Subject Code: 13MCA354	**I.A. Marks : 50**
Hours/Week : 4	**Exam Hours : 3**
Total Hours : 52	**Exam Marks : 100**

Introduction and Overview of the OR Modeling Approach **3 Hours**
The origin of OR, the nature of OR, the impact of OR, defining the problem and gathering data, Formulating a mathematical model, deriving solutions from the model, testing the model, preparing to apply the model, implementation .

Introduction to Linear Programming **6 Hours**
Formulation of linear programming problem (LPP), examples, Graphical solution, the LP Model, Special cases of Graphical method, assumptions of Linear Programming (LP), additional example

Solving LPP - the Simplex Method **14 Hours**
The essence of the simplex method, setting up the simplex method, algebra of the simplex method, the simplex method in tabular form, special cases in the simplex method, tie breaking in the simplex method, adopting to other model forms (Two Phase method, Big-M method), post optimality analysis.

Duality Theory and Sensitivity Analysis **9 Hours**
The essence of duality theory, economic interpretation of duality, primal dual relationship, adapting to other primal forms, the role of duality in sensitive analysis, the dual simplex method

Transportation and Assignment Problems **8 Hours**
The transportation problem, a stream line simplex method for the transportation problem, the assignment problem, a special algorithm for the assignment problem

PERT and CPM **6 Hours**
Network representation, Critical path (CPM) computations and PERT networks.

Game Theory **6 Hours**
The formulation of two persons, zero sum games, solving simple games- a prototype example, games with mixed strategies, graphical solution procedure, solving by linear programming, extensions

Text Books:

1. Frederick S.Hillier & Gerald J.Lieberman: Introduction to Operations Research, 8thEdition, Tata McGraw Hill, 2006. (Chapters 1.1-1.3, 2.1-2.6, 3.2-3.4, 4.1-4.7, 6.1-6.7, 7.1, 8.1-8.4, 13.1-3.4, 14.1-14.6)
2. Hamdy A Taha: Operations Research - An Introduction, 7th Edition, Pearson Education 2007 Chapter 6.6(except 6.6.3 and 6.6.4)

Reference Books:

1. Wayne L. Winston: Operations Research Applications and Algorithms, 4th Edition, Thomson Course Technology, 2003.
2. Theory and Problems of Operations Research, Richard Bronson and

Govindasami Naadimuthu, Schaum's Outline, Tata McGraw Hill, 2nd Edition, 1997.

Principles of User Interface Design

Subject Code: 13MCA355	**I.A. Marks : 50**
Hours/Week: 4	**Exam Hours : 3**
Total Hours: 52	**Exam Marks : 100**

Introduction **8 Hours**

Usability of Interactive Systems: Introduction, Usability Goals and Measures, Usability Motivation, Universal Usability, Goals for our profession. Guideline, principles, and theories**:** Introduction, Guidelines, principles, Theories,

Development Processes **6 Hours**

Managing Design Processes: Introduction, Organizational Design to support Usability,
The Four Pillars of Design, Development methodologies: Ethnographic Observation, Participatory Design, Scenario Development, Social Impact statement for Early Design Review, Legal Issues.

Evaluating Interface Design **6 Hours**

Introduction, Expert Reviews, Usability Testing and Laboratories, Survey Instruments, Acceptance tests, Evaluation during Active Use, Controlled Psychologically Oriented Experiments

Interaction Styles **8 Hours**

Direct Manipulation and Virtual Environments: Introduction, Examples of Direct Manipulation, Discussion of direct manipulation, 3D Interfaces, Tele-operation, Virtual and Augmented Reality
Menu Selection, Form Filling and Dialog Boxes: Introduction, Task-Related Menu Organization, Single Menus, Combination of Multiple Menus, Content Organization, Fast Movement Through Menus, Data Entry With Menus, Form Filling, Dialog Boxes and Alternatives, Audio Menus and Menus for Small Displays

Command and Natural Languages **6 Hours**

Introduction, Command-organization functionality strategies and structure, Naming and Abbreviations, Natural Language in computing.
Interaction Devices: Introduction, Keyboards and Keypads, Pointing Devices, Speech and Auditory interfaces, Displays-Small and Large

Design Issues **6 Hours**

Quality of Service: Introduction, Models of Response-Time Impacts, Expectations and Attitudes, User Productivity, Variability in Response time, Frustrating Experiences
Balancing Function and Fashion: Introduction, Error Messages, Non-anthropomorphic Design, Display design, web page design, Window Design, Color

User Documentation and Online Help : **6 Hours**

Introduction, Online versus paper documentation, Reading from paper versus Displays, Shaping the content of the Manuals, Accessing the Documentation, Online Tutorials and animated demonstrations, Online Communities for User Assistance, The Development Process.

Information Search and Visualization **6 Hours**

Introduction, Search in Textual Documents and Database Querying, Multimedia document searches, Advanced filtering and Search Interfaces,
Information Visualization : Introduction, Data tyoe by task taxonomy, Challenges for information visualization.

TextBooks

1. Ben Shneiderman, Plaisant, Cohen, Jacobs: Designing the User Interface, 5th Edition, Pearson ,Education, 2010

Reference Books

1. Alan Dix, Janet Finalay, Gregory D AbiwdmRussel Bealel: Human-Computer Interaction, III Edition, Pearson ,Education, 2008.
2. Eberts: User Interface Design, Prentice Hall, 1994
3. Wilber O Galitz: The Essential Guide to User Interface Design- An Introduction to GUI Design, Principles and Techniques, Wiley-Dreamtech India Pvt Ltd, 2011

Probability, Statistics & Numerical Techniques

Subject Code: 13MCA356	**I.A. Marks : 50**
Hours/Week: 4	**Exam Hours : 3**
Total Hours : 52	**Exam Marks : 100**

Introduction **4Hours**

Motivation, Probability Models, Sample Space, Events, Algebra of Events, Probability Axioms, Combinatorial Problems, Conditional Probability, Independence of Events, Bayes Rules

Random Variables **18 Hours**

Introduction, Random variables types ,functions of random variables, Probability mass functions, The Probability distribution functions, cumulative distribution function, expected values of x, moments ,moment generating function , Discrete Distributions, binomial distribution, Poisson distribution, Geometric distribution, continuous distribution ,normal distribution, exponential distribution

Regression and Analysis of Variance **6 Hours**

Introduction, Least-squares Curve Fitting, The Coefficients of Determination, Confidence Intervals in Linear Regression, Trend Detection and Slop estimation, Correlation Analysis, Simple Non-Linear Regression.

Numerical methods for solving algebraic transcendental equations **6 Hours**

Introduction, bisection, Newton'Raphson

Matrices **12 Hours**

Elementary row operation, Rank of a matrix, consistency of system of linear equations Solutions of system linear equations – Gauss elimination, Gauss seidel iterative method

Numerical integration **6 hours**

Trapezoidal rule, Simpsons 1/3 rd rule Simpsons 3/8 th rule

Text Books

1. Kishore S Trivedi "Probability & Statistics with Reliability, Queuing and Computer Science Applications ", Wiley Publications, Section Edition, 2012.
2. Arnold O Allen, "Probability, Statistics and Queuing Theory with Computer Science Applications ", Second Edition, ELSEVIER Publications, 2012.
3. Numerical methods for Science and Engineering Computation 6th Edition – R.R. Jain, M.K. Jain, S.R.K Iyengar by New Age International Publications
4. Numerical Methods Using Matlab 3rd Edition – Lindfield by Elsevier Publications

Reference Books

1. Murray R.Spiegel, "Probability and Statistics", McGrawHill, Schaum's Outline Series
2. A.Papoulis and S.Unnikrishnan Pillai, " Probability, Random Variables and Stochastic Processes", McGrawHill 4th Edition.
3. Probabality and Statistics for Engineers and Scientists 8th Edition by Ronald E Walpole Sharon L. Myers, Keyire Ye
4. Numerical Methods for Science and Engineering Computation - S.S. Sastry by PHI Publications

Java Programming Laboratory

Subject Code: 13MCA36	**I.A. Marks : 50**
Hours/Week: 3	**Exam Hours : 3**
Total Hours: 42	**Exam Marks : 50**

1. a. Write a JAVA Program to demonstrate Constructor Overloading and Method Overloading.
   b.Write a JAVA Program to implement Inner class and demonstrate its Access protection.
2. Write a program in Java for String handling which performs the following:
   i) Checks the capacity of StringBuffer objects.
   ii) Reverses the contents of a string given on console and converts the resultant string in upper case.
   iii) Reads a string from console and appends it to the resultant string of ii.
3. a. Write a JAVA Program to demonstrate Inheritance.
   b. Simple Program on Java for the implementation of Multiple inheritance using interfaces to calculate the area of a rectangle and triangle.
4. Write a JAVA program which has
   i. A Class called Account that creates account with 500Rs minimum balance, a deposit() method to deposit amount, a withdraw() method to withdraw amount and also throws LessBalanceException if an account holder tries to withdraw money which makes the balance become less than 500Rs.
   ii. A Class called LessBalanceException which returns the statement that says withdraw amount (___________Rs) is not valid.
   iii. A Class which creates 2 accounts, both account deposit money and one account tries to withdraw more money which generates a LessBalanceException take appropriate action for the same.
5. Write a JAVA program using Synchronized Threads, which demonstrates Producer Consumer concept.
6. Write a JAVA program to implement a Queue using user defined Exception Handling (also make use of throw, throws.).
7. Complete the following:
   1. Create a package named shape.
   2. Create some classes in the package representing some common shapes like Square, Triangle, and Circle.
   3. Import and compile these classes in other program.
8. Write a JAVA Program
   a. Create an enumeration Day of Week with seven values SUNDAY through SATURDAY. Add a method is Workday( ) to the DayofWeek class that returns true if the value on which it is called is MONDAY through FRIDAY.
   For example, the call DayOfWeek.SUNDAY.isWorkDay ( ) returns false.
9. Write a JAVA program which has
   i. A Interface class for Stack Operations
   ii. A Class that implements the Stack Interface and creates a fixed length Stack.
   iii. A Class that implements the Stack Interface and creates a Dynamic length Stack.
   iv. A Class that uses both the above Stacks through Interface reference and does the Stack operations that demonstrates the runtime binding.

10. Write a JAVA program to print a chessboard pattern.

11. Write a JAVA Program which uses FileInputStream / FileOutPutStream Classes.

12. Write JAVA programs which demonstrates utilities of LinkedList Class.

13. Write a JAVA program which uses Datagram Socket for Client Server Communication.

14. Write a JAVA applet program, which handles keyboard event.

Note: In the examination each student should do one question out of the above 14 questions

Computer Graphics Laboratory

Subject Code: 13MCA37	**I.A. Marks: 50**
Hours/Week: 3	**Exam Hours: 3**
Total Hours: 42	**Exam Marks: 50**

PART -A

1. Write a program to create a chess board using DDA line algorithm
2. Write a program to implement Bresenham's line drawing algorithm with all values of slopes
3. Write a program to implement Midpoint circle generation algorithm
4. Write a program to create a wireframe model of globe using equation of ellipse
5. Write a program to create and fill the two dimensional object by using boundary fill algorithm
6. Write a program to create (without using built in function) a cube by implementing translation algorithm by translating along 1. X-axis, 2.Y-axis and 3. X and Y plane
7. Write a program to create (without using built in function) and rotate (1. given an angle 2. Around x and y axis) a triangle by implementing rotation algorithm.
8. Write a program to create (without using built in function) a triangle by implementing scaling algorithm by zooming/un-zooming along 1. X-axis, 2.Y-axis and 3. X and Y plane
9. Write a program to create (without using built in function) a Cube by implementing reflection algorithm 1. X-axis, 2.Y-axis
10. Write a program to create (without using built in function) a square by implementing shear algorithm along 1. X-axis, 2.Y-axis
11. Write a program to animate a flag using Bezier Curve algorithm
12. Write a program to clip lines using Liang-Barsky algorithm

PART –B

1. Develop different chart options with the given inputs by applying DDA algorithm
2. Develop different line styles using Bresenham's algorithm
3. Develop different circular patterns using midpoint circle generation algorithm
4. Animate cube and globe with given attributes
5. Develop a screen saver with curves with given attributes
6. Develop a screen saver with text with given attributes
7. Develop a screen saver with 2D objects
8. Develop a screen saver with bouncing of 3D objects
9. Develop creative natural scenery.
10. Animate a bicycle / car with given attributes

Note:

Students Should Complete **All Programs from Part-A** and **Any Two Programs from Part – B** Using **Open GL**. Consider all types attributes like color, thickness, styles, font, background, speed etc while doing Part - B.

In the examination each student picks one question from the lot of all 12 questions from Part – A and demonstrate any program from Part-B

Online reference:

OpenGL Programming Guide, 'Redbook', Version 1.1 (Online)

Computer Networks Laboratory

Subject Code: 13MCA38	**I. A. Marks : 50**
Hours/Week : 3 Hrs.	**Exam Duration :3 Hrs**
Total Hours : 42 Hrs.	**Examination Marks : 50**

1. Write a TCL script to simulate the network described below

Consider a small network with five nodes n0, n1, n2, n3, n4, forming a star topology. The node n4 is at the center. Node n0 is a TCP source, which transmits packets to node n3 (a TCP sink) through the node n4. Node n1 is another traffic source, and sends UDP packets to node n2 through n4. The duration of the simulation time is 10 seconds.
Write a Tcl script (in the text area below) to simulate this scenario. Once you have written your simulation script, click on the "Run" button to execute it. You can verify your code by clicking on the "View Solution" button at the bottom of the page.

2. Write a TCL script to simulate a file transfer with ns2

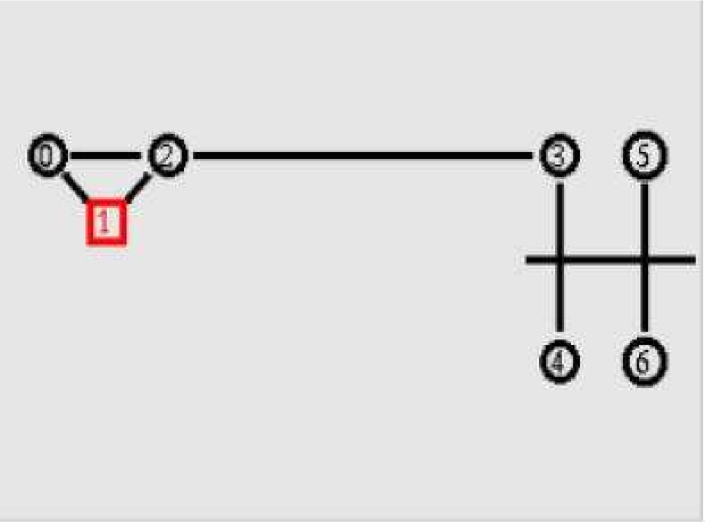
Consider a client and a server. The server is running a FTP application (over TCP). The client sends a request to download a file of size 10 MB from the server. Write a script to simulate this scenario. Let node #0 be the server and node #1 be the client. TCP packet size is 1500 B. Assume typical values for other parameters.
Note: This simulation require transfer of a **fixed** size file. Therefore, time required for the transfer would be constant for a given bandwidth of a link. To verify this, determine the time that would roughly be required for the transfer. Then look at the bottom of the trace file and verify whether there is any transmission beyond the time calculated.
To verify that the client has downloaded the entire file, plot the "Bytes Received " curve for node
#1. The y-axis is in Kbits. Convert it to MB and verify whether it approximates the specified file size. TCP headers would effectively increase the count of received bytes at node # 1.

3.Setting up a local area network with ns2

In this exercise you will be simulating a CSMA/CD based LAN with ns2. Consider the LAN with seven nodes to be an isolated one i.e. not connected to the Internet. Node # 0 in the LAN act as a UDP traffic source, and node # 6 is the destination node. Assume CBR traffic to be flowing between the nodes. The simulation lasts for 25 seconds.
In Ethernet a packet is broadcasted in the shared medium, and only the destination node accepts the packet. Other nodes simply drop it. What should be the number of hops a packet from node # 0 to node # 6 travel? Verify this from the "Hop Count" plot.
Additional Task:
Suppose the above LAN is to be connected to the Internet. Add node # 7 into the network so that it act as the gateway. Connect node # 0 and # 7 with a 1 Mb wired link. Move the UDP source to node # 7. How the hop count should get affected in this case? Verify from the plot.

4. Simulating link errors

Consider the following network diagram

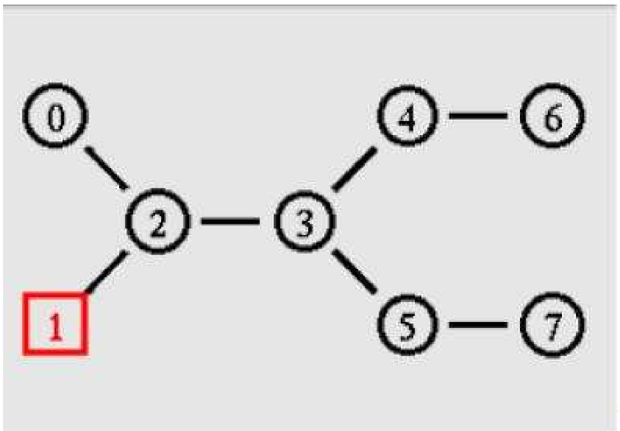


Here node # 2 act as a router. Any traffic to or from the LAN passes through it. Consider node # 1 running a FTP server, and node # 5 is downloading a file of size 4 MB. However, the link between node # 2 and # 3 is fault. It drops packets with a fixed probability of 0.2. Implement a link error model to reflect this.
It may be noted here that the file download time will be more than the we had in exercise # 2 of experiment # 1. Try different values of the simulation time to ensure that the file has been entirely transferred. Is the plot of bytes received a linear curve or non-linear? Why?
Presence of link errors cause one or more packets to be retransmitted. Verify this from the "Packet Retransmissions" plot.

