University of Rajasthan
Jaipur

SYLLABUS

Master of Computer Applications (M.C.A.)

(Two Year Course)

(Semester Scheme)

I & II Semester Examination 2023-24

III & IV Semester Examination 2024-25

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Eligibility:

(a) MCA Semester I :

Passed BCA/Bachelor Degree in Computer Science/Engineering or equivalent Degree.

OR

Passed B.Sc./B.Com./B.A. with Mathematics at 10+2 Level or at Graduation Level (with additional Bridge Courses as per the norms of the concerned University).

Obtained at least 50% marks (45% marks in case of candidates belonging to reserved category) in the qualifying Examination.

(b) **Bridge Course [For students other than BCA/Bachelor Degree in Computer Science/Engineering or equivalent Degree] :** It is an additional and compulsory course for Non Computer Graduates. No Marks of Bridge Course will be added in calculation of CGPA and percentile. It is mandatory for the student to pass this Course in order to have basic knowledge of computer science and secure the degree.

(c) In addition to the above qualification, a candidate has to qualify the URATPG (University of Rajasthan Admission to Post-Graduate) Examination for admission to MCA Course I Semester.

Scheme of Examination:

MCA (Master of Computer Applications) Syllabus as per new scheme : credit based semester system (Four Semesters in two years) with Continuous Assessment (30% with non-inclusion in cumulative Grade point average(CGPA)).

Part-I (Course and Internal Assessment)

- To obtain a Professional Master's MCA Degree, a candidate is required to earn 120 credits in FOUR semesters (Two Years) , out of total 144 credit points (36 credits per semester), with grade E or higher. Each student has to earn minimum 30 credits per semester (i.e. 120 credits in four semesters for MCA degree) with grade E or higher.
- Each semester of MCA course shall have 36 credits. There will be three core papers, three elective papers (4 credits each), two core laboratory and one elective laboratory (4 credits each).
- To earn credits for a paper (Theory and Practical), a candidate shall be required to obtain grade E or higher (or equivalent marks percentage) in the theory/practical examination (EoSE)
- Core papers (Theory and Practical) are compulsory papers for the students of MCA.
- Each semester will have Continuous Assessment (CA). The continuous assessment (CA) consists of two parts, namely (i) Internal Assessment and (ii) Sessional Test(s) in the ratio 30:70. The Internal Assessment component comprises of assessment of student's performance on the basis of factors like Attendance, Class Room Participation, Quiz, Home Assignment etc.
- To earn the credits for a paper (Theory and Practical) a candidate has to qualify in the Continuous Assessment (internal) Exam along with EoSE of that paper separately.
- However, the grade point/marks obtained in the continuous assessment will not be included in Semester Grade Point Average (SGPA). In Continuous Assessment and End of Semester Examination (EoSE) separate grades will be awarded.
- The candidate will not be permitted to appear in EoSE of a particular credit (i) if he/she does not fulfill 75% of attendance requirement, or (ii) he/she fails to secure a Semester Grade Point Average (SGPA) of 1.5 in the continuous assessment.

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- A course is identified by a course code designated by a string of six alphanumeric characters and a course title. In a course code the first three characters of the string indicate the degree/course name in short and the later three alphanumeric characters designate a particular course. In the case of compulsory core course (CCC) the fourth character identifies the semester numeric digit and in case of the elective core courses (ECC) the fourth character indicates the cluster of specialization. For compulsory or elective theory core courses the fifth digit is '0', for laboratory core course it is '1' and for project/seminar course it is 2 and the sixth digit indicates number of the course in that category.
  - Compulsory Core Courses (CCC)
  - Elective Core Courses(ECC)

Part II (Examination Paper Scheme):

1. Each Theory paper (CCC & ECC) of EoSE shall carry 100 marks The EoSE will be of 3 hours duration.
   (i) Candidate has to attempt five questions in all. All questions carry equal marks.
   (ii) **Question No. 1 (Compulsory)** covering whole syllabus will consists of 10 short answer questions carrying 2 marks each, based on Knowledge, Understanding and Applications of the topics/ texts covered in the syllabus.
   (iii)**Question No. 2 to 5**, each of 20 marks, will be framed by taking one question from each unit (may have sub-parts) with internal choice within the unit.

2. Each **Practical paper** (CCC & ECC) shall be of 3 hours duration on one day and carry 100 marks for the practical examination. The practical examination will involve 3 exercises, each of 20 marks, practical record of 15 marks and viva-voce examination of 25 marks.

Abbreviations Used :

Course Category
CCC: Compulsory Core Course
ECC: Elective Core Course
OEC: Open Elective Course
SSC: Self Study Core Course
SEM: Seminar
PRJ: Project Work

Contact Hours
L: Lecture
T: Tutorial
P: Practical or Other
S: Self Study

Relative Weights
IA: Internal Assessment (Attendance/ Classroom Participation//Home Assignment etc.)
ST: Sessional Test
EoSE: End of Semester Examination

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MCA-First Semester 2020-21

S. No.	Subject Code	Subject Title	Course category	Credit	Contact Hours per Week			EoSE * Duration(Hrs)	
					L	T	P	Thy	P
1	MCA 101	Object Oriented Programming Through Java	CCC	4	3	1	0	3	0
2	MCA 102	Operating Systems	CCC	4	3	1	0	3	0
3	MCA 103	Database Management Systems	CCC	4	3	1	0	3	0
4	MCA 104	Computer Architecture	ECC	4	3	1	0	3	0
5	MCA 105	Web Application Development	ECC	4	3	1	0	3	0
6	MCA 106	Discrete Mathematics	ECC	4	3	1	0	3	0
7	MCA 111	Java Lab	CCC	4	0	0	6	0	3
8	MCA 112	DBMS Lab	CCC	4	0	0	6	0	3
9	MCA 113	Web Application Development Lab	ECC	4	0	0	6	0	3
		Total Credit		36					
Bridge Course [For students other than BCA/Bachelor Degree in Computer Science/Engineering or equivalent Degree] : It is an additional and compulsory course for Non Computer Graduates. No Marks of Bridge Course will be added in calculation of CGPA and percentile. It is mandatory for the student to pass this Course in order to have basic knowledge of computer science and secure the degree.									
1	MCA BC1	Computer Fundamentals	CCC	-	3	-	-	3	
2	MCA BC2	Programming Through C&C++	CCC	-	3	-	-	3	
3	MCA BC3	Office Automation & Programming Lab	CCC	-	-	-	6	-	3

*EoSE- End of Semester Examination

MCA-Second Semester 2020-21

S.No.	Subject Code	Subject Title	Course category	Credit	Contact Hours per Week			EoSE * Duration(Hrs)	
					L	T	P	Thy	P
1	MCA 201	Programming in Python	CCC	4	3	1	0	3	0
2	MCA 202	Advanced Java Programming	CCC	4	3	1	0	3	0
3	MCA 203	Data Communication and Computer Networks	CCC	4	3	1	0	3	0
4	MCA 204	Algorithms and Data Structures	ECC	4	3	1	0	3	0
5	MCA 205	Software Engineering	ECC	4	3	1	0	3	0
6	MCA 206	Data Warehousing & Data Mining	ECC	4	3	1	0	3	0
7	MCA 211	Python Lab	CCC	4	0	0	6	0	3
8	MCA 212	Advanced Java Lab	CCC	4	0	0	6	0	3
9	MCA 213	Data Structures Lab	ECC	4	0	0	6	0	3
			Total Credit	36					

*EoSE- End of Semester Examination .