5. Measuring Network Performances

Bottleneck in the network

Consider a dumbbell topology with eight nodes as shown as in the following figure. Consider nodes# 2 and 3 to be two routers connecting two different networks. When the bandwidth of the link 2-3 is much lower than the sum of bandwidths of the other links in the network, it act as a bottleneck.



Assume node # 0 running a FTP application (over TCP) and sending data to node # 6. Node # 1 is sending CBR data node # 7. Assume all the links except 2-3 has a bandwidth of 1 Mb, propagation delay of 10ms and queue type as DropTail. (All are duplex links).

Tasks:

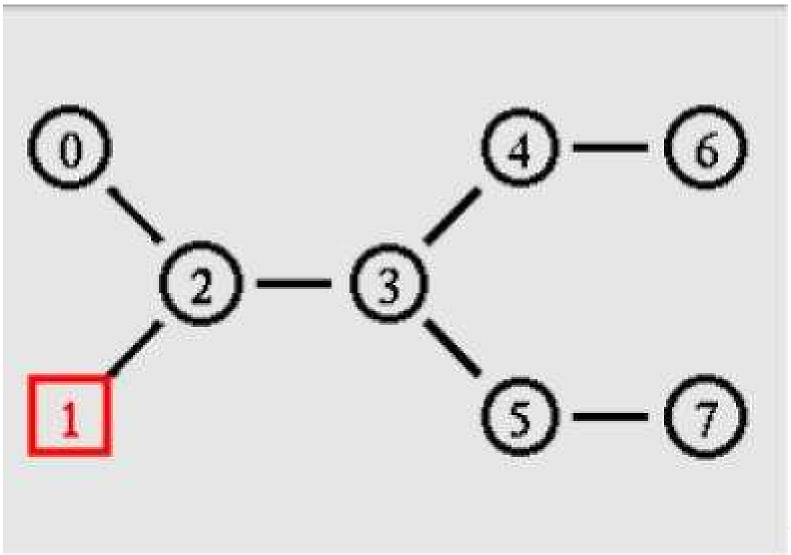
- The link 2-3 has a propagation delay of 10 ms. Vary it's bandwidth from 0.5 Mb to 2.5 Mb in steps of 0.25Mb.
- Compute the throughput for node # 3 in each case
- Plot the throughput vs. bandwidth data in the "Custom Plot" section below

Based on the above plots, suggest what should be the recommended bandwidth of the link 2-3. Now, plot the end-to-end delay between nodes 0 and 6 for the above chosen values of link 2-3 bandwidth. Revisit your previous answer (i.e. optimum bandwidth of link 2-3) based on these graphs.

Measuring Network Performances

6. Bandwidth sharing between TCP and UDP

Consider the dumbbell topology from our previous exercise:



Node # 0 is a TCP source, and the corresponding sink is at node # 6. Node # 1 is a UDP source (CBR traffic) with a null agent attached to node # 7. These two traffic flows through the common link 2-3. The aim of this exercise is to examine how TCP and UDP share the bandwidth between themselves when the rate of CBR traffic is changed.

Set the TCP packet size to 1460 B. The UDP and CBR packet sizes are 1500 B. All the links in the network have same bandwidths (say, 4 Mb), delay and queue types.

Part 1:

• Set the initial rate of CBR traffic to 0.5 Mb. Run the simulation, and plot the "Bytes Received" by node #s 4 and 5 (sinks for TCP and UDP traffic)

• Now, increment the rate up to 4 Mb, the link bandwidth, in steps of 0.5 Mb. Run the simulation and plot the graphs again.

How does the graphs change after each run? In particular, what's the nature of the graphs when the rate of CBR traffic is 50% of the bandwidth?

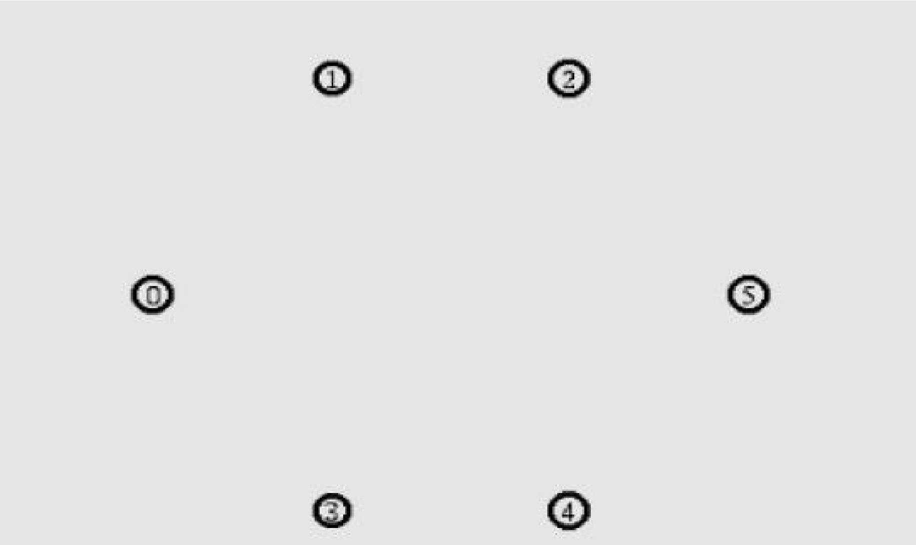
Part 2: Behaviour of UDP

• Reduce the bandwidth of the link 2-3 to say, 2 Mb. Repeat the above steps and observe the graphs in this case.

From the graphs plotted observe how UDP occupies a larger portion of the bandwidth. How does
the behaviour change for other variations of TCP (Newreno, Vegas)?

7. Write a TCL script to simulate the following scenario with ns2 simulator.

Consider six nodes, (as shown in the figure below) moving within a flat topology of 700m x 700m.



The initial positions of nodes are 0 (150,300) ,1 (300,500),2 (500,500),3 (300,100),4(500,100) and 5(650,300) respectively.A TCP connection is initiated between node 0 (source) and node 5 (destination) through node 3 and node 4 i.e the route is 0-3-4-5.

At time t = 3 seconds the FTP application runs over it.

After time t=4.0 sec, node 3 (300,100) moves towards node 1 (300,500) with a speed of 5.0m/sec

and after some time the path break, then the data transmit with a new path via node 1 and node 2 i.e the new route 0-1-2-5.

The simulation lasts for 60 secs. In the above said case both the route has equal cost.

Use DSR as the routing protocol and the IEEE 802.11 MAC protocol.

NowAnalyze the trace file and determine when the use of second route commence, and

Plot the number of packets received by each node over the entire time duration of the simulation

8. Simulate a wired network and demonstrate Distance Vector Routing algorithm .

9. Simulate a network which will create congestion in the network.With the trace file created identfy the points at which congestion occurs by writing sed / awk scripts. Also write a mechanism to correct/control the congestion.
Note : Network Free and open source software simulators like NS2 / NS3 could be used. If NS2 is used tcl scripting should be introduced . If NS3 is used c++ with python has to be introduced during first two or three weeks of the labs. Only above 9 experiments should be included for the laboratory exam.

Note: In the examination each student should do one question out of the above 9 questions

SEMESTER IV
ANALYSIS AND DESIGN OF ALGORITHMS

Sub Code : 13MCA41	**IA Marks : 50**
Hrs/Week : 04	**Exam Hours: 03**
Total Hours: 52	**Exam Marks: 100**

Introduction,Fundamentals of the Analysis of Algorithm Efficiency, Brute Force 12 Hours
Notion of Algorithm, Fundamentals of Algorithmic Problem Solving, Important Problem Types, Fundamental data Structures. Analysis Framework, Asymptotic Notations and Basic efficiency classes, Mathematical analysis of Recursive and Non-recursive algorithms, Examples. Selection Sort and Bubble Sort, Sequential Search and String Matching.

Divide-and-Conquer 8 Hours
Mergesort, Quicksort, Binary Search, Binary tree Traversals and related properties, Multiplication of large integers, Stressen's Matrix Multiplication

Decrease-and-Conquer 5 Hours
Insertion Sort, Depth First and Breadth First Search, Topological sorting, Algorithms for Generating Combinatorial Objects

Space and Time Tradeoffs 6 Hours
Sorting by Counting, Input Enhancement in String Matching, Hashing.

Dynamic Programming 5 Hours
Computing a binomial coefficient, Warshall's and Floyd's Algorithms, The Knapsack Problem and Memory Functions

Greedy Technique 4 Hours
Prim's Algorithm, Kruskal's Algorithm, Dijkstra's Algorithm, Knapsack

Limitations of Algorithm Power 12 Hours
Lower-Bound Arguments, Decision Trees, P, NP and NP-Complete Problems

Text Books:

1. Anany Levitin: Introduction to the Design and Analysis of Algorithms, Pearson Education, 2nd Edition.(Chapters 1.1-1.4, 2.1-2.5, 3.1, 3.2, 3.4, 4.1-4.5, 5.1-5.4, 6.1, 6.3, 6.4, 6.6, 7.1-7.3, 8.1, 8.2, 8.4, 9.1-9.4, 10.1-10.3, 11.1-11.3)

Reference Books:

1. Coremen T.H., Leiserson C.E., and Rivest R.L.: Introduction to Algorithms, PHI 1998.
2. Horowitz E., Sahani S., Rajasekharan S.: Computer Algorithms, Galgotia Publication 2001.
3. Michael T Goodrich and Roberto Tamassia : Algorithm Design, Wiley India
4. R C T Lee, S S Tseng, R C Chang, Y T Tsai : Introduction to Design and Analysis of Algorithms: A Strategic Approach, Tata McGraw Hill

Advanced JAVA Programming

Subject Code: 13MCA42	**I.A. Marks : 50**
Hours/Week : 4	**Exam Hours: 3**
Total Hours : 52	**Exam Marks: 100**

Servlets: **8 Hours**

Servlet Structure, Servlet packaging, HTMLbuilding utilities, Lifecycle, Single Thread model interface, Handling Client Request: Form Data, Handling Client Request: HTTP Request Headers. Generating server Response: HTTP Status codes, Generating server Response: HTTP Response Headers, Handling Cookies, Session Tracking.

JSP: **12Hours**

Overview of JSP Technology, Need of JSP, Benefits of JSP, Advantages of JSP, Basic syntax, Invoking java code with JSP scripting elements, creating Template Text, Invoking java code from JSP, Limiting java code in JSP, using jsp expressions, comparing servlets and jsp, writing scriptlets. For example Using Scriptlets to make parts of jsp conditional, using declarations, declaration example. Controlling the Structure of generated servlets: the JSP page directive, import attribute, session attribute, isElignore attribute, buffer and auto flush attributes, info attribute ,errorPage and is errorPage attributes, is Thread safe Attribute, extends attribute, language attribute, Including files and applets in jsp Pages, using java beans components in JSP documents

Java Beans & Annotations: **6 Hours**

Creating Packages, Interfaces, JAR files and Annotations. The core java API package, New java. Lang Sub package, Built-in Annotations. Working with Java Beans. Introspection, Customizers, creating java bean, manifest file, Bean Jar file, new bean, adding controls, Bean properties, Simple properties, Design Pattern events, creating bound properties, Bean Methods, Bean an Icon, Bean info class, Persistence ,Java Beans API.

JDBC: **8 Hours**

Talking to Database, Immediate Solutions, Essential JDBC program, using prepared Statement Object, Interactive SQL tool. JDBC in Action Result sets, Batch updates, Mapping, Basic JDBC data types, Advanced JDBC data types,
immediate solutions.

Introduction to EJB: **9 Hours**

The Problem domain, Breakup responsibilities, CodeSmart not hard, the Enterprise java bean specification. Components Types. Server Side Component Types, Session Beans, Message Driven Beans, Entity Beans, The Java Persistence Model. Container services. Dependency Injection, Concurrency, Instance pooling n caching, Transactions, security, Timers, Naming and object stores, Interoperability, Life Cycle Callbacks, Interceptors, platform integration. Developing your first EJB. preparation, Definitions, naming conventions, convention for the Examples, coding the EJB, the contract, the bean Implementation class, out of Container Testing, Integration Testing.

Server Side Component Models: **9 Hours**

The Stateless Session Bean, the Stateful Session Bean, the Singleton Session Bean, Message- Driven Beans. EJB and PERSISTENCE. Persistence Entity manager Mapping Persistence objects, Entity Relationships.

Text Books:

1. Marty Hall, Larry Brown. Core Servlets and Java Server Pages. Volume 1: Core Technologies. Second Edition. (Chapter 3,4,5,6,7,8,9,10,11,12,13,14).
2. Java 6 Programming Black Book, Dreamtech Press. 2012 (Chapter 17,18,19,20,21,22,27,28,29,30).
3. Andrew LeeRubinger, Bill Burke. Developing Enterprise Java Components. Enterprise JavaBeans 3.1.O'reilly. (Chapter 1,2,3,4,5,6,7,8,9,10,11).

Reference Books:

1. Michael Sikora, EJB 3 Developer Guide, A practical guide for developers and architects to the Enterprise Java Beans Standard, Shroff Publishers & Distributors PVT LTD. July 2008.

2. Herbert Schildt, Java The Complete Reference, Eight Edition. Comprehensive coverage of the Java Language. Tata McGraw-Hill Edition – 2011.

Advanced Web Programming

Subject Code : 13MCA43	**I.A. Marks : 50**
Hours/Week : 4	**Exam Hours : 3**
Total Hours : 52	**Exam Marks : 100**

1. Programming in Perl **7 Hours**
Origins and uses of Perl, Scalars and their operations, Assignment statements and simple input and output, Control statements, Fundamentals of arrays, Hashes, References, Functions, Pattern matching, File input and output; Examples.

2. CGI Scripting **6 Hours**
What is CGI? Developing CGI Applications, Processing CGI, Introduction to CGI.pm, CGI.pm methods, Creating HTML Pages Dynamically, Using CGI.pm – An Example, Adding Robustness, Carp, Cookies

3. Building Web Applications with Perl **5 Hours**
Uploading files, Tracking users with Hidden Data, Using Relational Databases, using libwww,

4. Introduction to PHP **8 Hours**
Origins and uses of PHP, Overview of PHP, General syntactic characteristics, Primitives, operations and expressions, Output, Control statements, Arrays, Functions, Pattern matching, Form handling, Files

5. Building Web applications with PHP **6 Hours**
Tracking users, cookies, sessions, Using Databases, Handling XML.

6. Introduction to Ruby **8 Hours**
Origins and uses of Ruby, Scalar types and their operations, Simple input and output, Control statements, Arrays, Hashes, Methods, Classes, Code blocks and iterators, Pattern matching.

7. Introduction to Rails **4 Hours**
Overview of Rails, Document requests, Processing forms, Rails applications with Databases, Layouts.

8. Introduction web 2.0, **4 Hours**
What is Web 2.0?, Folksonomies and Web 2.0, Software As a Service (SaaS), Data and Web 2.0, Convergence, Iterative development, Rich User experience, Multiple Delivery Channels, Social Networking.

9. Web Services **4 Hours**
Web Services: SOAP, RPC Style SOAP, Document style SOAP, WSDL, REST services, JSON format, What is JSON?, Array literals, Object literals, Mixing literals, JSON 0053yntax, JSON Encoding and Decoding, JSON versus XML.

Text Books:

1. Chris Bates: Web Programming Building Internet Applications, 3rd Edn, Wiley India, 2006 (Chapter 10,11,13)
2. Robert W. Sebesta: Programming the World Wide Web, 4th Edition, Pearson Education, 2008. (Chapters 8,11,13, 14, 15)
3. Francis Shanahan: Mashups, Wiley India 2007(Chapters 1, 6)

Reference Books:

1. M. Deitel, P.J. Deitel, A. B. Goldberg: Internet & World Wide Web How to H program, 3rdEdition, Pearson Education / PHI, 2004.
2. Xue Bai et al: The Web Warrior Guide to Web Programming, Thomson, 2003.
3. Joel Murach's PHP and MySQL. Mauch's Publications, First Edition.

Advanced Computer Networks

Subject Code: 13MCA441 **Internal Marks : 50**
Hours / Week: 4 **Exam Hours: 3**
Total Hours: 52 **External Marks: 100**

1 Introduction 2 Hours

History of TCP/IP, TCP Applications and Services, Performance Study of TCP/IP, Meaning of TCP Performance?

2 TCP/IP Fundamentals 4 Hours

TCP, TCP Services , Header Format, Encapsulation in IP, Acknowledgment Mechanism, Retransmission Mechanism, Connection Establishment and Termination, Control and Sliding Window, Congestion Control ,UDP ,UDP Services, Header Format ,Encapsulation in IP,IP Services, Fragmentation and Reassembly , Header Format and IP Version 6

3 Performance Measurement of TCP/IP Networks 3 Hours

Reasons for Network Measurement, Measurement Tasks, Classification of Measurement Tools, Popular Measurement Tools and Their Applications, Tcpdump, Tcpstat, Ttcp & Netperf. Distributed Benchmark System

4 TCP/IP Network Simulation 4 Hours

The Role of Simulation, Steps of a Systematic Simulation Study ,Types of Simulations, Continuous versus Discrete Event, Terminating versus Steady State, Synthetic versus Trace-Driven Simulation, Simulation Validation and Verification, Confidence Level of Simulation Results, Confidence Level Formula, Terminating Simulation, Steady-State Simulation, Common Simulation Mistakes, Simulation with Self-Similar Traffic. Network Simulators: Model Construction and Parameter Setting Data Collection, Simulation Execution, Presentation of Results and Examples of TCP/IP Simulation

5 TCP Modeling 5 Hours

Motivation for Mathematical Modeling of TCP, Essentials of TCP Modeling, Window Dynamics Packet-Loss Process, Gallery of TCP Models, Periodic Model, Detailed Packet Loss Model, Stochastic Model with General Loss Process, Control System Model and Network System Model

6. TCP/IP Performance over Wireless Networks 3 Hours

Wireless Networks: Generic Characteristics, Wireless Local Area Networks and Cellular Communications Networks. TCP Performance Issues over Wireless Links, Inappropriate Reduction of Congestion Window ,Throughput Loss in WLANs and Throughput Loss in Cellular Communication Systems .Improving TCP Performance over Wireless Links : Splitting TCP Connections ,Snooping TCP at Base Stations ,Notifying the Causes of Packet Loss , Adding Selective Acknowledgments to TCP and Comparison of Enhancement Schemes .Wireless System Evolution and TCP/IP :Trends in Cellular Communication Systems, Trends in Wireless LAN Systems , TCP/IP over Heterogeneous Wireless Systems

7. TCP/IP Performance over Mobile Networks 3 Hours

Cellular and Ad Hoc Networks :TCP Performance in Cellular Networks, Mobile IP, Impact of Mobility on TCP Performance, Approaches to Improve TCP Performance ,TCP Performance in Ad Hoc Networks, Dynamic Source Routing ,Impact of Mobility on TCP Performance, Approaches to Improve TCP Performance

8. TCP/IP Performance over Optical Networks 3 Hours
Evolution of Optical Networks, IP over DWDM ,Multiprotocol Label Switching ,Multiprotocol Lambda Switching ,Optical Burst Switching ,Optical Packet Switching :Optical Packet Format, Congestion Resolution in Optical Packet Switches , Performance of TCP/IP over Optical Networks, Optical Packet Network End-to-End Performance, Mapping of TCP in Optical Packets, Optical Packet Design in the TCP/IP Environment

9. TCP/IP Performance over Satellite Networks 8 Hours
A Brief History of Data Satellites, Motivations for Using Satellites,, ,Types of Satellites ,Satellite Internet Architectures ,Satellite Characteristics Affecting TCP :Long Feedback Loop, Link Impairment ,Bandwidth-Delay Product, Bandwidth Asymmetry ,Variable Delays ,LEO Handoff Spectral Congestion ,Security. TCP Enhancements for Satellite Networks :Path MTU Discovery ,TCP for Transactions, Window Scaling ,Large Initial Window, Byte Counting, Delayed ACKs after Slow Start ,Explicit Congestion Notification , Multiple Connections, Pacing TCP Segments , TCP/IP Header Compression, Security Issues Conclusions for TCP Enhancements. Advanced Enhancements and New Versions of TCP: Quick-Start TCP, High Speed TCP ,TCP Peach, Explicit Transport Error Notification TCP Westwood and XCP .New Transport Protocols for Satellite Links: Satellite Transport Protocol, Space Communications Protocol Specifications-Transport Protocol

10 TCP/IP Performance over Asymmetric Networks 3 Hours
Types of Network Asymmetry: Bandwidth Asymmetry, Media-Access Asymmetry, Loss Rate. Asymmetry Impact of Asymmetry on TCP Performance: Bandwidth Asymmetry, Media-Access Asymmetry. Improving TCP Performance over Asymmetric Networks: Uplink Bandwidth Management Handling Infrequent ACK . Experimental Evaluation of Performance Improvement Techniques Experiments with Bandwidth Asymmetry, Experiments with Media-Access Asymmetry.

11. New TCP Standards and Flavors 3 Hours
Duplicate Acknowledgments and Fast Retransmit, Fast Recovery and TCP Reno, TCP NewReno, TCP with Selective Acknowledgments, Forward Acknowledgments, TCP Vegas ,Overview of Other Features and Options and Performance Comparison of TCP Flavors

12 Active Queue Management in TCP/IP Networks 6 Hours
Passive Queue Management: Tail-Drop, Drop-From-Front, Push-Out, Problems with Passive Queue Management, Active Queue Management: Random Early Detection, Classifying the RED Variants:

RED Variants with Aggregate Control, RED Variants with Per-Flow Accounting, Performance Evaluation and Comparison of AQM Schemes: Throughput and Fairness, Delay and Jitter, Time Response, Traffic Oscillation, Performance of AQM Schemes, AQM &Differentiated Service

13 TCP Implementation 5 Hours
TCP Implementation Overview, Buffering and Data Movement, Accessing User Memory, TCP Data Exchange, Retransmissions, Congestion, High Performance TCP: High-Bandwidth-Delay Products Round-Trip Estimation, Path MTU Discovery ,Reducing End-System Overhead :Overhead, CPU Utilization, and Bandwidth , The Role of Application Processing, Sources of Overhead for TCP/IP, Per-Packet Overhead ,Interrupts, Checksums and Connection Management. Copy Avoidance: Page Remapping, Scatter/Gather I/O, Remote Direct Memory Access and TCP Offload.

Text Book :

High Performance TCP/IP: Networking Concepts, Issues, and Solutions, Mahbub Hassan and Raj Jain, IST Edition, 2009 PHI Learning
Chapters 1,2,3,4,5,6,7,8,9,10,11,12,13 (excluding those topics which are not in the syllabus)

Reference Books:

TCP/IP Illustrated (Volume I, Volume II and Volume III), W. Richard Stevens, *Addison-Wesley*

Data Warehousing and Data Mining

Subject Code :	**13MCA442**	**I.A. Marks**	**: 50**
Hours/Week :	**04**	**Exam Hours**	**: 03**
Total Hours :	**52**	**Exam Marks**	**: 100**

Data Warehousing and OLAP **8 Hours**
Data Warehouse basic concepts, Data Warehouse Modeling, Data Cube and OLAP

Data Mining **6 Hours**
Introduction, What is Data Mining, Motivating Challenges, Data Mining Tasks, Which technologies are used, which kinds of applications are targeted by Data Mining

Data Mining **6 Hours**
Types of Data, Data Mining Applications, Data Preprocessing

Association Analysis: Basic Concepts and Algorithms **8 Hours**
Frequent Item set Generation, Rule Generation, Compact Representation of Frequent Item sets, Alternative methods for generating Frequent Item sets, FP Growth Algorithm, Evaluation of Association Patterns

Classification **12 Hours**
Basics, General approach to solve classification problem, Decision Trees, Rule Based Classifiers, Nearest Neighbor Classifiers. Bayesian Classifiers, Estimating Predictive accuracy of classification methods, Improving accuracy of clarification methods, Evaluation criteria for classification methods, Multiclass Problem.

Clustering Techniques **8 Hours**
Overview, Features of cluster analysis, Types of Data and Computing Distance, Types of Cluster Analysis Methods, Partitional Methods, Hierarchical Methods, Density Based Methods, Quality and Validity of Cluster Analysis

Outlier Analysis **4 Hours**
Outlier detection methods, Statistical Approaches, Clustering based applications, Classification based approached

Text Books:

1. Pang-Ning Tan, Michael Steinbach, Vipin Kumar: Introduction to Data Mining, Addison-Wesley, 2005.
2. G. K. Gupta: Introduction to Data Mining with Case Studies, 3rd Edition, PHI, New Delhi, 2009.

Reference Books:

1. Arun K Pujari: Data Mining Techniques University Press, 2nd Edition, 2009.
2. Jiawei Han and Micheline Kamber: Data Mining - Concepts and Techniques, 2nd Edition, Morgan Kaufmann Publisher, 2006.
3. Alex Berson and Stephen J. Smith: Data Warehousing, Data Mining, and OLAP Computing Mc GrawHill Publisher, 1997.

Mobile Computing and Wireless Communications

Subject Code: 13MCA443	**IA Marks : 50**
Hours/Week: 04	**Exam Hours : 03**
Total Hours: 52	**Exam Marks : 100**

Mobile Computing Architecture: 6 Hours
Types of Networks, Architecture for Mobile Computing, 3-tier Architecture, Design Considerations for Mobile Computing,

Wireless Networks – 1: GSM and SMS 7 Hours
Global Systems for Mobile Communication (GSM and Short Service Messages (SMS): GSM Architecture, Entities, Call routing in GSM, PLMN Interface, GSM Addresses and Identities, Network Aspects in GSM, Mobility Management, GSM Frequency allocation. Introduction to SMS, SMS Architecture, SM MT, SM MO, SMS as Information bearer, applications

Wireless Networks – 2: GPRS 6 Hours
GPRS and Packet Data Network, GPRS Network Architecture, GPRS Network Operations, Data Services in GPRS, Applications for GPRS, Billing and Charging in GPRS

Wireless Networks – 3: CDMA, 3G and WiMAX 7 Hours
Spread Spectrum technology, IS-95, CDMA versus GSM, Wireless Data, Third Generation Networks, Applications on 3G, Introduction to WiMAX.

Mobile Client 6 Hours
Moving beyond desktop, Mobile handset overview, Mobile phones and their features, PDA, Design Constraints in applications for handheld devices. Mobile IP: Introduction, discovery, Registration, Tunneling, Cellular IP, Mobile IP with IPv6

Mobile OS and Computing Environment 7 Hours
Smart Client Architecture, The Client: User Interface, Data Storage, Performance, Data Synchronization, Messaging. The Server: Data Synchronization, Enterprise Data Source, Messaging. Mobile Operating Systems: WinCE, Palm OS, Simian OS, Linux, Proprietary OS Client Development: The development process, Need analysis phase, Design phase, Implementation and Testing phase, Deployment phase, Development Tools, Device Emulators.

Building, Mobile Internet Applications 6 Hours
Thin client: Architecture, the client, Middleware, messaging Servers, Processing a Wireless request, Wireless Applications Protocol (WAP) Overview, Wireless Languages: Markup Languages, HDML, WML, HTML, cHTML, XHTML, VoiceXML.

J2ME 7 Hours
Introduction, CDC, CLDC, MIDP; Programming for CLDC, MIDlet model, Provisioning, MIDlet life-cycle, Creating new application, MIDlet event handling, GUI in MIDP, Low level GUI Components, Multimedia APIs; Communication in MIDP, Security Considerations in MIDP.

Text Books:

1. Dr. Ashok Talukder, Ms Roopa Yavagal, Mr. Hasan Ahmed: Mobile Computing, Technology, Applications and Service Creation, 2d Edition, Tata McGraw Hill, 2010.
2. Martyn Mallik: Mobile and Wireless Design Essentials, Wiley, 2003.

Reference Books:

1. Raj kamal: Mobile Computing, Oxford University Press, 2007.
2. Iti Saha Misra: Wireless Communications and Networks, 3G and Beyond, Tata McGraw Hill, 2009.

Software Testing and Practices

Sub. Code : 13MCA444 **IA Marks: 50**
Hrs/Week : 4 **Exam Hours: 03**
Total Hours: 52 **Exam Marks : 100**

Basics of Software Testing **7 hours**
Humans, Errors and Testing, Software Quality; Requirements, Behavior and Correctness, Correctness Vs Reliability; Testing and Debugging; Test Metrics; Software and Hardware Testing; Testing and Verification; Defect Management; Execution History; Test Generation Strategies; Static Testing; Test Generation from Predicates.

Basic Principles, Test case selection and Adequacy **6 hours**
Sensitivity, Redundancy, Restriction, Partition, Visibility and Feedback, Test Specification and cases, Adequacy Criteria, Comparing Criteria

A perspective on Testing, Examples **7 Hours**
Basic definitions, Test cases, Insights from a Venn diagram, Identifying test cases, Error and fault taxonomies, Level of testing, Examples: Generalized pseudocode, The triangle problem, the NextDate function, The commission problem, The SATM (Simple Automation Teller Machine) problem, The currency converter, Saturn windshield wiper.

Boundary value testing, Equivalence class testing, Decision table based testing **7 Hours**
Boundary value analysis, Robustness testing, Worst-case testing, special value testing, Examples, Random testing, Equivalence classes, Equivalence test cases for triangle problem, NextDate function and commission problem, Guidelines and observations, Decision tables, Test cases for triangle problem.

Path Testing, Data flow testing **7 Hours**
DD Paths, Test coverage metrics, Basis path testing, guidelines and observations, Definition Use testing, Slice based testing, Guidelines and observations.

Levels of Testing, Integration Testing **6 Hours**
Traditional view of testing levels, Alternative life cycle models, the SATM systems, separating integration and system testing, Guidelines and observations.

Fault Based Testing **6 Hours**
Assumptions in fault-based testing, Mutation Analysis, Fault-based Adequacy Criteria; Variations on mutation Analysis; From Test case specification to Test Cases, Scaffolding, Generic vs specific Scaffolding, Test Oracles, Self checks as oracles, Capture and Replay.

Planning and Monitoring the Process, Documenting Analysis and Test **6 Hours**
Quality and Process, Test and Analysis strategies and plans, Risk Planning, Monitoring the Process, Improving the process, The quality team, Organizing documents, Test strategy document, Analysis and test plan, Test design specifications documents, Test and analysis reports.

Text Books

1. Adithya P.Mathur " Foundations of Software Testing – Fundamental Algorithms and Techniques", Pearson Education India, 2011
2. MauroPezze, Michael Young, Software testing and Analysis- Process, Principles and Techniques, Wiley India, 2012
3. Paul C Jourgensen, "Software Testing A Craftmans Approach", Aueredach publications, 3rd edition, 2011.

Reference Books

1. Kshirasagara Naik, Priyadarshi Tripathy: Software Testing and Quality Assurance, Wiley India 2012
2. M.G.Limaye: Software Testing-Principels, Techniques and Tools – McGrawHill, 2009
3. Brain Marick: The Craft of Software Testing, Pearson Education India, 2008
4. Ron Patton: Software Testing, 2nd Edition, Pearson Education, India, 2013
5. Rahul Shende, , "Software Automation testing tools for Beginners". Shroff publishers and distributors, 2012

Theory of Computation (Finite Automata and Formal Languages)

Subject Code: 13MCA445	**IA Marks : 50**
Hours/Week: 04	**Exam Hours : 03**
Total Hours : 52	**Exam Marks: 100**

Introduction and Finite Automata: 10 Hours

What is (not) a computer, The idea of computing, Computing Machines and Languages, What is the Science of Computing, Programming. Data Structures, Algorithms and Science, Birth of Science computing, Computability, Undecideability, Intractability and Intelligence, Why Study Science computing and Key Ideas, Automata- The idea of computing Machine, Automata Definition, Constructing Simple Automata, Handling End Condition, Handling Reject States, A Step-by-Step model for constructing Automata, States as Memory, Why Finite number of states, Constructing more complex Automata, Mantras for constructing Automata, Limitations of Finite Automata, Automata with Combinatorial States

NFA and Regular Expression 7 Hours

The idea of Non-Determinism, Constructing Non-Deterministic Automata, Eliminating Non-

Deterministic: converting NFA to DFA, Jumping States without Input, A method for minimizing Automata, Finite State Transducers, The idea of formal languages, Languages of Automata, Regular Expression, Constructing Regular Expressions, Converting Regular Expressions to Automata, Equivalence of Regular Expressions, Method for Constructing Regular Expressions, Regular Expressions in Practice

Regular Grammars and Languages 7 Hours

The idea of Grammar, The ideas of parsing and Derivation, Grammars for Regular Languages, Constructing Regular Grammars, converting automata to regular grammars, converting regular grammars to automata, constructing regular grammars: mantras, Closure properties, Answering questions about regular languages, Why are some languages not regular, The Pigeonhole Principle and Pumping Lemma, Using Pumping Lemma an Adversarial Game.

Context Free Grammars 7 Hours

The idea and nature of context free grammar, Constructing Context free grammars (LGs and Non LGs), Introduction to Parsing, Ambiguity and Eliminating ambiguity, The idea of Chomsky normal form, Converting to Chomsky normal form, The ideas of Griebach Normal form, Simple Linear and other grammars.