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MCA-Third Semester 2021-22

S.No.	Subject Code	Subject Title	Course Category	Credit	Contact Hours per Week			EoSE * Duration(Hr	
					L	T	P	Thy	P
1	MCA 301	Cloud Computing	CCC	4	3	1	0	3	0
2	MCA 302	.NET Frame Work and ASP.NET	CCC	4	3	1	0	3	0
3	MCA 303	Mobile Application Development	CCC	4	3	1	0	3	0
4	MCA 304	Artificial Intelligence	ECC	4	3	1	0	3	0
5	MCA **	Elective - 1(Any One in Elective Group –1)	ECC	4	3	1	0	3	0
6	MCA ***	Elective - 2(Any One in Elective Group –2)	ECC	4	3	1	0	3	0
7	MCA 311	.NET Lab	CCC	4	0	0	6	0	3
8	MCA 312	Mobile Application Development Lab	CCC	4	0	0	6	0	3
9	MCA 313	Communication and Soft Skill Lab	ECC	4	0	0	6	0	3
			Total Credit	**36**					

***EoSE- End of Semester Examination.**

/*: Please see the List of Elective papers (Elective-1 and Elective-2 corresponding)

MCA-Fourth Semester 2021-22

S. No.	Subject Code	Subject Title	Course Category	Credit	Contact Hours per Week			EoSE* Duration (Hrs)	
					L	T	P	Thy	P
1	MCA 401	Analysis and Design of Algorithms	CCC	4	3	1	0	3	0
2	MCA **	Elective - 3(Any One in Elective Group –3)	ECC	4	3	1	0	3	0
3	MCA 411	ADA Lab	CCC	4	0	0	6	0	3
4	MCA ***	Elective - 4(Any One in Elective Group –4)	ECC	4	0	0	6	0	3
5	MCA 413	Industrial Project : Minimum Two Months in an Organization approved by the Director/Head of the Centre/Department	CCC	20	0	0	30	0	3
			Total Credit	36					

*EoSE- End of Semester Examination

/*: Please see the List of Elective papers (Elective-3 and Elective-4 corresponding)

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Elective Papers

Elective Course Code	Course Category	Subject Title	Prerequisite	Semester
Elective-1 (Any one)				
MCA A01	ECC	Big Data Analytics	-	III
MCA A02	ECC	E-Commerce	-	III
MCA A03	ECC	Computer Graphics	-	III
MCA A04	ECC	Computer Oriented Numerical Methods	-	III
Elective-2 (Any one)				
MCA B01	ECC	Theory of Computation	-	III
MCA B02	ECC	Soft Computing	-	III
MCA B03	ECC	Computer Based Optimization Techniques	-	III
MCA B04	ECC	Cryptography & Network Security	-	III
Elective-3 (Any one)				
MCA C01	ECC	Data Science with R	-	IV
MCA C02	ECC	Machine Learning	-	IV
MCA C03	ECC	Digital Marketing	-	IV
MCA C04	ECC	Open Source Operating System	-	IV
Elective-4 (Any one)				
MCA D01	ECC	Data Science with R Lab	-	IV
MCA D02	ECC	Machine Learning Lab	-	IV
MCA D03	ECC	Digital Marketing Lab	-	IV
MCA D04	ECC	Open Source Operating System Lab	-	IV

Note: Student have to take any one subject in Elective Group-3 and also have to take one elective lab of same subject from the Elective Group-4.

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Bridge Course Syllabus

MCA BC1 : Computer Fundamentals

Theory & Tutorial: 4 hours per week
Examination: Theory Paper – 3 hours; Max. Marks – 100, Passing Marks - 40
Note:

1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question(may have sub parts) from each unit. There will be an internal choice within the unit.

UNIT- I

Introduction to Computer: Characteristics of computers, Evolution of computer, generation of computers, classification of computers, applications of computers.

Input and Output Devices: Keyboard, pointing devices, speech recognition, digital camera, scanners, optical scanners(OMR,OCR,MICR). Output devices - printers, plotters, microfilm, monitors, audio output, projectors, and terminals.

Computer System: Central processing unit (CPU), Memory, instruction format, instruction set.

Primary and Secondary Memory: Memory hierarchy, Random access memory (RAM), types of RAM, Read only memory (ROM), types of ROM. Classification of secondary storage devices, magnetic tape, magnetic disk, optical disk.

UNIT- II

Number Systems: Introduction to number system, Decimal, Binary, Octal, Hexadecimal, conversion between number bases, Arithmetic operations on binary numbers, Codes-BCD, EBCDIC, ASCII and Unicode.

Computer Software: Software definition, relationship between software and hardware, software categories, system software, application software, utility software.

Computer Languages: Introduction, classification of programming languages, generations of programming languages, features of a good programming language, Translators/ Language processors.

UNIT- III

Operating System: Introduction of operating system, types of operating system, functions of an operating system, modern operating systems.

Data Communication and Computer Network: Introduction, data communication, transmission media, multiplexing, switching, Types of Network- LAN,MAN & WAN, network topologies, communication protocols, network devices.

Internet Basics: Introduction, evolution of Internet, basic Internet terms, getting connected to Internet, Internet applications, electronic mail and other Internet Services, searching the web (search engines), languages of Internet, viruses. Use of Anti-Virus software.

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UNIT-IV

Office Management Tools:

MS-Word: Creating and Editing documents, Page formatting, Finding and replacing text, Spell & Grammar checking, Indexing, Tables and feature there in, Inserting (Objects, picture, files etc.), Using Graphics, using Mail Merge.

MS Excel: Spreadsheet terminology, organization of the worksheet area, editing cells using commands and functions, formatting worksheet, creating & editing charts, naming range and using statistical, mathematical and financial functions, multiple worksheets and Macros.

MS Power Point: Anatomy of a power Point Presentation, Creating and Viewing a presentation, Managing Slide Shows, Using hyperlinks, advanced navigation with action setting and action buttons, organizing formats with Master Slides, adding graphics, multimedia and special effects, creating presentation for the web.

MS Access: Planning a database (tables, queries, forms, reports), Creating and editing database, customizing tables, linking tables, designing and using forms, modifying database structure, maintaining database, Sorting and Indexing database, Querying a database and generating Reports.

Recommended Text / Reference Books:

1. Computer Fundamentals by P.K. Sinha, BPB Publication.
2. Fundamental of Computers Anita Goel, PearsonEducation.
3. RajaramanV.–FundamentalofComputers,PrenticeHallofIndiaPvt.Ltd.
4. Computer Fundamentals and Programming in C,Reema Thareja,OXFORD University Press.
5. Introduction to Computer,Peter Norton's, Tata McGraw Hill Publication.
6. MS-Office , Dr. S.S. Shrivastava, Published by Laxmi Publication.
7. Office 2019:In Easy Steps,Michal Price ,BPB Publication.

MCA BC2: Programming Through C & C++

Theory & Tutorial: 4 hours per week
Examination: Theory Paper – 3 hours; Max. Marks – 100, Passing Marks - 40
Note:

1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question(may have sub parts) from each unit. There will be an internal choice within the unit.

UNIT- I

Computer Program: Introduction, developing a program, algorithm, flowchart, pseudo code.
Basics of C: C Character set, tokens, variables and constants, keywords, Type casting, Scope and lifetime of variables, data types. Operators, Instructions, comment statements, simple input and output.