Pushdown Automata and Nature of Context Free Languages 7 Hours

Machines for Context Free Languages, Adding Memory: Why Stack Behavior, Constructing PDAs, Constructing CFGs to PDAs, Converting PDAs to CFGs, Non-determinism in PDAs, The CFL-CFG-PDA Triad, Closure Properties, Union of CFLs, Answering Questions about CFLs, Why are some languages not context-free, The pumping lemma for context free languages.

Turing Machines 8 Hours

The ideas of Universal Computing Machine, Constructing simple Turing machines, Constructing more complex Turing machines, Mantras for Constructing Turing Machines, The ideas of computation, computable functions, The Church-Turing Thesis, Variations of Turing Machines, The Universal Turing Machine

The Chmosky Hierarchy **6 Hours**

Languages, Grammars and Machines, Recursively Enumerable Languages, Counting Alphabets, Languages and Computing Machines, The idea of Enumeration, The idea of Diagnoalization, The ideas of Acceptance and Membership, Recursive Languages, Context Sensitive Languages and Grammars, The ideas of context, Other Grammars and Automata, Linear and Deterministic Context-Free Langauges.

Text Books:

1. Kavi Mahesh: Theory of Computation: A problem solving approach, Wiley India, 2012

Reference Books:

1. A. M. Padma Reddy, Finite Automata and Formal Languages: A simple Approach, Pearson Education India, 2010
2. Introduction to Automata Theory, Languages, and Computation, Addison Wesley Publishing company, 2010
3. Aho & Ulman:Theory of computation, Pearson Education.

Digital Image processing

Subject Code : 13MCA446	**IA Marks : 50**
Hrs/Week : 04	**Exam Hours: 03**
Total Hrs. : 52	**Exam Marks: 100**

UNIT 1: Introduction 10 Hours

What Is Digital Image Processing? The Origins of Digital Image Processing. Examples of Fields that Use Digital Image Processing. Fundamental Steps in Digital Image Processing. Components of an Image Processing System. Image Sampling and Quantization. Some Basic Relationships Between Pixels. Linear and Nonlinear Operations.

UNIT 2: Image Enhancement in the Spatial Domain 8 hours

Some Basic Gray Level Transformations. Histogram Processing. Enhancement Using Arithmetic/Logic Operations. Basics of Spatial Filtering. Smoothing Spatial Filters. Sharpening Spatial Filters. Combining Spatial Enhancement Methods.

UNIT 2: Image Enhancement in the Frequency Domain 8 hours

Introduction to the Fourier Transform and the Frequency Domain. Smoothing Frequency-Domain Filters. Sharpening Frequency Domain Filters. Homo-morphic Filtering.

UNIT 4: Morphological Image Processing and Image Segmentation 10 Hours

Dilation and erosion, opening and closing, Hit-or-Miss transformations, basic morphological algorithms, Detection of discontinues, edge linking and boundary detection, thresh holding, region –based segmentation.

UNIT 5: Representation and Descriptors 8 Hours

Representation. Boundary Descriptors. Regional Descriptors. Use of Principal Components for Description. Relational Descriptors.

UNIT 6: Use of Image Processing in Pattern Recognition 8 Hours

Introduction to the tools of Matlab and Open CV. Case study on Object Identification, Biometrics and Content Based Image retrieval.

Text Books:

1. Rafael C Gonzalez and Richard E Woods, Digital Image Processing, Pearson Education, 2002.
2. Anil K Jain, Fundamental of Digital Image Processing, Prentice Hall of India, 2004.

Reference Books:

1. William K Pratt, Digital Image Processing PIKS Scientific Inside, 4th Edition, Wiley
2. Vipul Singh, Digital Image Processing With Matlab & LabView, Reed Elsevier India Pvt Ltd, 2013,

Cryptography & Network Security

Subject Code: 13MCA451	**I.A. Marks : 50**
Hours/Week: 04	**Exam Hours: 03**
Total Hours: 52	**Exam Marks : 100**

Introduction **3 Hours**
OSI Security Architecture, Security Attacks, Security Services, Security Mechanism, Model for Network Security.

Classical Encryption Technique **5 Hours**
Symmetric Cipher Model, Substitution Techniques, Transposition Techniques.

Block Ciphers, Data Encryption Standard and Advanced Encryption Standard **8 Hours**
Block Cipher Principles, The Data Encryption Standard, Block Cipher Design Principles and Modes of operation, Evaluation Criteria for AES, AES Cipher-Encryption and Decryption, Data Structure, Encryption Round.

Public Key Cryptography and Key Management **6 Hours**
Principles of Public Key Cryptosystem, RSA algorithm, Key management, Diffie Hellman Key exchange

Message Authentication and Hash Function **6 Hours**
Authentication Requirement, Authentication Functions, Message Authentication Code, Hash Functions, Digital Signatures, Digital Signature Standard

Authentication Applications **5 Hours**
Kerberos, X.509 Authentication Service

Electronic Mail Security **5 Hours**
Pretty Good Privacy (PGP), S/MIME

IP Security **5 Hours**
IP Security Overview; IP Security Architecture; Authentication Header; Encapsulating Security Payload; Combining Security Associations; Key Management.

Web Security **5 Hours**
Web security Considerations; Secure Socket layer (SSL) and Transport layer Security (TLS); Secure Electronic Transaction (SET)

System Security **4 Hours**
Intruders, Intrusion Detection, Firewall Design Principles- Characteristics, Types of Firewall and Firewall Configuration.

Text Books:

William Stallings, “Cryptography and Network Security – Principles and Practices”, 4th Edition, Pearson Education, 2009. (Chapters: 1, 2.1-2.3, 3.1,3.2,3.5, 5.1,5.2, 6.2, 9.1,9.2, 10.1,10.2, 11.1-11.4, 13.1, 13.3, 14.1, 4.2, 15.1, 15.2, 16.1-16.6, 17.1-17.3, 18.1, 18.2, 20.1; Exclude the topic not mentioned in the syllabus)

Reference Book:

1.Behrouz A. Forouzan and Debdeep Mukhopadhyay: “Cryptography and Network Security”, 2nd Edition, Tata McGraw-Hill, 2010.
2.Atul Kahate, “Cryptography and Network Security” 2nd Edition TMH.

Network Management

Subject code: 13MCA452 **IA Marks: 50**
Hours/ Week: 04 **Exam Hours: 3**
Total Hours : 52 **Exam Marks: 100**

Requirements for the Management of Networked Systems 05 Hours
Management Scenarios, Management functions, Organizational aspects of Management, Time aspects of Management

IP Network Management 07 Hours
Choosing to manage the network, Choosing a configuration method, Management information Base, Simple Network Management Protocol, Extensible markup Language, Common Object Request Broker Architecture.

IP-Based Service Implementation and Network Management 08 Hours
Simple Network Management Protocol, Ip- Based Service Implementation-OSS, Provisioning Issues, Network Management Issues, OSS Architecture

Network Management Architecture 06 Hours
Background, Defining Network Management, Network Management Mechanisms, Architectural Considerations.

SLA and Network Monitoring 05 Hours
Passive and Active Network Monitoring, Passive Network Monitoring, Active Network Monitoring.

MPLS Network Management: AN Introduction 05 Hours
A brief Introduction to MPLS, MPLS Applications, Key Aspects of MPLS Network Management, Management Information Base Modules for MPLS.

MPLS Management Interfaces 05 Hours
The basics of Management Interfaces, Command line interface, CORBA, XML, Bulk File Transfer, Simple Network Management Protocol

Optical Networks: Control and Management 05 Hours
Network Management functions, Optical Layer Services and Interfacing, Layers within the Optical Layer, Multivendor Interoperability, Performance and Fault Management, Configuration

Web-Based Management 06 Hours
NMS with Web Interface and Web- Based Management Web Interface to SNMP Management, Embedded Web- Based Management, Desktop management interface, Web-Based Enterprise Management, WBEM: Windows Management Instrumentation, Java

management Extensions, Management of a Storage Area Network: Future Directions.

Text Books:

1. Network Management- Know it all by Adrian Farrel, Elsevier publications. Chapter 1-8
2. Network Management- Principles and Practice, Mani Subramaniam, Pearson Education.Chapter 14

Reference Books:

1. Network Management, Morris, Pearson Education
2. Practical Guide to SNMPv3 and Network Management, David Zeltserman, PHI.

NOSQL

Subject Code::	**13MCA453**	**I.A. Marks :**	**50**
Hours/Week	03	**Exam Hours**	**: 3**
Total Hours :	**52**	**Exam Marks**	**: 100**

Introduction to NOSQL **6 Hours**

Definition of NOSQL, History of NOSQL and Different NOSQL products, Exploring MondoDB Java/Ruby/Python, Interfacing and Interacting with NOSQL

NOSQL **Basics** **12 Hours**

NOSQL Storage Architecture, CRUD operations with MongoDB, Querying, Modifying and Managing NOSQL Data stores, Indexing and ordering datasets (MongoDB/CouchDB/Cassandra)

Advanced NOSQL **8 Hours**

NOSQL in CLOUD, Parallel Processing with Map Reduce, BigData with Hive

Working with NOSQL **10 Hours**

Surveying Database Internals, Migrating from RDBMS to NOSQL, Web Frameworks and NOSQL, using MySQL as a NOSQL

Developing Web Application with NOSQL **and** NOSQL **Administration** **16 Hours**

Php and MongoDB, Python and MongoDB, Creating Blog Application with PHP, NOSQL Database Administration

Text Books

1. “Professional NOSQL” by Shashank Tiwari, 2011, WROX Press (Chapter 1,2,3,4,5,6,7, 8, 9,10.11.12.13.15)
2. The Definitive guide to MongoDB, The NoSQL Database for Cloud and Desktop Computing, Apress 2010 (Chapter 6,7,8,9)

Software Architectures

Subject Code :	**13MCA454**	**IA. Marks : 50**
Hours/Week:	**4**	**Exam Hours : 3**
Total Hours :	**52**	**Exam Marks : 100**

Introduction **06 Hours**
What software architecture is and what it is not; Architectural Structures and views; Architectural patterns; What makes a "good" architecture? Why is software important?

Context of Software Architecture **04 Hours**
Technical Context; Project life-cycle context; Business context; Professional context; Stake holders; How is Architecture influenced? What Do Architecture influence?

Understanding Quality Attributes **12 Hours**
Architecture & Requirements; Functionality; quality attribute considerations; Specifying and achieving Quality attribute requirements; Guiding quality design decisions; Availability; Interoperability; Modifiability; Performance; Security; Testability; Usability

Quality Attribute modeling and Analysis **06 Hours**
Modeling Architecture to enable quality attribute analysis; Quality attribute check lists; Through experiments and Back-of-the envelope analysis; Experiments; Simulations and prototypes; Analysis at different stages of the life cycle

Architecture and requirements **06 Hours**
Gathering ASRs from requirements documents; ASRs by interviewing stake holders; ASRs by understanding the business; capturing ASRs in a utility tree; Typing the methods together

Designing an Architecture **03 Hours**
Design strategy; the attribute driven design methods; the steps of ADD

Documenting Software Architecture **06 Hours**
Uses and Audiences for architecture documentation; Notations, View and Behavior; Documentation and quality attributes

Architecture, Implementation & Testing **03 Hours**
Architecture and implementation; Architecture and testing

Architectural Patterns **06 Hours**
Introduction to patterns; From Mud to structure; Layers; Pipes and filters; Blackboard; Distributed systems; Brocker; Interactive systems; Model-view-control; Presentation-abstraction- control; Adaptable systems; Microkernel

Text Books:

1. Len Bass, Paul Clements, Rick Kazman: Software Architecture in Practice, 3d Edition, Pearson Education, 2013 (Listed Topics only from Chapters 1,2,3,4,5,6,7,8,9,10,11,14,16,17,18,19)
2. Frank Buschmann, Regine Meunier, Hans Rohnert, Peter Sommerlad, Michael Stal: Pattern- Oriented Software Architecture, A System of Patterns, Volume 1, John Wiley and Sons, 2012 (chapter 2)

Reference Books:

1. Richard N. Taylor, Nenad Medvidovic and Eric M. Dashofy: Software Architecture: Foundations, Theory, and Practice, Wiley- India 2012
2. Mary Shaw and David Garlan: Software Architecture-Perspectives on an Emerging Discipline, Prentice Hall of India, 2007.

Enterprise Resource Planning

Subject Code : 13MCA455	**I.A. Marks : 50**
Hours/Week : 4	**Exam Hours : 3**
Total Hours : 52	**Exam Marks : 100**

Unit I Introduction To ERP **9 Hours**

Overview, Benefits of ERP, ERP and Related Technologies, Business Process Reengineering, Data Warehousing, Data Mining, On–line Analytical Processing, Supply Chain Management.

Unit II ERP Implementation **12 Hours**

Implementation Life Cycle, Implementation Methodology ,Hidden Costs, Organizing Implementation ,Vendors,Consultants and Users ,Contracts , Project Management and Monitoring.

Unit III Business Modules **10 Hours**

Business Modules in an ERP Package, Finance, Manufacturing, Human Resource, Plant Maintenance, Materials Management, Quality Management, Sales and Distribution.

Unit IV ERP Market **10 Hours**

ERP Market Place, SAP AG, PeopleSoft ,Baan Company , JD Edwards World Solutions Company, Oracle Corporation ,QAD , System Software Associates.

Unit V ERP – Present And Future **11 Hours**

Turbo Charge the ERP System , EIA, ERP and E–Commerce , ERP and Internet, Future Directions in ERP.

TextBooks

1. Alexis Leon, “ERP Demystified”, Tata McGraw Hill, 1999.
2. Joseph A. Brady, Ellen F. Monk, Bret J. Wangner, “Concepts in Enterprise Resource Planning”, Thomson Learning, 2001.

Reference Books

1. Vinod Kumar Garg and N.K .Venkata Krishnan, “Enterprise Resource Planning concepts and Planning”, Prentice Hall, 1998.
2. Jose Antonio Fernandz, “ The SAP R /3 Hand book”, Tata McGraw Hill

Mobile Applications

Subject Code: 13MCA456	**I.A. Marks : 50**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

Foundation **6 Hours**

Mobile devices vs. desktop devices; ARM and intel architectures, Power Management, Screen resolution, Touch interfaces, Application deployment (App Store, Google Play, Windows Store); Native vs. web applications

Frameworks and Tools **10 Hours**

Development Environments (XCode, Eclipse, VS2012, PhoneGAP, etc.); Development Tools (HTML5, CSS, JavaScript, JQuery); Mobile-specific enhancements (Browser-detection, Touch interfaces, Geolocation, Screen orientation); Mobile browser "interpretations" (Chrome/Safari/Gecko/IE).

Mobile OS Architectures **8 Hours**

Mobile OS Architectures (Android, iOS, Windows); Mobile OS (Darwin, Linux, Windows); Runtime Environments (Objective-C, Dalvik, winRT), Mobile Agents and Peer-to-Peer Architecture

Performance Management **6 Hours**

Memory Management, Power Management, Security, Synchronization and Replication of Mobile Data, Getting the Model right, Storing and Retrieving Data

Developing an Application **8 Hours**

Building a simple "Hello World" App (Android, iOS, Windows); App-structure, built-in Controls, file access, basic graphics; Building useful apps; Database, Network, File access; Packaging and Deployment

System-level Apps **6 Hours**

Native programming (Android), Low-level programming (iOS), Low-level APIs (Windows).

Advanced Topics:Power Management,Augmented Reality,Mobile Device Security **8 Hrs**

Wake locks and assertions, Low-level OS support, Writing power-smart applications, GPS , Accelerometer, Camera, Mobile malware, Device protections, Rooting (Android), Jailbreaking (iOS), Defenestration (Windows)

Text Books:

1 Jeff McWherter, Scott Gowell: Professional Mobile Application Development, John Wiley & Sons, Aug 2012
2 Reto Meier: Professional Android 4 Application Development, Wrox Publications, 2012
3 HTML5, CSS3 and Jquery with Adobe Dreamweaver CS 5.5 Learn by Video, David Powers, Richard, Trade paperback, Peachpit Press, 2011

References:

1. Valentino Lee, Heather Schnerider, Robbie Schell: Mobile Applications: Architecture, Design and Development, Prentice Hall, 2004
2. Rajkamal: Mobile Computing, Oxford University Press, 2007.
3. Wallace B McClure, Nathan Blevins, John J. Croft IV, Jonathan Dick, Chris Hardy : Professional Android Programming with Mono for Android and .NET/C#, Wiley-India.
4. Reto Meier : Professional Android 4 Application Development, Wiley-India

Algorithms Laboratory

Subject Code : 13MCA46	**I.A Marks : 50**
Hours/Week : 3	**Exam Marks : 50**
Total Hours : 42	**Exam Hours : 3**

Implement the following using C/C++ Language.

1. Implement Recursive Binary search and Linear search and determine the time required to search an element. Repeat the experiment for different values of n, the number of elements in the list to be searched and plot a graph of the time taken versus n.

2. Sort a given set of elements using the Heapsort method and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n.

3. Sort a given set of elements using Merge sort method and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n.

4. Obtain the Topological ordering of vertices in a given igraph.

5. Implement 0/1 Knapsack problem using dynamic programming.

6. From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm.

7. Sort a given set of elements using Quick sort method and determine the time required sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n.

8. Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm.

9. Print all the nodes reachable from a given starting node in a digraph using BFS method.

10. Check whether a given graph is connected or not using DFS method.

11. Find a subset of a given set S = {sl,s2,.....,sn} of n positive integers whose sum is equal to a given positive integer d. For example, if S= {1, 2, 5, 6, 8} and d = 9 there are two solutions{1,2,6}and{1,8}.A suitable message is to be displayed if the given problem instance doesn't have a solution.

12. a. Implement Horspool algorithm for String Matching.
b. Find the Binomial Co-efficient using Dynamic Programming.

13. Find Minimum Cost Spanning Tree of a given undirected graph using Prim’s algorithm.

14. a. Implement Floyd’s algorithm for the All-Pairs- Shortest-Paths Problem.
    b. Compute the transitive closure of a given directed graph using Warshall's algorithm.

15. Implement N Queen's problem using Back Tracking.

Note: In the examination questions must be given based on above lots.

Advanced Java Programming Laboratory

Subject Code : 13MCA47	**I.A. Marks : 50**
Hours/Week : 3	**Exam Marks: 50**
Total Hours : 42	**Exam Hours : 3**

1. Write a JAVA Servlet Program to implement a dynamic HTML using Servlet (user name and Password should be accepted using HTML and displayed using a Servlet).

2. Write a JAVA Servlet Program to Auto Web Page Refresh (Consider a webpage which is displaying Date and time or stock market status. For all such type of pages, you would need to refresh your web page regularly; Java Servlet makes this job easy by providing refresh automatically after a given interval).

3. Write a JAVA Servlet Program to implement and demonstrate get() and Post methods(Using HTTP Servlet Class).

4. Write a JAVA Servlet Program using cookies to remember user preferences.

5. a. Write a JAVA JSP Program to implement verification of a particular user login and display a Welcome page.
   b. Write a JSP program to demonstrate the import attribute.

6. Write a JAVA JSP Program which uses jsp:include and jsp:forward action to display a Webpage.

7. Write a JAVA JSP Program which uses <jsp:plugin> tag to run a applet.

8. Write a JAVA JSP Program to get student information through a HTML and create a JAVA Bean class, populate Bean and display the same information through another JSP.

9. Write a JAVA Program to insert data into Student DATA BASE and retrieve info based on particular queries(For example update, delete, search etc…).

10. Write a JSP program to implement all the attributes of page directive tag.

11. An EJB application that demonstrates Session Bean (with appropriate business logic).

12. An EJB application that demonstrates MDB (with appropriate business logic).

13. An EJB application that demonstrates persistence (with appropriate business logic).

Note: In the examination each student should do one question out of the above 13 questions

Mini Project-I Guidelines

Subject Code : 13MCA48	**IA Marks : 50**
Hours/week : 3	**Exam Hours : 03**
Total Hours : 42	**Exam Marks : 50**

PART A

1. Write a perl program to insert name and age information entered by the user into a table created using MySQL and to display the current contents of this table.
2. Create XHTML form with Name, address line1, address line2 and email text fields. On submitting, store the values in MySQL table. Retrieve and display the data based on name.
3. Write a PHP program to read student data from an XML file and store into the MySQL database. Retrieve and display using SEARCH function.
4. Build a Rails application to accept book information viz. accession number, title, authors, edition and publisher from a web page and store the information in a database and to search for a book with the title specified by the user and to display the search results with proper headings.

PART B

Develop a web application project using the languages and concepts learnt in the theory and exercises listed in part A with a good look and feel effects. You can use any web technologies and frameworks and databases.

Note:

1. In the examination each student picks one question from part A.
2. A team of two or three students must develop the mini project. However during the exam ination, each student must demonstrate the project individually.
3. The team must sub mit a brief project report (25-30 pages) that must include the following

    a. Introduction
    b. Requirement Analysis
    c. Software Requirement Specification
    d. Analysis and Design
    e. Implementation
    f. Testing

4. The report must be evaluated for 10 Marks. Demonstration and Viva for 20 Marks.

Instructions:

1. In the examination, one exercise from part A is to be asked for 20 marks.
2. Mini project student group size is limited to two students only.
3. The mini project under part B has to be evaluated for 30 marks.
4. Project report duly signed by the Guide and HOD need to be submitted during examination.

SEMESTER V
Object-Oriented Modeling and Design Patterns

Subject Code: 13MCA51	**I.A. Marks : 50**
Hours/Week: 4	**Exam Hours: 3**
Total Hours: 52	**Exam Marks: 100**

1. Introduction, Modeling Concepts **3 Hrs**
What is Object Orientation? What is OO development? OO themes; Evidence for usefulness of OO development; OO modeling history. Modeling as Design Technique: Modeling; abstraction; The three models.

2. Class Modeling and Advanced Class Modeling: **7 Hrs**
Object and class concepts; Link and associations concepts; Generalization and inheritance; A sample class model; Navigation of class models; Practical tips. Advanced object and class concepts; Association ends; N-array associations; Aggregation; Abstract classes; Multiple inheritance; Metadata; Reification; Constraints; Derived data; Packages; Practical tips

3. State Modeling and Advanced State Modeling **6 Hrs**
State Modeling: Events, States, Transitions and Conditions; State diagrams; State diagram behavior; Practical tips. Advanced State Modeling: Nested state diagrams; Nested states; Signal generalization; Concurrency; A sample state model; Relation of class and state models; Practical tips.

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4. Interaction Modeling and Advanced Interaction Modeling **4 Hrs**
Interaction Modeling: Use case models; Sequence models; Activity models. Use case relationships; Procedural sequence models; Special constructs for activity models.

5. Process Overview, System Conception **3 Hrs**
Process Overview: Development stages; Development life cycle. System Conception: Devising a system concept; elaborating a concept; preparing a problem statement.

6. Domain Analysis and Application Analysis **8 Hrs**
Overview of analysis; Domain class model; Domain state model; Domain interaction model; Iterating the analysis. Application Analysis: Application interaction model; Application class model; Application state model; adding operations.

7. System Design and Class Design **7Hrs**
Overview of system design; Estimating performance; Making a reuse plan; Breaking a system in to sub-systems; Identifying concurrency; Allocation of sub-systems; Management of data storage; Handling global resources; Choosing a software control strategy; Handling boundary conditions; Setting the trade-off priorities; Common architectural styles; Architecture of the ATM system as the example. Class Design: Overview of class design; Bridging the gap; Realizing use cases; Designing algorithms; Recursing downwards, Refactoring; Design optimization; Reification of behavior; Adjustment of inheritance; Organizing a class design; ATM example.

8. Patterns **4 Hrs**
What is a pattern and what makes a pattern? Pattern categories; Relationships between

patterns; Pattern description.

9. Design Patterns **10 Hrs**

Introduction, structural decomposition, Organization of work, Model View Controller; Communication Patterns: Forwarder-Receiver; Client-Dispatcher-Server; Publisher-Subscriber; Management Patterns: Command processor; Whole Part, Master Slave, View Handler;

Text Books:

1. Michael Blaha, James Rumbaugh: Object-Oriented Modeling and Design with UML, 2nd Edition, Pearson Education / PHI, 2005. (Chapters 1 to 15)
2. Frank Buschmann, Regine Meunier, Hans Rohnert, Peter Sommerlad, Michael Stal: Pattern-Oriented Software Architecture, A System of Patterns, Volume 1, John Wiley and Sons, 2006. (Chapters 1, 3)

Reference Books:

1. Grady Booch et al: Object-Oriented Analysis and Design with Applications, 3rd Edition, Pearson, 2007.
2. Mark Priestley: Practical Object-Oriented Design with UML, 2nd Edition, Tata McGraw-Hill, 2003.
3. K. Barclay, J. Savage: Object-Oriented Design with UML and JAVA, Elsevier, 2008.
4. Booch, G., Rumbaugh, J., and Jacobson, I.: The Unified Modeling Language User Guide, 2nd Edition, Pearson, 2005.
5. E. Gamma, R. Helm, R. Johnson, J. Vlissides: Design Patterns-Elements of Reusable Object- Oriented Software, Addison-Wesley, 1995.
6. Simon Bennett, Steve McRobb and Ray Farmer: Object-Oriented Systems Analysis and Design Using UML, 2nd Edition, Tata McGraw-Hill, 2002.
7. Rumbaugh, Blaha, Premerhani, Eddy, Lorensen; Object Oriented Modeling and Design, PHI Latest Edition

System Simulation and Modeling

Subject Code: 13MCA52	**IA Marks : 50**
Hours/Week: 04	**Exam Hours : 03**
Total Hours: 52	**Exam Marks : 100**

Introduction **6 Hours**

When simulation is the appropriate tool and when it is not appropriate; Advantages and disadvantages of Simulation; Areas of application; Systems and system environment; Components of a system; Discrete and continuous systems; Model of a system; Types of Models; Discrete-Event System Simulation; Steps in a Simulation Study.

Statistical Models in Simulation **6 Hours**

Review of terminology and concepts; Random Variables, Probability Distribution, Probability distribution function, Useful statistical models; Discrete distributions; Continuous distributions; Poisson process; Empirical distributions.

Random-Number Generation, Random-Variate Generation **8 Hours**

Properties of random numbers; Generation of pseudo-random numbers; Techniques for generating random numbers; Tests for Random Numbers, Random-Variate Generation: Inverse transform technique; Acceptance-Rejection technique; Special properties.

Queuing Models **8 Hours**

Characteristics of queuing systems; Queuing notation Simulation Examples: Queuing, Inventory System

General Principles, Simulation Software **6 Hours**

Concepts in Discrete-Event Simulation: The Event-Scheduling / Time-Advance Algorithm, World Views, Manual simulation Using Event Scheduling; List processing. Simulation in Java;

Input Modeling **6 Hours**

Data Collection; Identifying the distribution with data; Parameter estimation; Goodness of Fit Tests; Fitting a non-stationary Poisson process; Selecting input models without data; Multivariate and Time-Series input models, uniformity and independence, Chi-Square test, K-S Test.

Verification and Validation **6 Hours**

Verification, Calibration, and Validation; Optimization: Model building, verification and validation; Verification of simulation models; Calibration and validation of models.

Estimation of Absolute Performance & Computer System Simulation **6 Hours**

Types of simulations with respect to output analysis; Stochastic nature of output data; Absolute measures of performance and their estimation; Output analysis for terminating simulations; Output analysis for steady-state simulations.

Text Books:

1. Jerry Banks, John S. Carson II, Barry L. Nelson, David M. Nicol: Discrete-Event System Simulation, 5th Edition, Pearson, 2010. (Listed topics only from Chapters1 to 12)

Reference Books:

1. Lawrence M. Leemis, Stephen K. Park: Discrete – Event Simulation: A First Course, Pearson / Prentice-Hall, 2006.
2. Averill M. Law: Simulation Modeling and Analysis,4th Edition, Tata McGraw-Hill, 2007.
3. Simulation 5ed Ross Elsevier
4. Theory of modeling and simulation, Zeiglar, Elsevier

Programming Using C#.NET

Subject: 13MCA53	**IA Marks: 50**
Hours/ Week: 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

Getting started with .NET Framework 4.0 — 04 Hours

Benefits of .NET Framework, Architecture of .NET Framework 4.0, Components of .NET Framework 4.0: CLR, CTS, Metadata and Assemblies, .NET Framework Class Library, Windows Forms, ASP .NET and ASP .NET AJAX, ADO .NET, Windows workflow Foundation, Windows Presentation Foundation, Windows Communication Foundation, Widows Card Space and LINQ.

Introducing C# — 06 Hours

Need of C#, C# Pre-processor Directives, Creating a Simple C# Console Application, Identifiers and Keywords. Data Types, Variables and Constants: Value Types, Reference Types, Type Conversions, Boxing and Undoing, Variables and Constants. Expression and Operators: Operator Precedence, Using the ?? (Null Coalescing) Operator, Using the :: (Scope Resolution) Operator and Using the is and as Operators. Control Flow statements: Selection Statements, Iteration Statements and Jump Statements.

Namespaces, Classes, Objects and Structures — 06 Hours

Namespaces, The System namespace, Classes and Objects: Creating a Class, Creating an Object, Using this Keyword, Creating an Array of Objects, Using the Nested Classes, Defining Partial Classes and Method, Returning a Value from a Method and Describing Access Modifiers. Static Classes and Static Class Members. Properties: Read-only Property, Static Property, Accessibility of accessors and Anonymous types. Indexers, Structs: Syntax of a struct and Access Modifiers for structs.

Object- Oriented Programming — 05 Hours

Encapsulation: Encapsulation using accessors and mutators, Encapsulation using Properties. Inheritance: Inheritance and Constructors, Sealed Classes and Sealed Methods, Extension methods. Polymorphism: Compile time Polymorphism/ Overloading, Runtime Polymorphism/ Overriding. Abstraction: Abstract classes, Abstract methods. Interfaces: Syntax of Interfaces, Implementation of Interfaces and Inheritance.

Delegates and Events and Exception Handling — 05 Hours

Delegates: Creating and using Delegates, Muticasting with Delegates. Events: Event Sources, Event Handlers, Events and Delegates, Multiple Event Handlers. Exception Handling: The try/catch/finally statement, Checked and Unchecked Statements.

Graphical User Interface with Windows Forms **10 Hours**

Introduction, Windows Forms, Event Handling: A Simple Event- Driven GUI, Visual Studio Generated GUI Code, Delegates and Event- Handling Mechanism, Another Way to Create Event Handlers, Locating Event Information. Control Properties and Layout, Labels, TextBoxes and Buttons, GroupBoxes and Panels, CheckBoxes and RadioButtons, ToolTips, Mouse-Event Handling, Keyboard-Event Handling. Menus, MonthhCalendor Control, Date TimePicker Control, LinkLabel Control, ListBox Control, CheckedListBox Control, ComboBox Control, TreeView Control, ListView Control, TabControl Control and Multiple Document Interface (MDI) Windows.

Data Access with ADO.NET **08 Hours**

Understanding ADO.NET: Describing the Architecture of ADO.NET, ADO>NET, ADO.NET Entity Framework. Creating Connection Strings: Syntax for Connection Strings. Creating a Connection to a Database: SQL Server Database, OLEDB Database, ODBC Data Source. Creating a Command Object. Working with DataAdapters: Creating DataSet from DataAdapter, Paging with DatyaAdapters, Updating with DataAdapters, Adding Multiple Tables to a DataSet, Creating Data View. Using DataReader to Work with Databases.

Web App Development with ASP.NET **08 Hours**

Introduction, Web Basics, Multitier Application Architecture, Your First Web Application: Building WebTime Application, Examining WEebTime.aspx's Code-Behind File, Standard Web Controls: Designing a Form, Validation Controls, Session Tracking: Cookies, Session Tracking with http Session State, Optaions.aspx :Selecting a Programming Language, ecommenations.aspx: Displaying Recommendations based on Session Values.

Case study: Database-Driven ASP.NET Guestbook, Building a Web Form that Displays Data from a Database, Modifying the Code-Behind File for the Guestbook Application, ASP.NET AJAX: Traditional Web Applications, Ajax Web Applications, Testing an ASP.NET Ajax application, the ASP.NET Ajax Control Toolkit. Case study: Password-Protected Books Database Application

Text Books:

1. .NET 4.0 Programming (6-in-1), Black Book, Kogent Learning Solutions Inc., Wiely- Dream Tech Press. (Chapters: 1,10,11,12,13,14 and 19).
2. Paul Deitel and Harvey Deitel: C# 2010 for Programmers, 4th Edition, Pearson Education. (Chapters: 14,15,19 an 27.3)

References Books:

1. Andrew Trolsen: Pro C# 5.0 and the .NET 4.5 Framework, 6th Edition, Wiely-Appress.
2. Bart De Smet: C# 4.0 Unleashed, Pearson Education- SAMS Series.
3. Hebert Shildt: Programming in C# 4.0, Tata McGraw Hill.

Mobile and Adhoc Sensor Networks

Subject Code: 13MCA541	**I.A. Marks : 50**
Hours/Week : 4	**Exam Hours: 3**
Total Hours : 52	**Exam Marks: 100**

Unit I **12 Hours**

Mobile Ad-Hoc Networking with a View of 4G Wireless: Imperatives and Challenges, Off-the-Shelf Enables of Ad Hoc Networks, IEEE 802.11 in Ad Hoc Networks: Protocols, Performance and Open Issues, Scatternet Formation in Bluetooth Networks, Antenna Beam forming and Power Control for Ad Hoc Networks.

Unit II **10 Hours**

Topology Control in Wireless Ad Hoc Networks, Broadcasting and Activity Scheduling in Ad Hoc Networks, Location Discovery, Mobile Ad Hoc Networks (MANETs): Routing Technology for Dynamic, Wireless Networking, Routing Approaches in Mobile Ad Hoc Networks.

Unit III **10 Hours**

Energy-Efficient Communication in Ad Hoc Wireless Networks, Ad Hoc Networks Security, Self- Organized and Cooperative Ad Hoc Networking, Simulation and Modeling of Wireless, Mobile, and Ad Hoc Networks, Modeling Cross-Layering Interaction Using Inverse Optimization, Algorithmic Challenges in Ad Hoc Networks.