Control and Looping Structures : decision control structure, loop control structure, switch-case control structure,
Arrays: Introduction, types of arrays and String Handling Functions.

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Unit-II

Functions : Functions, function prototype, subroutines, scope and lifetime of identifiers parameter passing mechanism, recursion.

User defined data types: typedef, enumerated data types, union, structure, array of structures, Pre-processors, header files and standard library functions.
Pointer: Definition and uses of pointer, pointer arithmetic, pointers and arrays, pointers and function.

Input/Output: Console Input and Output functions, data files, operations on data files, text and binary files.

Unit- III

Introduction to OOP: Essentials of OOP : Objects, Classes, Encapsulation, Data abstraction, Inheritance, Reusability, Polymorphism, Delegation, Message Communication.

Basics : Preprocessors, comments, Data types, Operators, Control and Loops Structures, Arrays and String handling, Modular programming with Functions, Structure and Unions.

Class and Object :Pointer and Run time binding, Dynamic memory allocation, Storage class, access specifiers, Class, Member functions, member data, Objects, Constructors, Destructors, Inline member functions, Friend Functions, Static member function, Arrays of objects, Pointers and their uses.

Inheritance: Definition, Types of inheritances, types of derivations and their implementations, container classes, member access control.

Unit-IV

Polymorphism: Functions Overloading, Operator Overloading, early binding polymorphism with pointers, Unary and Binary Operator Overloading, Overload Assignment Operator.

Virtual Function : Virtual Function, late binding, pure virtual functions, abstract classes, Generic Programming with Templates, Friend function, Overloaded Function Templates, Multiple Arguments function Template.

Exception handling: Exception handling mechanism- try, throw & Catch.

Recommended Text / Reference Books:

1. Balagurusamy E; Programming in ANSI C;Fifth Edn; Mc Graw Hill.
2. Kanetkar Y.; LET US C; X Edition, BPB.
3. Gottfried B; Programming with C: Schaum Qutlines; Mc Graw Hill Edition.
4. Deitel HM & Deitel JP; C/C++ How to program; 5th Edn; Pearson Pub.
5. Balagurusamy ; Object Oriented Programming in C++; 4th Edition TMH,2009.
6. Venugopal, Rajkumar; Mastering C++; Tata Mcgrow Hill, 2006.
7. Kanetkar Y.: LET US C++; BPB; 2009.

Practical Examination :

Each practical paper shall be of 3 hours duration on one day and carry 100 marks for the practical examination. The practical examination will involve 3 exercises, each of 20 marks, practical record of 15 marks and viva-voce examination of 25 marks.

MCA BC3: Office Automation and Programming Lab
Practical Lab
Examination: Practical Examination
Lab Exercise on Theory Paper MCA B01 and MCA B02

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Course Contents in Detail - MCA I Semester 2020 -21

Note :

1. Papers MCA 101, MCA 102, MCA 103, MCA 111 and MCA 112 are compulsory(CCC) and Papers MCA 104, MCA 105, MCA 106 and MCA 113 are elective(ECC).
2. Continuous assessment(Internal) will be done by the concerned teacher on the basis of test papers, regularity in the class and performance of the student. Maximum marks in continuous assessment of each paper is 100.

MCA 101 : Object Oriented Programming Through Java

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:

1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question(may have sub parts) from each unit. There will be an internal choice within the unit.

Unit-I

Introduction to OOP : Basic concepts of Object Oriented Programming , Objects and Classes, Data abstraction and Encapsulation, Inheritance, Polymorphism, Dynamic binding, Message communication: Benefits & applications of OOP.

Introduction to Java : History, Java features, Java Environment- JDK, API. Types of Java program, Creating and Executing a Java program; Java tokens: Keywords, Character set, Identifiers, Literals, Separator; Java Virtual Machine (JVM); Command Line Arguments; Comments in Java program.

Elements: Constants Variables, Data types, Scope of variables, Type casting. Operators-Arithmetic, Logical, Bit wise operator, Increment and Decrement, Relational, Assignment , Conditional ,Special operator, Expressions, Evaluation of expressions.

Unit-II

Decision Making and Branching: If statement and its types, switch statement; Decision making and looping -while loop, do While, for loop, break labeled loop, continue statement.

Arrays: One Dimensional Array, Multidimensional Array, Vectors, Wrapper classes; String Array, String Methods, String Buffer Class.

Class and Objects : Defining a class, Methods, Creating objects, Accessing class members, Constructors, Method overloading, Static members, Nesting of Methods, this keyword.

Inheritance : Define a subclass, deriving a sub class, Single Inheritance, Multilevel Inheritance, Hierarchical Inheritance, Overriding methods, Final variables and methods, final classes, Finalize methods, Abstract methods and classes, Visibility Control- Public access, Private access, friend, protected. **Interface**-Multiple Inheritance, Defining interface, Extending interface, Implementing Interface, Accessing interface variables.

Unit-III

Packages: Java API Packages-System Packages, Naming Conventions, Creating & Accessing a Packages, Finding Packages and CLASSPATH, Adding Class to a Packages, Hiding Classes.

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JAVA Streams : Data Flow with Java Streams, Input Streams, Output Streams.

Exception Handling: Advantages of Exception Handling, Types of Errors, Basics of Exception Handling, try blocks, throwing an exception, catching an exception, finally statement, declaring and throwing custom Exceptions.

Multithreading: Creating treads, life cycle of a thread, defining & running thread, thread methods, thread priority, synchronization, implementing run-able interface, thread scheduling.

Unit-IV

Collections : The Collection Framework, The Collection Classes, implementation of List, Set and Map interface, Accessing a Collection via an Iterator, object Ordering, The SortedSet and SortedMap Interface, Comparators.

GUI in Java : applet and it uses, Applet life cycle, Abstract window tool kit, Event Handlers, Event Listeners. AWT Controls and Event Handling- Labels, Text Component, ActionEvent, Buttons, CheckBoxes, ItemEvent, Choice, Scrollbars, Layout Managers, Input Events, Menus; Introduction to Swing

Networking: Java utility for networking, Manipulating URLs, reading a file on a Web server. Establishing simple Client Server.

Recommende Books:

1. Herbert Schildt, "Java: The Complete Reference", 11th Edition, McGraw-Hill, 2019.
2. E. Balagurusamy, "Programming with Java: A Primer", 6th Edition, Tata McGraw-Hill, 2019.
3. H.M.Deitel, P.J.Deitel, "Java: how to program", Fifth edition, Prentice Hall of India.
4. Cay Horstmann, Gary Cornell; Core Java Fundamentals – Volume I and II;; Pearson Education.
5. Khalid A. Mughal, Rolf W. Rasmussen; A Programmer's Guide to Java Certification (2nd Edn.).

MCA 102 : Operating Systems

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:

1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I

Basic Concepts : Necessity of an Operating System, Operating system structure, Evolution of Operating System (multiprogramming systems, batch systems, timesharing system, distributed systems and Real Time system), Operating system structure, Operating system components and services, system calls, system programs, Virtual machines.

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Unit-II

Process management: process concept, process scheduling, cooperating processes, Threads, Inter-process communication, CPU scheduling criteria, Scheduling algorithms, Multiple-processor scheduling, Real time scheduling and Algorithm evaluation.

Process Synchronization and Deadlocks: The Critical section problem, synchronization hardware semaphores, Classical problems of synchronization, Critical regions, Monitors, Deadlocks-System model, Characterization, Deadlock prevention, Avoidance and Detection, Recovery from deadlock, Combined approach to deadlock handling.

Unit-III

Storage management: Memory management- Logical and Physical Address Space, Swapping, Contiguous Allocation, Paging, Segmentation with paging, Virtual Memory, Demand paging and its performance, page replacement algorithms, Allocation of frames, Threshing, Page Size and other considerations, Demand segmentation, File systems, secondary storage Structure, File concept access methods, directory implementation, Efficiency and performance recovery.

Disk Structure and Scheduling : Disk structure, Disk scheduling methods, Disk management , Recovery Disk structure, disk structure, disk scheduling methods, disk management, Swap-Space management, Disk reliability.

Unit-IV

Protection and Security :Goals of Protection, Domain of protection, The Security problem, Program threats, Authentication, One Time passwords, program threats, System threats, Threat Monitoring, Encryptions. Computer Security techniques.

Case Study: Windows NT – Design principles, System components, Environments subsystems, File system, Networking and program interface.

Recommended Text / Reference Books:

1. Galvin P.B, Silberschatz; Operating System Principles; (Seventh Edition),J Wiley 2018
2. Tanenbaum A.S, Modern Operating Systems, 2nd Edn. PHI Publ,2006
3. William Stalling: Operating Systems, Internal & Design Principles, Sixth Edn; Pearson, 2009.
4. Gary Nutt: Operating Systems-A Modern Perspective (Second Edition) , Pearson Education, 2008.
5. D.M. Dhamdhere: Systems Programming and Operating Systems (Second Edition), Tata McGraw Hill Publishing company Limited.
6. Harvey M. Deitel, Operating Systems, Pearson Education.

MCA 103: Database Management System

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note: 1.

1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

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Unit-I

Overview of DBMS: Basic concepts, DBMS v/s File system, Database system architecture, Schemas, Instances, Components, Database users, Three-tier architecture, Client/Server architecture, Data independence, Database models.

Data modeling using the Entity Relationship Model :Data Modeling using ER Model, ER diagram, mapping constraints, Keys, Types of Keys, Generalization, aggregation, reduction of ER diagrams to tables, Integrity Rules, Dependency and its types, Data Dictionary, Normalization (1NF, 2 NF, 3NF, BCNF), inclusion dependencies, loss less join decompositions, Dr. E.F. Codd's Rules.

Unit-II

Transaction Management : Transactions: Concepts, ACID Properties, States Of Transaction, Serializaibility, Isolation, conflict & View Serializable Schedule, Checkpoints, Deadlock Handling.

Database Querying: Relational Algebra, Set Operations, Relational Calculus, Steps In Query Processing, Algorithms For Selection, Sorting And Join Operations, Understanding Cost Issues In Queries, Query Optimization, Transformation Of Relational Expressions, Query Evaluation Plans.

Unit-III

SQL and PL/SQL : Introduction to SQL: Characteristics of SQL, Advantages of SQL, SQL data types and literals, Types of SQL commands, SQL operators, Tables, views and indexes, Constraints, Group By and Having Clause, Order By Clause, Queries and sub queries, Functions-string, date, numeric, aggregate, Join, **PL/SQL** basics, blocks, architecture, variables, constants, attributes, character set, PL/SQL control structure, data types, conditional and sequential control statements, cursors, exceptions, triggers, functions, procedures and packages.

Unit-IV

Concurrency Control: Locks Based Protocols, Time Stamp Based Protocols, Validation Based Protocol, Multiple Granularity, Multi-version Schemes.

Recovery System & Security : Failure Classifications, Recovery & Atomicity, Log Base Recovery, Recovery with Concurrent Transactions, Shadow Paging, Failure with Loss of Non-Volatile Storage, Backup, Introduction to Security & Authorization.

Emerging Databases: Introduction to emerging Databases-OODBMS, ORDBMS, Distributed database, Multimedia database ,Special database-limitations of conventional databases, advantages of emerging databases.

Recommended Text / Reference Books:

1. Korth H F and Silberschataz A, System Concepts, Sixth Edition; McGraw Hill,2010
2. Leon, and Leon, SQL Tata McGraw Hill Pub. Co. Ltd.
3. Ivan Bayross; SQL/PL 4th Edn: BPB,2009
4. Navathe S.B. Elmasri R,; Fundamentals of Database Systems, Fifth Edition, Pearson 2011.
5. Ramakrishan and Gharke, Database Management Systems, 3rd Ed, Tata McGraw Hill, 2007.
6. Data C J Database Management Systems, 8th Edn,Pearson Education Asia.
7. Singh S.K.; Database Systems; I Edition; Pearson, 2006.
8. Thomas Connolly and Carolyn Begg, "Database Systems: A Practical Approach to Design, Implementation, and Management, Addison Wesley, 6th Edition, 2014.

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MCA-104: Computer Architecture

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:

1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I

Basic Building Blocks :Logic gates, basic combinational logic, Boolean functions & Expressions, multiplexer, decoders, encoders, comparators, adder and substructures, BCD to 7 segment decoder, sequential circuits, RS, JK, D and T flip flops, counter and shift register, Clock and Timing events.

Basic of Computer organization: System buses and instruction cycles, memory subsystem organization and interfacing, I/O subsystem organization and interfacing, Register transfer languages.

Unit-II

Instruction and Addressing : Addressing methods and machine program sequencing memory location addresses, encoding of information, instructions types, Instruction format and instructions sequencing addressing modes, paging, relative, indirect and indexed addressing.

CPU design: Specifying a CPU, design and implementation of a simple CPU (fetching instructions from memory decoding and executing instructions, establishing required data paths, design of ALU, Number representation, Arithmetic operations, floating point arithmetic. Design of the control unit and design verification),design and implementation of a simple micro-sequencer.

Unit-III

Memory Organization: Main memory concepts, Auxiliary memory, Associative memory, virtual memory & paging and cache memory organization.

Input and Output organization: Asynchronous data transfer, programmed I/O Interrupts (types, processing of interrupts implementing interrupts inside CPU) Direct memory access, I/O processors. serial communication.

Unit-IV

Vector and Array Processing: Shared-Memory, Multiprocessing, Distributed Multi Computing.

Microprocessor Concepts: Pin Diagram of 8085, Architecture of 8085, Addressing Mode of 8085, functional block diagram of 8085 assembly language, instruction set of 8085.

Recommended Text / Reference Books:

1. John D. Carpinelli: Computer Systems Organization & Architecture; 3rd Edition; Person Education Asia,2008
2. M, Morris Mano; Computer System Architectures; III Edition, Prentice Hall of India,2017
3. Malvino B ; Digital Computer Electronics III Edition; TMHL

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4. John P. Hayes, Computer Architecture and Organization, McGraw Hill, International Edition.
5. Vincent J P Heuring and Harry f Jordan: Computer Systems Design & Architecture , Addison Wesley, Person Education Asia.
6. David A. Patterson and John L. Hennessy, Computer Organization and Design: The Hardware/Software Interface, Fifth Edition, Morgan Kaufmann / Elsevier, 2014.
7. William Stallings, Computer Organization and Architecture – Designing for Performance, 8th Edition, Pearson Education, 2010.

MCA 105: Web Application Development

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:

1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I

Introduction to Web Concepts and WWW : Creating and Maintaining Web Sites; Planning, Navigation and Themes, Site types and Architecture, Elements of a Web page(Pages & Layout, Text, colour, Images, GUI Forms & GUI Features), steps of creating a site and Web site Planning.