Unit IV **10 Hours**

Introduction and Overview of Wireless Sensor Networks: Applications of Wireless Sensor Networks, Examples of Category 1 WSN Applications, Another Taxonomy of WSN Technology. Basic Wireless Sensor Technology: Sensor Node Technology, Sensor Taxonomy, WN Operating Environment, WN Trends**.**

Unit V Text **10 Hours**

Wireless Transmission Technology and Systems: Radio Technology Primer, Available Wireless Technologies. Medium Access Control Protocols for Wireless Sensor Networks: Fundamentals of MAC Protocols, MAC Protocols for WSNs, Sensor-MAC Case Study, IEEE 802.15.4 LR-WPANs Standard Case Study**.**

Text Book:

1. “Adhoc and Sensor Networks” by Stefano Basagni, Silvia Giordano, Ivan Stojmenvic. IEEE Press, A John Wiley & Sons, Inc., Publication 2004.

References

1. Kazem Sohraby, Daniel Minoli, Taieb Znati. Wireless Sensor Networks, A John Wiley & Sons, Inc., Publication 2007

Parallel Computing

Subject Code : 13MCA542 **IA |Marks:50**
Hours / Week : 4 **Exam Hours: 3**
Total Hours : 52 **Exam Marks: 50**

1. Introduction to Parallel Computing **2 Hours**
Need of Performance, Building Parallel Systems, Why to Write Parallel Programs? How to Write Parallel Programs? Approach : Concurrent, Parallel, Distributed

2 Parallel Hardware and Parallel Software **4 Hours**
Background, Modifications to the von Neumann Model, Parallel Hardware, Parallel Software, Input and Output, Performance, Parallel Program Design and Writing and Running Parallel Programs

3 Distributed Memory Programming with MPI **10 Hours**
Getting Started, The Trapezoidal Rule in MPI, Dealing with I/O, Collective Communication, MPI Derived Data types, A Parallel Sorting Algorithm

4 Shared Memory Programming with Pthreads **12 Hours**
Processes, Threads and Pthreads, Hello, World program ,Matrix-Vector Multiplication, Critical Sections Busy-Waiting, Mutexes, Producer-Consumer Synchronization and Semaphores, Barriers and Condition Variables, Read-Write Locks, Caches, Cache-Coherence, and False Sharing and Thread-Safety

5 Shared Memory Programming with OpenMP **18 Hours**
Introduction to OpenMP, The Trapezoidal Rulem Scope of Variables, The Reduction Clause, The Parallel For Directive, More About Loops in OpenMP: Sorting, Scheduling Loops, Producers and Consumers, Caches, Cache-Coherence, and False Sharing and Thread-Safety

6 Parallel Program Development and Parallel Algorithms **6 Hours**
Two N-Body Solvers, Tree Search and Case Studies

Text Books:

1. **An introduction to parallel programming** by peter s. Pacheco. 2011.I Edition ,morgan kaufmann publishers

Reference Books :

1. **Using OpenMP**: Portable Shared Memory Parallel Programming ,Gabriele Jost and Ruud van der Pas The MIT Press (October 12, 2007)
2. **Using MPI** - 2nd Edition: Portable Parallel Programming with the Message Passing Interface,William Gropp and Ewing Lusk, 1999, 2nd edition, MIT Press
3. **Pthreads Programming**: A Posix Standard for Better Multiprocessing,Dick Buttlar, Jacqueline Farrell & Bradford Nichols .1996, I Edition , Oreilly

Multimedia Systems

Subject Code:	**13MCA543**	**I.A. Marks**	**: 50**
Hours/Week :	**4**	**Exam Hours**	**: 3**
Total Hours :	**52**	**Exam Marks**	**: 100**

Introduction, Media and Data Streams, Audio Technology **7 Hours**

Multimedia Elements; Multimedia Applications; Multimedia Systems Architecture; Evolving Technologies for Multimedia Systems; Defining Objects for Multimedia Systems; Multimedia Data Interface Standards; The need for Data Compression; Multimedia Databases.

Media: Perception Media, Representation Media, Presentation Media, Storage Media, Transmission Media, Information Exchange Media, Presentation Spaces & Values, and Presentation Dimensions; Key Properties of a Multimedia System: Discrete & Continuous Media, Independence Media, Computer Controlled Systems, Integration; Characterizing Data Streams: Asynchronous Transmission Mode, Synchronous Transmission Mode, Isochronous Transmission Mode; Characterizing Continuous Media Data Streams.

Sound: Frequency, Amplitude, Sound Perception and Psychoacoustics; Audio Representation on Computers; Three Dimensional Sound Projection; Music and MIDI Standards; Speech Signals; Speech Output; Speech Input; Speech Transmission.

Graphics and Images, Video Technology, Computer-Based Animation **7 Hours**

Capturing Graphics and Images Computer Assisted Graphics and Image Processing; Reconstructing Images; Graphics and Image Output Options. Basics; Television Systems; Digitalization of Video Signals; Digital Television; Basic Concepts; Specification of Animations; Methods of Controlling Animation; Display of Animation; Transmission of Animation; Virtual Reality Modeling Language.

Data Compression **12 Hours**

Storage Space; Coding Requirements; Source, Entropy, and Hybrid Coding; Basic Compression Techniques; JPEG: Image Preparation, Lossy Sequential DCT-based Mode, Expanded Lossy DCT-based Mode, Lossless Mode, Hierarchical Mode. H.261 (Px64) and H.263: Image Preparation, Coding Algorithms, Data Stream, H.263+ and H.263L; MPEG: Video Encoding, Audio Coding, Data Stream, MPEG-2, MPEG-4, MPEG-7; Fractal Compression.

Optical Storage Media **6 Hours**

History of Optical Storage; Basic Technology; Video Discs and Other WORMs; Compact Disc Digital Audio; Compact Disc Read Only Memory; CD-ROM Extended Architecture; Further CD-ROM-Based Developments; Compact Disc Recordable; Compact Disc Magneto-Optical; Compact Disc Read/Write; Digital Versatile Disc.

Content Analysis **6 Hours**

Simple Vs. Complex Features; Analysis of Individual Images; Analysis of Image Sequences; Audio Analysis; Applications.

Data and File Format Standards **7 Hours**

Rich-Text Format; TIFF File Format; Resource Interchange File Format (RIFF); MIDI

File Format; JPEG DIB File Format for Still and Motion Images; AVI Indeo File Format; MPEG Standards; TWAIN

Multimedia Application Design **7 Hours**

Multimedia Application Classes; Types of Multimedia Systems; Virtual Reality Design; Components of Multimedia Systems; Organizing Multimedia Databases; Application Workflow Design Issues; Distributed Application Design Issues.

Text Books:

1. Ralf Steinmetz, Klara Narstedt: Multimedia Fundamentals: Vol 1-Media Coding and Content Processing, 2nd Edition, Pearson Education, 2003. (Chapters 2, 3, 4, 5, 6, 7, 8, 9)
2. Prabhat K. Andleigh, Kiran Thakrar: Multimedia Systems Design, PHI, 2003. (Chapters 1, 3, 7)

Reference Books:

1. K.R Rao, Zoran S. Bojkovic and Dragorad A. Milovanovic: Multimedia Communication Systems: Techniques, Standards, and Networks, Pearson Education, 2002.
2. Nalin K Sharad: Multimedia information Networking, PHI, 2002.

PATTERN RECOGNITION

Subject Code : 13MCA544	**IA Marks : 50**
Hrs/Week : 04	**Exam Hours : 03**
Total no. of Lecture Hrs. : 52	**Exam Marks : 100**

UNIT – 1 **8 Hours**
INTRODUCTION: Machine perception, pattern recognition systems, design cycle, learning and adaptation, Applications of pattern recognition.

UNIT – 2 **9 Hours**
PROBABILITY: Introduction, probability of events, random variables, Joint distributions and densities, moments of random variables, estimation of parameters from samples, minimum risk estimators.

UNIT – 3 **10 Hours**
STATISTICAL DECISION MAKING: Introduction, Baye's Theorem, multiple features, conditionally independent features, decision boundaries, unequal costs of error, estimation of error rates, the leavingone- out technique. Characteristic curves, estimating the composition of populations.

UNIT – 4 **9 Hours**
NONPARAMETRIC DECISION MAKING: Introduction, histograms, Kernel and window estimators, nearest neighbor classification techniques, adaptive decision boundaries, adaptive discriminate Functions, minimum squared error discriminate functions, choosing a decision making technique.

UNIT – 5 **8 Hours**
UNSUPERVISED LEARNING AND CLUSTERINGS: Unsupervised Bayesian learning, data decryption and clustering, criterion functions and clustering, Hierarchical clustering, Online clustering, component analysis.

UNIT – 6 **8 Hours**
ARTIFICIAL NEURAL NETWORKS: Introduction, nets without hidden layers. nets with hidden layers, the back Propagation algorithms, Hopfield nets, an application.

TEXT BOOKS:

1. **Pattern Classification** Duda R. O., and Hart P E., and Stork D G., Wiley Publishers
2. **Pattern Recognition and Image Analysis,** Earl Gose, Richard J and Steve J, PHI
3. **Pattern recognition** (Statistical, structural and Neural Approaches), Robert Schalkoff

REFERENCE BOOKS
1. **"Pattern Recognition,** Sergios Thedoridis & Konstantinos Koutrumbas, Elsevier Academic Press, 4th Edition.

Service Oriented Architectures (SOA)

Sub. Code: 13MCA545 **IA Marks:50**
Hrs/Week: 4 **Exam Hours:03**
Total Hours: 52 **Exam Marks: 100**

Introduction to SOA, Evolution of SOA **6 hours**
Fundamentals of SOA, Common characteristics of contemporary SOA, Common tangible benefits of SOA, A SOA timeline (from XML to Web Services to SOA), The continuing evolution of SOA (standards organizations and Contributing vendors), The roots of SOA (comparing SOA to Past Architectures)

Web Services and Primitives of SOA **6 hours**
The Web Services framework, Services (as Web Services), Service Description (with WSDL), Messaging (with SOAP)

Web Services and Contemporary SOA **12 Hours**
Message Exchange patterns, Service Activity; Coordination, Atomic Transactions, Business Activities, Orchestration, Choreography, Addressing, Reliable Messaging, Correlation, Policies, Meta data Exchange, Security, Notification and eventing.

Principles of Service – Orientation **7 Hours**
Services- Orientation and the enterprise, Anatomy of service-oriented Architecture, Common Principles of Service Orientation; How Service Orientation principles inter relate, Service Orientation and object orientation, Native Web Service support for service orientation principles.

Service Layers **6 Hours**
Service Orientation and contemporary SOA, Service Layer Abstraction, Application service layer, Business Service Layer, Orchestration Service Layer, Agnostic Services, Service Layer Configuration scenarios.

Business Process Design **7 Hours**
WS-BPEL Language basics, WS-Coordination overview, Service oriented business process redesign, WS-Addressing language basics, Ws-Reliable messaging language basics.

Enterprise Applications **8 Hours**
Learning Objectives, Architectural Considerations, Solution Architecture for Enterprise Applications, Solution Architecture for Enterprise Applications based on SOA, Software Platforms for Enterprise Applications.

Text Books

1. Thomas Erl: Service Oriented Architecture- Concepts, Technology and Design, Pearson Education, 2013 (listed topics only from Chapters 3,4,5,6,7,8,9,16,17)
2. Shankar Khambhapaty, Service Oriented Architecture for Enterprise and Cloud Applications, 2nd Edition, Wiley-India, 2012 (listed topics only from Chapter 5,6)

Reference Books

1. Frank cohen: FastSOA, Elsevier, 2010
2. Eric Newcomer, Greg Lomow: Understanding SOA with Web Services, Pearson Education, 2009.

Compiler Design

Subject Code: 13MCA546	**IA Marks: 50**
Hours/ Week: 4	**Exam Hours: 3**
Total Hours: 52	**Exam Marks: 100**

Introduction, Lexical analysis **8 Hours**

Language processors; The structure of a Compilers; The evolution of programming languages; The science of building a compiler; Applications of Compiler technology; Programming language basics; Lexical analysis: The Role of Lexical Analyzer; Input Buffering; Specifications of Tokens; Recognition of Tokens.

Syntax Analysis - 1 **6 Hours**

Introduction; Context-free Grammars; Writing a Grammar; Top-down Parsing

Syntax Analysis – 2 **6 Hours**

Bottom-up Parsing; Introduction to LR Parsing: Simple LR.

Syntax Analysis – 3 **6 Hours**

More powerful LR parsers; Using ambiguous grammars; Parser Generators.

Syntax-Directed Translation **6 Hours**

Syntax-Directed definitions; Evaluation order for SDDs; Applications of Syntax-directed translation; Syntax-directed translation schemes

Intermediate Code Generation **8 Hours**

Variants of syntax trees; Three-address code; Types and declarations; Translation of expressions; Type checking; Control flow; Back patching; Switch statements; Intermediate code for procedures.

Run-Time Environments **6 Hours**

Storage Organization; Stack allocation of space; Access to non-local data on the stack; Heap management; Introduction to garbage collection

Code Generation **6 Hours**

Issues in the design of Code Generator; The Target language; Addresses in the target code; Basic blocks and Flow graphs; Optimization of basic blocks; A Simple Code Generator.

Text Books:

1. Alfred V Aho, Monica S. Lam, Ravi Sethi, Jeffrey D Ullman: Compilers-Principles, Techniques and Tools, 2nd Edition, Addison-Wesley, 2007. (Chapters 1, 3.1 to 3.4, 4, 5.1 to 5.4, 6, 7.1 to 7.5, 8.1 to 8.6)

Reference Books:

1. Charles N. Fischer, Richard J. leBlanc, Jr.: Crafting a Compiler with C, Pearson Education, 1991.
2. Andrew W Apple: Modern Compiler Implementation in C, Cambridge Univ. Press, 1997.
3. Kenneth C Louden: Compiler Construction Principles & Practice, Thomson Education, 1997.

CLOUD COMPUTING

Subject Code: 13MCA551	**I.A. Marks: 50**
Hours/Week: 4	**Exam Hours: 3**
Total Hours: 52	**Exam Marks: 100**

Distributed System Models and Enabling Technologies **8 Hours**

Scalable Computing Service over the Internet: The Age of Internet Computing, scalable computing Trends and New Paradigms, Internet of Things and Cyber-Physical Systems. System Models for Distributed and Cloud Computing: Clusters of Cooperative Computers, Grid Computing Infrastructures, Peer-to-Peer Network Families, Cloud Computing over the Internet. Software Environments for Distributed Systems and Clouds: Service-Oriented Architecture (SOA), Trends towards Distributed Operating Systems, Parallel and Distributed Programming Models. Performance, Security, and Energy-Efficiency: Performance Metrics and Scalability Analysis, Fault-Tolerance and System Availability, Network Threats and Data Integrity,
Energy-Efficiency in Distributed Computing.

Computer Clusters for scalable parallel computing **6 Hours**

Clustering for massive parallelism: Cluster Development Trends, Design Objective of Computer Clusters, Fundamental Cluster Design issues. Virtual machines and Virtualization of clusters and Data centers: Implementation levels of virtualization: levels of virtualization Implementation, VMM Design requirements and providers, Virtualization support at the OS level, Middleware Support for Virtualization.

Cloud Platform Architecture over Virtualized Data Centers **5 Hours**

Cloud computing and Service Models: Public, Private, and Hybrid Clouds, Cloud Ecosystem and Enabling Technologies, Infrastructure-as- a- Service (IaaS), Platform- and Software-as-a-Service (Paas, SaaS). Architectural Design of Compute and Storage Clouds: A Generic Cloud architecture Design, Layered Cloud Architectural development, Virtualization Support and Disaster Recovery, Architectural Design Challenges.

Public Cloud Platforms **7 Hours**

GAE, AWS, and Azure: Smart Cloud, Public Clouds and Service Offerings, Google App Engine (GAE), Amazon Web Service (AWS), Microsoft Windows Azure. Inter-cloud Resource Management: Extended Cloud Computing Services, Resource Provisioning and Platform Deployment, Virtual Machine Creation and Management. Cloud Security and Trust management: Cloud Security Defense Strategies, Distributed Intrusion/Anomaly Detection, Data and Software Protection Techniques.

Cloud Programming and Software Environments **8 Hours**

Features of Cloud and Grid Platforms: Cloud Capabilities and Platform Features, Traditional Features Common to Grids and Clouds, Data Features and Databases, Programming and Runtime Support. Parallel and Distributed Programming Paradigms: Parallel Computing and Programming Paradigms, MapReduce, Twister and Iterative MapReduce, Hadoop Library from Apache.

Programming Support of App Engine **10 Hours**

Programming the Google App Engine, Google File System (GFS), Bigtable, Google's NOSQL system, Chubby, Google's Distributed Lock service. Programming on Amazon AWS and Microsoft Azure: Programming on Amazon EC2, Amazon Simple Storage Service S3, Amazon Elastic Block Store EBS and SimpleDB, Microsoft Azure programming support. Emerging Cloud Software Environments: Open Source Eucalyptus and Nimbus, Open Nebula, Sector/Sphere, and OpenStack, Manjrasoft Aneka Cloud and Appliances.