Introduction of HTML and XHTML : introduction markup language, editing HTML & XHTML: Common tags, headers, text styles linking, images, formatting text, horizontal rules and more line breaks, ordered lists and unordered lists, basic HTML/XHTML tables: intermediate tables and formatting, forms, more complex forms, internal linking, creating and using image maps.

Unit-II

Java script: Introduction to scripting language, memory concepts, arithmetic decision making. Java script control structures, Java script functions, program modules in java script, functions, scope rules, recursion java script global functions.

Java script arrays: introduction, array declaring and allocating memory, passing arrays to functions, multiple subscripted arrays. java script objects-introduction, math, string, data, Boolean and number objects etc.

Unit-III

CSS: introduction – inline styles, creating style sheets with the style element, conflicting styles, linking external style sheets, positioning elements, backgrounds, element dimensions, text flow and the CSS box model, user style sheets, Filter and Transitions, HTML DOM, Browser BOM.

Event model : introduction, event ON CLICK, event ON LOAD – error handling with ON ERROR, tracking the mouse with event, more DHTML events.

Introduction to PHP &Web Server Architecture : Overview of PHP Capabilities, PHP HTML embedding tags & syntax, Simple script examples, PHP & HTTP Environment variables. PHP Language Core-Variables, Constants, Data Types, PHP: Operators, Flow Control & Loops,

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Unit-IV

PHP &Web Server Architecture : Arrays, String, Functions Include & require statements, Simple File & Directory Access Operations, Error handling, Processing HTML form using GET, POST, REQUEST, SESSION, COOKIE variables, Sending E-mail, Database Operations with PHP, Connecting to My-SQL (or any other database), Selecting a db, building & Sending Query, retrieving, updating & inserting data, CMS: Wordpress. Note: XAMMP is used for PHP. WordPress: Introduction & Installations.

Recommended Text / Reference Books:

1. Jennifer Robbins , "Learning Web Design: A Beginner's Guide to HTML, CSS, JavaScript, and Web graphics", O'reilly, 2018
2. Adrian W. West ," Practical Web Design for Absolute Beginners", 2016
3. Harvey M. Dietel, Paul Dietel& Tem R. Nieto, ", Internet& World Wide Web How to Program", Pearson, 2011
4. Ivan Bayross. "Web enabled commercial application development using HTML, DHTML, JavaScript, PERL-CGI", BPB Publications, 2010
5. Thomas A; Powel: Web Design ; C.R. : Second Edition TMH,2009.
6. Thomas A. Powel : HTML & XHTML : C.R. Fourth Edition; TMH, 2008
7. M.L. Young; Complete Reference b: Internet; 2nd Edition; Tata McGraw Hill, 2006
8. PHP and MySQL Web Development (Developer's Library) 5th Edition, Luke Welling Laura Thomson,2016
9. Mike McGrath, "PHP & MySQL in easy Steps", Tata McGraw Hill, 2012.

MCA 106: Discrete Mathematics

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:

1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I

Matrices : Introduction, Rank of Matrix, Solving System of Equations, Inverse of a Matrix, Set theory, Principle of inclusion and exclusion, partitions, Relations, Properties of relations, Matrices of relations, Closure operations on relations, Functions- injective, subjective and objective functions.

Unit-II

Permutation and Combination: Permutation, Combination with and without repetition.
Probability: Probability Classical, relative frequency and axiomatic definitions of probability, addition rule and conditional probability, multiplication rule, total probability, Bayes' Theorem and independence problems.

Unit-III

Proposition Calculus : Propositions and logical operators, Truth table, Propositions generated by a set, Equivalence and implication, Basic laws, Functionally complete set of connectives, Normal forms, Proofs in Propositional calculus, Predicate calculus.

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Graphs & Trees : Basic Concepts of Graphs, Sub graphs, Matrix Representation of Graphs: Adjacency Matrices, Incidence Matrices, Isomorphic Graphs, Paths and Circuits, Eulerian and Hamiltonian Graphs, Multigraphs, Planar Graphs, Euler's Formula, Spanning Trees.

Unit-IV

Recurrence Relation & Generating Function: Discrete numeric function, generating function, Recurrence relations, Homogeneous linear Recurrence relation with constant coefficients.

Finite State Machine : Finite state machines as models of physical systems, equivalent machine, finite state machine as language recognizes, finite state language of type-3 languages.

Recommended Books:

1. Kenneth H.Rosen, "Discrete Mathematics and Its Applications", Tata McGraw Hill, 7th Edition, 2017.
2. Seymour Lipschutz, Marc Laras Lipson, Varsha H. Patil, " Discrete Mathematics (Schaum's Outlines) (SIE)", Revised 3rd Edition, 2017
3. Murray Spiegel John Schiller, R. Alu Srinivasan, DebasreeGoswami, " Probability and Statistics", 3rd Edition, 2017
4. Salaria, R.S.: "Computer Oriented Numerical Methods", Khanna Book Publishing Co. (P.) Ltd., New Delhi. 5th Edition, 2012
5. C.L. Liu "Elements of Discrete Mathematics" ; 12th Edition, Tata McGraw Hill Pub. Comp. Ltd., 2000.
6. John Truss " Discrete Mathematics for Computer Scientists" – Pearson Education, Asia
7. Hopcroft John E. ET. AL., "Introduction to Automata Theory, Languages and Computation", Pearson Education; 3rd edition, 2011.

Practical Examination :

Each practical paper shall be of 3 hours duration on one day and carry 100 marks for the practical examination. The practical examination will involve 3 exercises, each of 20 marks, practical record of 15 marks and viva-voce examination of 25 marks.

MCA 111: Java Lab
Practical Lab
Examination : Practical Examination
Lab Exercise on Theory Paper MCA 101

List of experiments:

1. Simple java applications for understanding references to an instant of a class
2. Handling Arrays in JAVA
3. Handling strings in JAVA
4. Implementation polymorphism
5. Package creation
6. Developing user defined packages in java
7. Use of Inheritances
8. Use of Interfaces
9. Threads, Multithreading
10. Collection handling
11. GUI/Swings applications
12. I/O Stream handling
13. Exception Handling

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MCA 112: DBMS Lab
Practical Lab
Examination : Practical Examination
Lab Exercise on Theory Paper MCA 103

List of experiments:

1. SQL data types, Operators, Literals, Constraints
2. Assignment on Queries: Select / From / Where/ Group By/Having Clause/ Order By Clause/ SQL Operators/ Joins/ Built-in Functions
3. PL/SQL Block Structure
4. Conditional Statements
5. Iterations: Simple Loops, For Loop, While Loop, Nested Loops
6. Exception Handling
7. Database Programming with Record Variables
8. Database Programming with Cursors, Cursor-For Loop
9. Procedures & Functions
10. Triggers
11. Packages

MCA 113: Web Application Development Lab
Practical Lab
Examination : Practical Examination
Lab Exercise on Theory Paper MCA 105

List of experiments:

HTML:

- Basics Elements & Attributes, HTML Formatting tags, Links,
- Images, Tables, Forms Elements
- HTML5 Audio and Video, HTML5 Input Types & Attributes
- CSS Syntax, CSS Attribute Selectors
- CSS properties: Fonts, Background, Colors, Links, Lists,
- CSS Box Model, Display, Opacity, Float, Clear
- CSS Layout, CSS Navigation Bar,
- CSS Rounded Corners, CSS Border Images, CSS Animations

JavaScript:

- Displaying Output, DeclaringVariables, Operators, Arithmetic, Data Types,Assignment,
- JavaScript Functions, Booleans, Comparisons, Conditional ,
- JavaScript Switch, Loops, Break, Type,
- JavaScript Objects, Scope,
- Strings and String Methods
- Numbers and Number Methods, Math, JavaScript Dates: Formats and Methods
- JavaScript Events, JavaScript, JavaScript Forms (API and Validation), Objects,
- JavaScript Functions, JavaScript DOM, JavaScript Validation, Browser BOM

PHP:

- Installing XAMMP
- Variables, Data Types, Constants, Operators, Programming Loops,
- PHP Functions,
- Arrays
- Strings Functions
- PHP Form Handling, Require & Include
- PHP with MySQL

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Syllabus of MCA II Semester: 2020-21

Note :

1. Papers MCA 201, MCA 202, MCA 203, MCA 211 and MCA 212 are compulsory(CCC) and Papers MCA 204, MCA 205, MCA 206 and MCA 213 are elective(ECC).
2. Continuous assessment(Internal) will be done by the concerned teacher on the basis of test papers, regularity in the class and performance of the student. Maximum marks in continuous assessment of each paper is 100.

MCA-201: Programming in Python

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:

1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I

Introduction: Installing Python; basic syntax, interactive shell, editing, saving, and running a script. data types; variables, assignments; immutable variables; numerical types; arithmetic operators and expressions; comments in the program; understanding error messages; Conditions, boolean logic, logical operators; ranges; Control statements: if-else, loops (for, while); short-circuit (lazy) evaluation.

Unit-II

String manipulation: subscript operator, indexing, slicing a string; strings and number system: converting strings to numbers and vice versa.
Regular Expression : Regular Expression: Introduction/Motivation, Special Symbols and Characters for REs, REs and Python.
Lists, tuples, and dictionaries: basic list operators, replacing, inserting, removing an element; searching and sorting lists; dictionary literals, adding and removing keys, accessing and replacing values; traversing dictionaries.
Design with functions: complexity; arguments and return values; formal vs actual arguments, named arguments. Program structure and design. Recursive functions.

Unit-III

Text files : manipulating files and directories, os and sys modules; text files: reading/writing text and numbers from/to a file; creating and reading a formatted file (csv or tab-separated).

Classes and OOP: classes, objects, attributes and methods; defining classes; design with classes, data modeling; persistent storage of objects, inheritance, polymorphism, operator overloading (_eq_, _str_, etc); abstract classes;

Excetipton Handling : Exceptions in Python, Detecting and Handling Exceptions, Exceptions as Strings, Raising Exceptions, Assertions, Standard Exceptions.

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Unit-IV

Multithreading : Understanding threads, Forking threads, synchronizing the threads, Programming using multithreading.

Graphical user interfaces : event-driven programming paradigm; tkinter module, creating simple GUI; buttons, labels, entry fields, dialogs; widget attributes - sizes, fonts, colors layouts, nested frames

Database Interaction : MySQL Database Connection using Python, Creating and Searching Tables, Reading and storing config information on database, Programming using database connections Python

Recommended Books:

1. R. Nageswara Rao, "Core Python Programming", Dreamtech Press, 2nd Edition, 2018
2. Dr. M. Suresh Anand, Dr. R. Jothikumar, Dr. N. Vadivelan, "Python Programming" , Notion Press, 1stEdition, 2020
3. Martin C. Brown, "The Complete Reference Python", McGraw Hill Education, 4thEdition, 2018
4. Allen B. Downey, "Think Python", O'Reilly Media, 2016
5. Amit Ashok Kamthane, Ashok NamdevKamthane, " Programming and Problem Solving with Python" , McGraw Hill HED, 1st Edition, 2017
6. SakisKasampalis, Quan Nguyen, Dr Gabriele Lanaro, Ingram, "Advanced Python Programming", short title, 2019

MCA 202: Advanced Java Programming

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:

1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I

J2EE Overview : Need of J2EE, J2EE Architecture, J2EE APIs, J2EE Containers. Web Application Basics, Architecture and Challenges of Web Application, Servlet Life Cycle, Developing and Deploying Servlets, Exploring Deployment Descriptor (web.xml), Handling Request and Response, Initializing a Servlet. Servlet Chaining, Session Tracking and Management .

Unit-II

Java Server Pages : Basic JSP Architecture, Life Cycle of JSP, JSP Tags & Expressions, JSP Implicit Objects, JSP Directives, Tag Libraries ,Using JDBC with JSP , Accessing a Database, Adding a Form, Updating the Database.

Ajax and jQuery: Introduction to Ajax, Cross-Browser DOM, Advantages and Disadvantages, Ajax the jQuery way: using load, post, get functions, jQuery: jQuery Basics, Selecting Element with jQuery, Managing Events, Hiding and Showing Elements, Toggling visibility using jQuery.

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Unit-III

JDBC: The JDBC Connectivity Model, Types of JDBC Drivers., Basic steps to JDBC, setting up a connection to database, Creating and executing SQL statements, ResultSet and ResultSet Metadata Object,Accessing Database.

Unit-IV

Introduction to Spring : Overview of Spring Framework- Inversion of Control / Dependency Injection Concepts, Aspect Oriented Programming - concept ,Spring MVC Architecture , Bean Factory and Application Context, Attaching and Populating beans, Injecting data through setters and constructors , Listening on events, Publishing events, Spring MVC Layering, Dispatcher Servlet, Writing a Controller, DAO, Models, Services, Spring Configuration File, Error handling Strategy.

Recommended Books:

1. Herbert Schildt, "Java: The Complete Reference", 10th Edition, McGraw-Hill, 2017.
2. Marty Hall and Larry Brown, "Core Servlets and Java Server Pages", 2nd Edition, 2003.
3. MertCaliskan, Kenan Sevindik, Rod Johnson, Jurgen Holler, "Beginning Spring", Wrox publication, Feb 2015.
4. E. Balagurusamy, "Programming with Java: A Primer", Tata McGraw-Hill, 2019.
5. Bryan Basham, Kathy Sierra & Bert Bates, "Head First Servlets and JSP" Paperback – 2011
6. Bruce Eckel, "Thinking in Java", 4th Edition, Prentice Hall, 2006.
7. Cay S. Horstmann, "Core Java, Volume I: Fundamentals", 9th Edition, Pearson Education, 2014.
8. Santosh Kumar K, "JDBC, Servlet, and JSP: Black Book", Kogent Solutions Inc., 2008.
9. Madhusudhan Konda, "Just Spring", 1st edition, O'Reilly, 2011.

MCA 203: Data Communication and Computer Networks

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:

1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I

Overview of Data Communication and Networks: Need of Networking, Basic concept –Computer communication methods, Data Transmission modes, Signals, Modulation – Principles of Modulation, AM and FM Modulator Circuits, pulse Code Modulation, signaling and decoding Digital Band-pass Modulation, Demodulation – detection, signals and Noise, Detection of Binary Signal in Gaussian Noise, Demodulation of shaped Pulses, Digital Band Pass demodulation.

Network Models : Internet model, OSI seven layer network model, Functions of OSI layers, LAN technologies – protocols and standards, LAN hardware, TCP/IP (Protocols, architecture, layers, services).