Ubiquitous Clouds and the Internet of Things **8 Hours**

Performance of Distributed Systems and the Cloud Data-intensive Scalable Computing (DISC), Quality of Service in Cloud computing, Benchmarking MPI, Azure, EC2, MapReduce, and Hadoop. Online social and Professional Networking: Online Social Network Characteristics, Graph-Theoretic Analysis of Social networks, Communities and Applications of Social Networks, Facebook: The World's Largest Content-Sharing Network, Twitter for Micro blogging, News and Alert Services.

Text Book:

1. Kai Hwang, Jack Dungaree, and Geoffrey Fox: Distributed and Cloud Computing, From Parallel Processing to the Internet of Things, MK Publishers, 2012. Chapters – 1,2,3,4,5,6,9

Reference Books:

1. Michael Miller, Cloud Computing: Web-Based Applications that change the Way you work and collaborate Online, Pearson Publication, 2012.
2. Anthony T. Volte, Toby J. Volte, Robert Elsenpeter: Cloud Computing, A Practical Approach, McGraw Fill, 2010.
3. Cloud Computing for Dummies: J. Hurwitz, ISBN 978-0-470-484-8
4. Dr. Kumar Sourabh, Cloud Computing, 2nd Edition, Wiley India.

WEB 2.0 AND RICH INTERNET APPLICATIONS

SubCode: 13MCA552	**IAMarks:50**
Hrs/Week: 4	**Exam Hours:3**
Total Hours:52	**Exam Marks:100**

Building Rich Internet Applications with AJAX **6 Hours**

Building Rich Internet Applications with AJAX: Limitations of Classic Web application model, AJAX principles, Technologies behind AJAX, Examples of usage of AJAX, Dynamic web applications through Hidden frames for both GET and POST methods. IFrames, Asynchronous communication and AJAX application model.

Ajax with XMLHTTP object **6 Hours**

Creating Ajax Applications: An example, Analysis of example ajax.html, Creating the JavaScript, Creating and opening the XMLHttpRequest object, Data download, Displaying the fetched data, Connecting to the server, Adding Server-side programming, Sending data to the server using GET and POST.

Handling multiple XMLHttpRequest objects in the same page, Using two XMLHttpRequest objects, Using an array of XMLHttpRequest objects, Using inner functions, Downloading JavaScript, connecting to Google Suggest, Creating google.php, Downloading from other domains with Ajax, HTML header request and Ajax, Defeating caching, Examples.

Building XML and working with XML in JavaScript, Getting the document element, Accessing any XML element, Handling whitespace in Firefox, Handling cross-browser whitespace, Accessing XML data directly, Validating XML, Further examples of Rich Internet Applications with Ajax

Ajax Patterns **4 Hours**

Predictive fetch pattern, Submission throttling pattern, Periodic refresh, Multi stage download, Fall back patterns

Working with PHP and DOM in Ajax **6 Hours**

Working with PHP server variables, Getting the data in to array format, Wrapping applications in to a single PHP page, Validating input from the user, Validating integers and text, DOM, Appending new elements to a web page using the DOM and Ajax, Replacing elements using the DOM, Handling timeouts in Ajax, Downloading images with Ajax, Example programs.

Flex – 1: Understanding Flex Environment and Layouts **6 Hours**

Introduction: Understanding Flex Application Technologies, Using Flex Elements, Working with Data Services (Loading Data at Runtime), The Differences between Traditional and Flex Web Applications, Understanding How Flex Applications Work, Understanding Flex and Flash Authoring.Building Applications with the Flex Framework: Using Flex

Tool Sets, Creating Projects, Building Applications, Deploying Applications.
Framework Fundamentals: Understanding How Flex Applications Are Structured, Loading and Initializing Flex Applications, Understanding the Component Life Cycles, Loading One Flex Application into Another Flex Application, Differentiating Between Flash Player and the Flex Framework, Caching the Framework, Understanding Application Domains, Localization, Managing Layout: Flex Layout Overview, Making Fluid Interfaces, Putting It All Together.

Flex – 2: Working with MXML and ActionScript 8 Hours

MXML: Understanding MXML Syntax and Structure, Making MXML Interactive Working with UI Components: Understanding UI Components, Buttons, Value Selectors, Text Components, List-Based Controls, Pop-Up Controls, Navigators, Control Bars Customizing Application.Appearance: Using Styles, Skinning components, Customizing the preloader, Themes, Runtime CSS ActionScript: Using ActionScript, MXML and ActionScript Correlations, Understanding ActionScript Syntax, Variables and Properties, Inheritance, Interfaces, Handling Events, Error
Handling, Using XML

Flex – 3: Working with States 6 Hours

Managing State: Creating States, Applying States, Defining States, Adding and Removing Components, Setting Properties, Setting Styles, Setting Event Handlers, Using Action Scripts to Define States, Managing Object Creation Policies, Handling State Events, Understanding State Life Cycles, When To Use States. Using Effects and Transitions: Using Effects, Creating Custom Effects, Using Transitions, Creating Custom Transitions.

Flex – 4: Working with Data Models and Data Binding 4 Hours

Working with Data: Using Data Models, Data Binding, Enabling Data Binding for Custom Classes, Data Binding Examples, Building data binding proxies. Validating and Formatting Data: Validating user input, Formatting Data.

Impacts of the Next Generation of the web 3 Hours

Business models for Internet and web, Data Ownership, SAAS, Socialization and cocreation of content.

The Semantic web and Web 2.0 3 Hours

Overview of semantic web, Languages of the Semantic Web, Ontologies, Micro-formats, collaborative tagging and folksonomies.

Text Books:

1.Nicholas C Zakas et al: Professional AJAX, Wiley India, publications, (Chapters 1 to 3)
2. Steven Holzner: Ajax: A Beginner's Guide, Tata McGraw Hill, 2011. (Listed topics from Chapters 3, 4, 7, 11, 12)

Reference Books:

1. Chafic Kazon and Joey Lott: Programming Flex 3, O'Reilly, 2011. (Listed topics from Chapters 1 to 8, 12 to 15)
2. Gottfried Vossen and Stephan Hagemann: Unleashing Web 2.0 Elsevier, Inc 2011 (Listed topics from Chapters 5 and 6)

3. Thomas A. Powel: Ajax The Complete reference, McGraw Hill, 2008.
4. Gottfried Vossen, Stephan Hagemann: Unleashing Web 2.0 From Concepts to Creativity, Elsevier, 2007.
5. Colin Moock: Essential Actionscript 3.0, O'Reilly Publications, 2007.
6. Steven Holzner : Ajax Bible Wiley India , 2007.
7. Justin Gehtland et al: A Web 2.0 primer Pragmatic Ajax, SPD Publications, 2006.
8. Eric Van derVlist et al: Professional Web 2.0 Programming, Wiley India, 2007.

Information Retrieval and Search Engines

Subject Code: 13MCA553	**I.A.Marks :50**
Hours/Week: 4	**Exam Hours : 3**
Total Hours: 52	**Exam Marks: 100**

UNIT 1 INTRODUCTION 4 Hours

Information Retrieval, Search Engines, Search Engineers.

UNIT 2 ARCHITECTURE OF A SEARCH ENGINE 5 Hours

Architecture, Basic Building Blocks, Text Acquisition, Text Transformation Index Creation, User Interaction, Ranking and Evaluation

UNIT 3 CRAWLS AND FEEDS 6 Hours

Deciding what to search, Crawling the Web, Directory Crawling, Document Feeds, Conversion Problem, Storing the Documents, Detecting Duplicates, removes noise.

UNIT 4 PROCESSING TEXT 8 Hours

Text Statistics, Document Parsing, Document Structure and Markup, Link Analysis, Information Extraction, Internationalization

UNIT 5 RANKING WITH INDEXES 6 Hours

Abstract Model of Ranking, Inverted indexes, Compression, Entropy and Ambiguity, Delta Encoding, Bit-aligned codes, Auxiliary Structures, Index Construction, Query Processing.

UNIT 6 QUERIES AND INTERFACES 5 Hours

Information Needs and Queries ,Query Transformation and Refinement , Showing the Results Cross-Language Search.

UNIT 7 RETRIEVAL MODELS 12 Hours

Overview of Retrieval Models , Boolean Retrieval , The Vector Space Model, Probabilistic Models, Information Retrieval as Classification, BM25 Ranking Algorithm, Complex Queries and Combining Evidence, Web Search, Machine Learning and Information Retrieval ,.

UNIT 8 EVALUATING SEARCH ENGINES 6 Hours

The Evaluation Corpus , Logging , Effectiveness Metrics, Recall and Precision Averaging and Interpolation , Efficiency Metrics, Training, Testing, and Statistics

Text Books and References

1. **Search Engines: Information Retrieval in Practice:** Trevor Strohman, Bruce Croft Donald Metzler, Kindle **Edition**

Soft Computing

Subject Code: 13MCA554 **I.A. Marks : 50**
Hours/Week: 04 **Exam Hours: 03**
Total Hours: 52 **Exam Marks: 100**

Genetic Algorithm: An Overview **5 Hours**
History of Evolutionary Computing, The Appeal of Evolution, Biological Terminology, Elements of Genetic Algorithm, Genetic Algorithms and Traditional Search Methods, Applications and Examples of Genetic Algorithm.

Genetic Algorithm in Problem Solving **5 Hours**
Evolving Computer Programs, Data Analysis and Prediction, Evolving Neural Networks.

Theoretical Foundations of Genetic Algorithm **5 Hours**
Schemas and the Two-Armed Bandit Problem, Royal Roads, Exact Mathematical Models of Genetic Algorithm.

Implementing a Genetic Algorithm **5 Hours**
When should a Genetic Algorithm be used , Encoding a Problem for a Genetic Algorithm, Adapting the Encoding, Selection Methods , Genetic Operators, Parameters for Genetic Algorithm.

Introduction to fuzzy set theory **8 hours**
Probabilistic reasoning, Fuzzy sets, Mathematics of fuzzy set theory, Operations on fuzzy sets, Comparison of fuzzy and crisp set theory.

Fuzzy mapping **6 Hours**
One to one mapping, Max-min principle, Extension principle, Implication rules – mamdani implications.

Membership functions **8 Hours**
Universe of discourse, Mapping inside fuzzy domain, Fuzzy membership mapping methods, Application to real world problems.

Neural Networks and Fuzzy System **6 Hours**
Neural and Fuzzy Machine Intelligence, Fuzziness as Multivalence, The Dynamical System Approach to Machine Intelligence: The Brain as a Dynamical System, Intelligent Behaviour as Adaptive Model Free estimation.

Neural Network Theory **4 Hours**
Neuron as Functions, Signal Monotonicity, Biological Activations and Signals, Neuron Fields, Neuronal Dynamical System, Common Signal Functions, Pulse –Coded Signal Functions

Text Books:

1. Melanie Mitchell: An Introduction to Genetic Algorithms, Prentice-Hall of India, India Edition, 2004. (Chapters: 1, 2, 4, 5 Exclude the topic not mentioned in the syllabus)
2. Timothy J. Ross : Fuzzy logic to engineering applications , McGraw Hill Inc, India Edition
3. Bart Kosko: Neural Networks and Fuzzy Systems – A Dynamical Systems Approach to Machine Intelligence, PHI Learning, India Edition, 2009. (Chapters: 1 and 2)

Reference Book:

1. D.E. Goldberg, Genetic Algorithms in Search, Optimization and Machine Learning, Addison-Wesley,1989.
2. Z. Michalewicz , Genetic Algorithms + Data Structures = Evolution Programs, Springer-Verlag,1994.
3. N.K. Sinha & M.M Gupta(Eds), Soft Computing & Intelligent System: Theory & Applications, Academic Press, 2000.
4. M.T. Hagan, H.B. Demuth and M. Beale, Neural Network Design, Thompson Learning,1996.
5. S.N Sivanandam, S.N Deepa, Principles of Soft Computing, 2nd Edition, Wiley

Storage Area Networks

Subject Code: 10MCA555	**I.A. Marks : 50**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

Introduction to Information Storage and Management, Storage System Environment 7 Hours

Information Storage, Evolution of Storage Technology and Architecture, Data Center Infrastructure, Key Challenges in Managing Information, Information Lifecycle Components of Storage System Environment, Disk Drive Components, Disk Drive Performance, Fundamental Laws Governing Disk Performance, Logical Components of the Host, Application Requirements and Disk Performance.

Data Protection, Intelligent Storage system 6 Hours

Implementation of RAID, RAID Array Components, RAID Levels, RAID Comparison, RAID Impact on Disk Performance, Hot Spares Components of an Intelligent Storage System, Intelligent Storage Array

Direct-Attached Storage, SCSI, and Storage Area Networks 7 Hours

Types of DAS, DAS Benefits and Limitations, Disk Drive Interfaces, Introduction to Parallel SCSI, Overview of Fibre Channel, The SAN and Its Evolution, Components of SAN, FC Connectivity, Fibre Channel Ports, Fibre Channel Architecture, Zoning, Fibre Channel Login Types, FC Topologies.

NAS, IP SAN 6 Hours

General – Purpose Service vs. NAS Devices, Benefits of NAS, NAS File I / O, Components of NAS, NAS Implementations, NAS File-Sharing Protocols, NAS I/O Operations, Factors Affecting NAS Performance and Availability. iSCSI, FCIP.

Content-Addressed Storage, Storage Virtualization 6 Hours

Fixed Content and Archives, Types of Archive, Features and Benefits of CAS, CAS Architecture, Object Storage and Retrieval in CAS, CAS Examples. Forms of Virtualization, SNIA Storage Virtualization Taxonomy, Storage Virtualizations Configurations, Storage Virtualization Challenges, Types of Storage Virtualization,

Business Continuity, Backup and Recovery 6 Hours

Information Availability, BC Terminology, BC Planning Lifecycle, Failure Analysis, Business Impact Analysis, BC Technology Solutions. Backup Purpose, Backup Considerations, Backup Granularity, Recovery Considerations, Backup Methods, Backup Process, Backup and restore Operations, Backup Topologies, Backup in NAS Environments, Backup Technologies.

Local Replication, Remote Replication 7 Hours

Source and Target, Uses of Local Replicas, Data Consistency, Local Replication Technologies, Restore and Restart Considerations, Creating Multiple Replicas, Management Interface, Modes of Remote Replication, Remote Replication Technologies, Network Infrastructure.

Securing the Storage Infrastructure, Managing the Storage Infrastructure 7 Hours

Storage Security Framework, Risk Triad, Storage Security Domains, Security Implementations in Storage Networking Monitoring the Storage Infrastructure, Storage Management Activities, Storage Infrastructure Management Challenges, Developing an Ideal Solution.

Text Books:

1. G. Somasundaram, Alok Shrivastava (Editors): Information Storage and Management: Storing, Managing & Protecting Digital Information in Classic, Visualized and Cloud Environments, 2nd edition, EMC Education Services, Wiley-India, 2009. ISBN 978-1-1180-9483-9

Reference Books:

1. Ulf Troppens, Rainer Erkens and Wolfgang Muller: Storage Networks Explained, Wiley India, 2003.
2. Rebert Spalding: Storage Networks, The Complete Reference, Tata McGraw Hill, 2003.
3. Richard Barker and Paul Massiglia: Storage Area Networks Essentials A Complete Guide to Understanding and Implementing SANs, Wiley India, 2002.

Software Project Management

Subject Code: 13MCA556 **I.A. Marks : 50**
Hours/Week: 4 **Exam Hours : 3**
Total Hours: 52 **Exam Marks: 100**

UNIT I INTRODUCTION TO SOFTWARE PROJECT MANAGEMENT 6 Hours
Project Definition – Contract Management – Activities Covered By Software Project Management – Overview of Project Planning – Stepwise Project Planning.

UNIT II PROJECT EVALUATION 8 Hours
Strategic Assessment – Technical Assessment – Cost Benefit Analysis –Cash Flow Forecasting – Cost Benefit Evaluation Techniques – Risk Evaluation.

UNIT III ACTIVITY PLANNING 16 Hours
Objectives – Project Schedule – Sequencing and Scheduling Activities –Network Planning Models – Forward Pass – Backward Pass – Activity Float – Shortening Project Duration – Activity on Arrow Networks – Risk Management – Nature Of Risk – Types Of Risk – Managing Risk – Hazard Identification – Hazard Analysis – Risk Planning And Control.

UNIT IV MONITORING AND CONTROL 12 Hours
Creating Framework – Collecting The Data – Visualizing Progress – Cost Monitoring – Earned Value – Prioritizing Monitoring – Getting Project Back To Target – Change Control – Managing Contracts – Introduction – Types Of Contract – Stages In Contract Placement – Typical Terms Of A Contract – Contract Management – Acceptance.

UNIT V MANAGING PEOPLE AND ORGANIZING TEAMS 10 Hours
Introduction – Understanding Behavior – Organizational Behavior: A Background – Selecting The Right Person For The Job – Instruction In The Best Methods – Motivation – The Oldman – Hackman Job Characteristics Model – Working In Groups – Becoming A Team –Decision Making – Leadership – organizational Structures – Stress –Health And Safety – Case Studies.