Unit-II

Data transmission: Data Communication Systems, DTE-DCE Interface, Modems, Transmission media (Guided & Unguided), Multiplexing – FDM, WDM, TDM, Digital Subscriber Line, Error detection and correction; Microwave-Electromagnetic spectrum, Characteristics, use of MIW in communications; Satellite- Artificial Satellite, Geosynchronous Satellites, Orbital classification, Multiple accessing.

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Optical fiber communication : Basic concept of light propagation, Fiber Cables, Light sources, Optical Detectors, Fiber cable losses, wave division multiplexing, fiber distributed data interface, the fiber channel

Unit-III

Internet: Internet Architecture, Internet protocol and datagram, Routing protocols, UDP, Internet standard services, DNS.

Networking Technology: ISDN (Services, Channels, Layers, Broadband ISDN), Cable Modem System, SMDS, Frame relay, fast Ethernet, 100VG-any LAN and Gigabit Ethernet, FDDI and CDDI, Asynchronous Transfer, ATM (Architecture, layers, classes, services).

Unit-IV

Network Performance, Analytical approaches, simulation, traffic monitoring, Network Management-SNMP, RMON and RMNv2, TMN, Directory services and network management.
Issue related to network reliability and security, SSL and VPN, Introduction only to firewalls and Kerberos, Cyber Laws.

Recommended Text / Reference Books:

1. Andrew S.Tanenbaum, "Computer Networks", Prentice Hall, 5th Edition, January, 2013.
2. A. BehrouzForouzan, "Data Comm. & Netw.5e Global Ed (English)" , McGraw Hill Education(India) Private Limited, 5thEdition, 2013.
3. William Stallings, "Cryptography and Network Security: Principles and Practice", Pearson Education, 5thEdition, 2011.
4. Andrew S.Tanenbaum, "Computer Networks ", Prentice Hall, 5thEdition (Paperback) January 2013
5. Douglas E.Comer& M. S. Narayana, "Computer Networks and Internets with Internet Applications", Pearson Education, 4th Edition, 2009.
6. Fred Halsall, "Data Communications, Computer Networks and Open Systems", Addison Wesley, 4th Edition, 2001.
7. M.A. Miller, Data and Netowork Communications, Thomosn Kearning
8. Gilbert Held, Understanding Data Communication, Techmedia.
9. Fred Harshal, Data Communications Communications, Networks, Pearson Education Asia.

MCA 204 : Algorithms and Data Structures

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:

1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I

Introduction : Algorithms, pseudo code, efficiency of algorithms, analyzing algorithms and problems, complexity measures, basic time analysis of an algorithm, space & time complexity. Data abstraction and basic data structures, data types and abstract data types.

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Basic data structures – Arrays, Stack, Queues and their applications, dequeue and priority queues. linked and sequential representation of arrays, stacks & queue. Polish notations, Arithmetic expressions

Unit-II

Linked lists : Representation of linked list in memory. insertion, deletion, traversal and searching of linked list, Circular linked list, Doubly linked list.
Trees: Basic concepts, linked representation, representation in continuous memory. Binary and N-ary trees, Searching, insertion and deletion in binary search tree, traversing algorithms using stacks, header nodes threads.

Unit-III

Graphs : Graphs and their representations, sequential representation- Adjacent matrix, incidence matrix, linked representation of graphs, operations on graph, traversing a graph. DFS and BFS algorithms.
Heap : Heap structures, heap sort algorithm.

Unit-IV

Sorting and Searching: Use various data structures for searching and sorting, Internal and external sorting techniques, linear and binary search, Hash tables & Hashed searching, Bubble sort, Insertion sort, Selection sort, Merge sort, Radix sort, quick sort.

Recommended reference books :

1. S. Lipschutz: Data Structures; Mc Graw Hill International Edition,2008.
2. E. Horowitz &Sahni, "Fundamental Data Structure", Galgotia Book Source, 2007
3. A.V. Aho, J.E. Hopcroft, and J.D. Ullman, Data Structures and Algorithms, 3rd Edition; Pearson Education Asia,2008
4. Salaria R.S.: Data Structure and Algorithms Using C/C++; 4th Edition; Khanna.
5. Jean-Paul Tremblay and Paul G. Sorenson, An Introduction to Data structures with applications TMH Publishing Co.Ltd.
6. A. Michael Berman: Data Structures via C++ Oxford University Press.
7. Jean-Paul Tremblay and Paul G. Sorenson, An Introduction to Data Structures with application, TMH Publishing Co. Ltd.
8. A. Tannenbaum, "Data Structure Using C", Pearson Education, 2019.

MCA 205 : Software Engineering

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:

1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I

Introduction to System, Software and Software Engineering : Systems concepts and definitions: System's theory, Definition of System, System Characteristics/ features, System Components.
The Evolving Role of Software, Software: A Crisis on the Horizon and Software Myths, Software Engineering: A Layered Technology, Software Process Models, The Linear Sequential Model, The Prototyping Model, Spiral model,The RAD Model, Evolutionary Process Models, Component-Based

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Development, Process, Product and Process, SDLC Agility and Agile Process model, Extreme Programming, Other process models of Agile Development and Tools.

Unit-II

Software Project Requirement Analysis and Specification : Software Metrics (Process, Product and Project Metrics), Software Project Estimations, Software Project Planning (MS Project Tool), Project Scheduling & Tracking, Basic idea of behavioral modeling in UML. State diagrams, Interaction diagrams, Use case diagrams, Understanding the Requirement, Requirement Modeling, Requirement Specification (SRS), Requirement Analysis and Requirement Elicitation, Requirement Engineering.

Project Planning & Scheduling : Size Estimation, Cost Estimation, Models, Static, single variable models, Static, Multivariable Models, COCOMO, The Putnam Resource Allocation Model, Risk Identification and Projection: RMMM, Project scheduling and Tracking. Object- oriented concepts and principles. software risks, Risk identification, Risk projection, risk refinement, risk mitigation, monitoring and management, the RMMM plan

Unit-III

Software Design & Quality Management : Design Concepts and Design Principal, Design Documentation, Design Tools- ER Diagram, DFD, Decision Tree, Decision Table, Dictionary, Design Methods: Data Design, Architectural Design, Interface Design, Component Level Design (Function Oriented Design, Object Oriented Design) (MS Visio Tool),User Interface Design, Web Application Design, Advanced structured modeling in UML

Quality Planning: Quality Concepts, Procedural Approach to Quality Management, Software Quality assurances, software reviews, formal technical reviews, Formal approaches to SQA, Statistical Software Quality assurances, Change Management: software Configuration Management, The SCM repository, SCM Process, Configuration Management for Web Engineering.

Unit-IV

Software Testing : Fundamentals, White Box Testing, Black Box Testing, software testing strategies, verification and Validation, System Testing, Unit testing, Integration testing and Debugging.

Software Maintenance and Configuration Management: Types of Software Maintenance, Re-Engineering, Reverse Engineering, Forward Engineering, The SCM Process, Identification of Objects in the Software Configuration, Risk-Related Monitoring. Emerging Trends in software Engineering.

Emerging technologies- Introduction to Security engineering, Service- Oriented s/w engineering, Aspect-Oriented s/w engineering and S/W Reengineering. CMM level-5(concept and advantages).