TEXT BOOK:

1. “Software Project Management”, Bob Hughes, Mikecotterell, Third Edition, Tata McGraw Hill, 2004.

REFERENCES:

1. Software Engineering Project management, Wiley Edition Second Edition edited by Richard H Thayer Foreword by Edward Yourdon
2. “Information Technology Project Management”, Jack T. Marchewka, 3rd edition, Wiley India, 2009.
3. "Managing Global Projects", Ramesh, Gopalaswamy, Tata McGraw Hill, 2001.
4. “Software Project Management”, Royce, Pearson Education, 1999.
5. “Software Project Management in Practice”, Jalote, Pearson Education, 2002.

Software Design Laboratory

Subject Code: 13MCA56	**I.A Marks : 50**
Hours/Week : 3	**Exam Hours: 03**
Total Hours : 42	**Exam Marks: 50**

The student has to draw the necessary UML diagrams using any suitable UML Drawing Tool and implement in Java OR C++ OR C# a program to demonstrate the Design Pattern specified by the Examiner. For Analysis and Design models, diagrams such as Use-case, Class Diagram, Sequence/Collaboration Diagram Should be drawn with suitable scenario, activity diagram, component diagram & deployment diagram.

The Design Pattern is allotted based on lots from the following list:

1) Expert
2) Controller
3) Publisher-Subscriber
4) Command
5) Forward-Receive
6) Client-Dispatcher
7) Proxy
8) Façade
9) Polymorphism
10) Whole-Part
11) Master-Slave

Note: Any Supporting Tool may be used.

.NET Laboratory

Subject Code : 13MCA57 **I.A. Marks : 50**
Hours/Week : 3 **Exam Hours: 3**
Total Hours : 42 **Exam Marks: 50**

PART A

1. Write a Program in C# to demonstrate Command line arguments processing.
2. Write a Program in C# to demonstrate boxing and Unboxing.
3. Write a program to demonstrate Operator overloading.
4. Find the sum of all the elements present in a jagged array of 3 inner arrays.
5. Using Try, Catch and Finally blocks write a program in C# to demonstrate error handling.
6. Demonstrate Use of Virtual and override key words in C# with a simple program.
7. Write a program to demonstrate delegates.
8. Write a program to demonstrate abstract class and abstract methods in C#.
9. Write a program to illustrate the use of different properties in C#.
10. Demonstrate arrays of interface types (for runtime polymorphism) with a C# program.

PART – B

1. Consider the Database STUDENT consisting of following tables: tbl_Course (CourseID: int, CourseName: string) tbl_Student (USN: string, StudName: string, Address: string, CourseID: int, YrOfAdmsn: int)
Develop suitable windows application using C#.NET having following options:
1. Entering new course details.
2. Entering new student details.
3. Display the details of students (in a Grid) who belong to a particular course.
4. Display the details the students who have taken admission in a particular year.

2. Consider the Database BLOODBANK consisting of following tables: tbl_BloodGroup (BloodID: int, BloodGroup: string) tbl_Donor (DonorID: int, DonorName: stirng, Address: string, ContactNo: int, DOB: date, Gender: string, Weight: int, BloodID: int)
Develop suitable windows application using C#.NET having following options:
1. Entering Blood group details.
2. Entering new donor details.
3. Display the details of donors (in a Grid) having particular blood group.
4. Display the details of donors (in a Grid) based on gender.
5. Display the details of donors (in a Grid) based on age (above 18), weight (above 45KG) and Gender(user’s choice).

3. Consider the Database STUDENT consisting of following tables: tbl_Course (CourseID: int, CourseName: string) tbl_Book (BookID :int, BookTitle: string, Author: string, CourseID: int) tbl_Student (USN: string, StudName: string, CourseID: int)
tbl_BookIssue(USN: string, BookID: int, IssueDate: Date)

Develop suitable windows application using C#.NET having following options:
1. New Course Entry.
2. New Book Entry
3. New Student Entry

4. Issue of books to a student.
5. Generate report (display in a grid) showing all the books belonging to particular course.
6. Generate report (display in a grid) showing all the books issued on a particular date.
7. Generate report (display in a grid) showing all the books issued to a particular student.

4. Develop a Web Application using C#.NET and ASP.NET for an educational institution. The master page should consist of Institution Name, Logo and Address. Also, it should provide hyperlinks to Departments, Facilities Available and Feedback. Each department page and facilities page should be designed as static pages. The hyperlinks should navigate to these static pages in the form of Content Pages associated with Master Page designed. The Feedback page should have fields to enter Name, Email and Message with Submit and Cancel Buttons. Database should be created to store these three data.

5. Develop a Web Application using C#.NET and ASP.NET for a Bank. The BANK Database should consist of following tables: tbl_Bank (BankID: int, BankName: string)
tbl_Branch (BranchID: int, BankID: int, BranchName: string) tbl_Account (AccountNo: int, BankID: int, BranchID: int, CustomerName: string, Address: string, ContactNo: int, Balance: real) (Note: AccountNo and BankID together is a composite primary key).

The master page of this web application should contain hyperlinks to New Bank Entry, New Branch Entry (of selected Bank), New Customer Entry (based on branch and bank) and Report Generation. The hyperlinks should navigate to respective content pages. These content pages provide the fields for respective data entry. The reports should be generated (display in grid) as below:
1. Display all records of particular bank.
2. Display all records of a branch of particular bank.
3. The balance should be displayed for the entered account number (Bank and Branch
are input through ComboBox controls and Account number is input through TextBox).

Note:
1. **Students are required to execute one question from Part A and one from Part B.**
2. **Part A has to be evaluated for 20 marks and Part B has to be evaluated for 30 marks**

Mini Project-II Guidelines

Subject Code: 13MCA58

1. A team of only two students must develop the mini project. However during the exami nati on, each student must demonstrate the project individually

2. The team may implement project of their choice using any one of the technologies lear nt in VSemester like OOMD, C# With.NET, using SSM concepts or any other technolog y along with designing of database (mandatory).

3. The team must submit a brief project report (25-30 pages) that must include the following

   a. Introduction
   b. Literature survey
   c. Hardware & Software Requirements
   d. System Design Architecture
   e. Implementation (screenshots to be included)
   f. Testing
   g. Conclusion
   h. Future enhancements.
   j. Bibliography

   Appendix: User Manual with the help of screen shots and text description

4. The report must be evaluated for 10 Marks. Demonstration for 30 Marks and Viva for 10 Marks

VI semester Project Work (13MCA61)

General Rules

1. Students are required to take up individual project in companies/Respective Colleges other than the mini project standards already taken up during previous semesters.
2. Project should be real time work, for total of 5 months duration
3. Project work may be application oriented or research oriented as per student and guide‘s interest. Therefore the project reports will vary depending on whether it is application oriented project or research based project.
4. Regular project work weekly dairy should be maintained by the students, signed by the external guide and internal guide in order to verify the regularity of the student. (Enclosing the Format)
5. Seminars / presentation should be given at Synopsis, SRS, Design and Project Completion levels.
6. Project verification at the place of project work must mandatory by the internal guide, for completion of the work.
7. If project report is not as per the format and not a real time project, external guides will have every right to reject the project
8. Examination Marks

IA	– 50 Marks
Dissertation	– 125
Viva	– 75
Total	– 250 Marks

9. **Students are encouraged and appreciated to show their project code demo along with their power point slide show during their viva-voce exams as an added advantage.**

Guidelines for the Preparation of Project Reports

1. **Printing Area:** The margins should be: **Left:** 1.25”, **Right**: 1.00”, **Top and Bottom-** 1.00”. The text should be justified to occupy the full line width, so that the right margin is not ragged, with words hyphenated as appropriate. Please fill pages so that the length of the text runs to the right margin.

2. The report must be printed on one side only. Please use a high-resolution printer, preferably a laser printer with at least 300 dpi. Project reports must be printed neatly on

one side of the paper on a A4 size bond paper. The reports submitted to the department/guide(s) must be hard bounded with dry tone Xerox.

3. **Abstract:** The abstract should summarize the contents of the report and should contain at least 150 and at most 350 words. It should be set in 12-point font size. There should be two blank (10-point) lines before and after the title **ABSTRACT**.

4. **Layout, Typeface, Font Sizes, and Numbering:** For the main text, please use 12-point type and 1.5 line spacing. We recommend using **Times New Roman** fonts. Italic type may be used to emphasize words in running text. Bold type and underlining should be avoided.

5. **Headings.**
   The chapter headings should be in capitals and must be separated from the other text by 24point line space.

   Headings should be in the form where each word is capitalized (i.e., nouns, verbs, and all other words except articles, prepositions, and conjunctions should be set with an initial capital) and should, with the exception of the title, be aligned to the left. The font sizes are given in Table 1.

   Here are some examples of headings: “Criteria to Disprove Context-Freeness of Collage Languages”, “On Correcting the Intrusion of Tracing Non-deterministic Programs by Software”, “A User-Friendly and Extendable Data Distribution System”, “Multi-flip Networks: Parallelizing GenSAT”, “Self-determinations of Man”.

Table 1 Font sizes of headings. Table captions should always be positioned Above the tables. The final sentence of a table caption should end without a period

Heading	**Example**	**Font Size and Style**
Title	**Chapter 1 Introduction**	**16 Point Bold**
First Level Heading	**1.1. Preamble**	**14 Point Bold**
Second Level Heading	**2.3.1. Mandatory or Regulatory Signs**	**12 Point Bold**
Third Level Heading	**Stop and Give away signs**	**12 Point Bold**
Fourth Level Heading	***Creation of database***	**12 Point Bold Italicized**

Figures and Photographs

Check that in line drawings, lines are not interrupted and have constant width. Grids and details within the figures must be clearly readable and may not be written one on top of the other. The lettering in figures should have a height of 2 mm (10-point type). Figures should be scaled up or down accordingly.

Figures should be numbered and should have a caption which should always be positioned under the figures, in contrast to the caption belonging to a table, which should always appear above the table. Please center the captions between the margins and set them in 9-point type (Fig. 1 shows an example). The distance between text and figure should be about 12 point spacing, the distance between figure and caption about 6 point spacing.

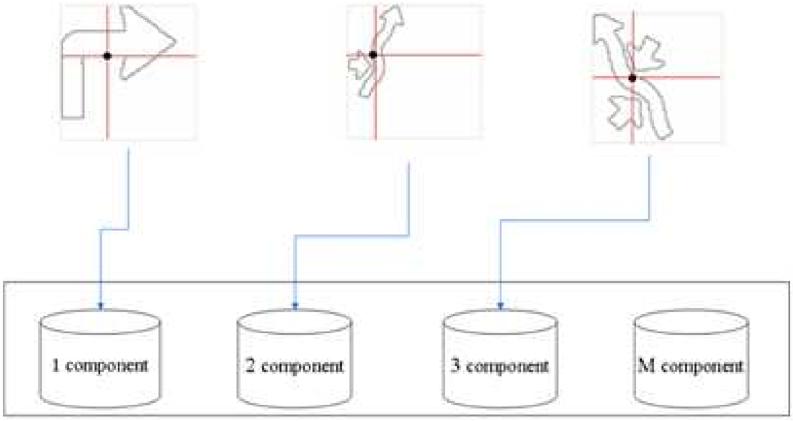

Fig 1.1. The last sentence of a figure caption should generally end without a period.

6. Formulas

Displayed equations or formulas are centered and set on a separate line (with an extra line or halfline space above and below). Displayed expressions should be numbered for reference. The numbers should be consecutive within each section or within the contribution, with numbers enclosed in parentheses and set on the right margin. For example, A correlation matrix $C^f_{M \times M}$ is computed using equation (5),

$$C^f_{ij} = \frac{d^k_f(\Sigma AB) - (\Sigma A)(\Sigma B)}{\sqrt{d^k_f(\Sigma A^2) - (\Sigma A)^2}\sqrt{d^k_f(\Sigma B^2) - (\Sigma B)^2}} \qquad (5)$$

Here, A and B are the feature vectors of query examples q_i and q_j and d^k_f is the dimension of feature f_k.

7. Program Code

Program listings or program commands or algorithms in the text are normally set in typewriter font, e.g., CMTT10 or Courier.
Example of an Algorithm is

Algorithm-1: Database Creation (Mean and Standard Deviation based approach)

```
Input: Static images of potential traffic sign
Output: Database created.
Methodology:
    For each input image do
    Step1: Preprocess the image as explained in section 4.3.1
    Step2: Calculate the number of components in a sign as explained in section 4.3.1.
    Step3: calculate a feature vector as mentioned in section 4.3.2.1.
    Step4: Store the feature vector computed in step 3 in the corresponding database,
           based on number of components present in the sign.       For End.
Algorithm End.
```

8. **Footnotes/ Header**
   Footnotes/Header should appear at the bottom of the normal text area, with a line of about 5 cm in Word set immediately below/above the text.

Header sample: (Project title is left aligned and page number is right aligned)

<<Project Title>> <<Page Number>>

Sample Footer:

<College Name> Department of MCA 2013-2014

9. The list of references is headed "References" and is assigned a number with square brackets in the decimal system of headings. The list should be set in small print and placed at the end of the dissertation, in front of the appendix, if any exists. Please do not insert a page break before the list of references if the page is not completely filled. An example is given at the end of this information sheet. For citations in the text please use square brackets and consecutive numbers: [1], [2], [3] etc.

10. Page Numbering
Reports must be printed with page numbers on the top right corner.

11. The total number of reports to be prepared are three

- One copy to the concerned guide
- One copy for University
- One copy to candidate
- Two CD's having soft copy of Project report (for department purpose)

12. Before taking the **final printout**, the approval of the concerned guide is mandatory and suggested corrections, if any, must be incorporated.

13. Every copy of the report must contain (See formats towards the end of this document)

- Outer title page (parrot green) with a plastic cover
- Inner title page (White)
- Certificate in the format enclosed, only certificate will be signed by following:
  - Principal

- HOD
- Internal guide and External guide (if project is carried out in company)
- Guide and/or Co-guide (if project is carried out in college)

14. The **organization of the report** should be as follows

- Inner title page
- Certificate
- Project Completion certificate from Company / College
- Declaration (by student)
- Acknowledgement
- Abstract
- Table of Contents
- List of table and figures
- Main body of project

Proper **attention** is **to be paid to the technical contents as well as to the organization of the report and clarity of the expression.** Care should be taken to avoid spelling and typing errors. The student should note that report (write-up) forms the important component in the overall evaluation of the project.

Sample content (more suitable for Application oriented projects) is attached and number of pages may be 40-70 which can be modified as per guide’s instructions depending on the project under development. The respective guides can decide how the content of the project report must be organized if the project is research oriented, as a specific format cannot be defined for various domains of research problems.

CONTENTS (For Application oriented Projects)

(COVER PAGE)

PROJECT TITLE

A Dissertation submitted in partial fulfillment of the requirements for the award of degree of

MASTER OF COMPUTER APPLICATIONS
of
Visvesvaraya Technological University

By

STUDENT NAME
(USN Number)

Under the Guidance of
GUIDE NAME

logo
Department of Master of Computer Applications, Institute Name, Address, Place, Pincode.
June 2013

(Inner Title Page)

PROJECT TITLE
A Dissertation submitted in partial fulfillment of the requirements for the award of degree of
MASTER OF COMPUTER APPLICATIONS
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By
STUDENT NAME
(USN Number)

Under the Guidance of

Internal Guide: **External Guide:**

Guide Name **Name**
Affiliation Affilation/ Address
Address Address
Email : *Email :*

logo
Department of Master of Computer Applications, Institute Name, Address, Place, Pincode.
June 2013

(Certificate)

INSTITUTE NAME

LOGO

Department of Master of Computer Applications, Institute Name
Address

CERTIFICATE

This is to Certify that **Student Name** *has completed his/her final semester project work entitled* **"******"** *as a partial fulfillment for the award of Master of Computer Applications degree, during the academic year 2013 under my (our joint) supervision.*

Signature of Internal Guide	**Signature of External Guide**
Guide Name	**Guide Name**
Affiliation	Affiliation
Address	Address

Head of the Dept./Director **Principal**

Declaration

I, <**Name of student**>, student of 6th MCA, <**College Name**>, bearing USN **<USN of student>** hereby declare that the project entitled <**Project Title**> has been carried out by me under the supervision of External Guide /(or Guide) **<Name of the Guide>**, <**Designation of Guide**> and Internal Guide (or Co-guide) <**Name of the Guide>,** <**Designation of Guide**> and submitted in partial fulfillment of the requirements for the award of the Degree of Master of Computer Applications by the **Visvesvaraya Technological University** during the academic year 2014. This report has not been submitted to any other Organization/University for any award of degree or certificate.

Name:

Signature:

External Examiner Project Dissertation Evaluation Form

Project Title:

Student Name With USN:

1. Relevance of the project with respect to real scenario: (External Examiner will have to write maximum of 5 lines for this) – **50 Marks**

2. Project Standard with respect to the post graduation / research / application oriented, to be explained by the external examiner – **50 Marks**

3. Final Testing and Results with technical conclusions – **25 Marks**

Total Marks:

Signature of the External Examiner

with Name and Date