Reference /Text Books

1. Pressman, Roger (2001) Software Engineering; A Practitioner's Approach, 8th ed. M Graw-Hill,2014.
2. Sommerville Lan; Software Engineering, 9th Ed. Pearson Education,2014
3. Jalote, Pankaj (1997) An integrated Approach to Software Engineering 2nd Ed.
4. James Rumbaugh. MichealBlaha, "Object oriented Modeling and Design with UML", 2nd Edition, 2007.
5. Simon Bennett, Steve McRobb and Ray Farmer, " Object-Oriented Systems Analysis and Design Using UML" 4th Edition,McGraw Hill Education, 2010
6. Charles Ritcher, "Designing Flexible Object Oriented systems with UML", Tech Media, 2008.
7. Grady Booch, James Rumbaugh, IvarJacobson., "The Unified Modeling Language User Guide", 2nd Edition, Pearson, 2007.

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MCA 206 : Data Warehousing & Data Mining

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:

1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I

Introduction to Data Warehousing : Introduction, Data Warehouse importance and functions, Multidimensional Data Model, Data Matting and it's usage, Cost of data marting, Metadata, Data warehouse Architecture, Building a Data warehouse, Implementation, Further Development, Planning and Project Management of Data Warehouse.

Unit-II

Data Mining : Data Warehousing to Data Mining, Evolution Analysis, Classification of Data Mining Systems, Architecture of data mining system, Major Issues in Data Mining. Data preprocessing : Needs preprocessing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction, Deserialization and Concept Hierarchy Generation; Analysis of Attributes Relevance. Discriminating between Different Classes. Data Warehouse and OLAP Technology for Data Mining.

Unit-III

Association Rules : Association Rule Mining, Single- Dimensional Boolean Association Rules from Transactional Databases. Apriori algorithm, Use of sampling for frequent item-set, FP tree algorithm, Multi-Level Association Rules from Transaction Databases. Issues regarding classification & prediction. Different Classification Methods- Decision Tree, Bayes Classification, Rule based, Classification by Back-Propagation, Prediction.

Unit-IV

Clustering and Applications of Data Mining : Cluster Analysis, Types of Data Categorization of Major Clustering Methods, Kmeans, Partitioning Methods, Hierarchical Methods, Density Based Methods, Grid Based Methods, Model-Based Clustering Methods, Clustering High Dimensional Data, Constraint Based Cluster Analysis, Outlier Analysis, Data Mining Applications.

Future Trends : Multidimensional Analysis and Descriptive Mining of Complex Data Objects, Active learning, Reinforcement learning, Text mining, Graphical models, Web Mining , Basics of Data Mining Tools. Spatial Databases, Multimedia Databases, Time Series and Sequence Data, Text Databases, Web Mining, Spatial mining, Temporal Mining, Applications and Trends in Data Mining.

Recommended Books :

1. Data Warehousing in the Real World – SAM ANAHORY & Dennis MURRAY. Peasrson Edn Asia.
2. Data Mining – Concepts and Techniques- JIA WEI HAN & MICHELINE KAMBER Hareourt India.
3. Data Warehousing ; Reema Thareja; Oxford
4. Data Mining Introductory and advanced topics MARGARET H DUNHAM PEARSON EDUCATION.

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5. Data Warehousing in Real World Anahory, Pearson Education.
6. Data Mining Techniques- ARUN K PUJARI, University Press.
7. Bulding the Data Warehouse- W. H. Inmon, 3rd Edition, Wiley, 2003.
8. Data Warehousing Fundamentals- PAULRAJ PONNAIAH WILLEY STUDENT EDN.

Practical Examination :

Each practical paper shall be of 3 hours duration on one day and carry 100 marks for the practical examination. The practical examination will involve 3 exercises, each of 20 marks, practical record of 15 marks and viva-voce examination of 25 marks.

MCA 211: Python Lab

Practical Lab
Examination: Practical Examination-
Exercises based on the Theory paper MCA 201.

List of Experiments:

1. Implement a sequential search
2. Create a calculator program
3. Explore String Functions
4. Implement Selection Sort
5. Implement Stack
6. Read and Write into a file
7. Demonstrate usage of basic regular expression
8. Demonstrate use of advanced regular expressions for data validation
9. Demonstrate use of List
10. Demonstrate use of Dictionaries
11. Create Comma separate files(CSV), Load CSV files into internal data structure
12. Write script to work like a SQL SELECT statement for internal data structure

MCA 212: Advanced Java Lab
Practical Lab :
Examination: Practical Examination-
Exercises based on the Theory paper MCA 202.

List of Experiments:

1. Dynamic HTML using Servlet
2. Use of get() and Post() methods
3. Cookies in Servlet
4. Session tracking and Management
5. JDBC
6. JSP Actions elements
7. Directives elements in JSP
8. JSP Tags
9. Implement JDBC with JSP
10. Implement JDBC with Servlet
11. Applications using Spring Web MVC

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MCA 213: Data Structures Lab
Practical Lab
Examination: Practical Examination-
Exercises based on the Theory paper MCA 204

List of Experiments:

1. Array implementation of Stack and Queue
2. Linked list implementation of List, Stack Queue
3. Array implementation of QUEUE
4. Applications of List, Stack and Queue ADTs
5. Implementation of Binary Trees and operations of Binary Trees
6. Implementation of Binary Search Trees
7. Implementation of AVL Trees
8. Implementation of Heaps using Priority Queues.
9. Graph representation and Traversal algorithms
10. Applications of Graphs
11. Implementation of searching and sorting algorithms

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Note :

1. Papers MCA 301, MCA 302, MCA 303, MCA 311 and MCA 312 are compulsory(CCC) and Papers MCA 304, MCA 305, MCA 306 and MCA 313 are elective(ECC).
2. Continuous assessment(Internal) will be done by the concerned teacher on the basis of test papers, regularity in the class and performance of the student. Maximum marks in continuous assessment of each paper is 100.

MCA-301 : Cloud Computing

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:

1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I

Introduction of Cloud Computing: Nutshell of cloud computing, Enabling Technology, Vision, feature Characteristics and components of Cloud Computing. Challenges, Risks and Approaches of Migration into Cloud. , Layer and Types of Clouds, Services models, Cloud Reference Model.

Unit-II

Cloud Computing Architecture: Data center Design and interconnection Network, Architectural design of Compute and Storage Clouds. Cloud Programming and Software: Features of cloud programming, Parallel and distributed programming paradigms-MapReduce, Hadoop , High level Language for Cloud. Service Oriented Architecture – REST and Systems of Systems – Web Services – Publish Subscribe Model

Unit-III

Virtualization Technology: Definition, Understanding and Benefits of Virtualization. Implementation Level of Virtualization, Virtualization Structure/Tools and Mechanisms, Hypervisor VMware, KVM, Xen. Virtualization: of CPU, Memory, I/O Devices, Virtual Cluster and Resources Management, Virtualization of Server , Desktop, Network, and Virtualization of data-center.

Unit-IV

Securing the Cloud: Cloud Information security fundamentals, Cloud security services, Design principles, Policy Implementation, Cloud Computing Security Challenges, Cloud Computing Security Architecture. Legal issues in cloud Computing. Data Security in Cloud: Risk Mitigation , Understanding and Identification of Threats in Cloud, SLA-Service Level Agreements, Trust Management

Cloud Platforms in Industry: Amazon web services, Google AppEngine, Microsoft Azure Design, Aneka: Cloud Application Platform -Integration of Private and Public Clouds Cloud applications:

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Protein structure prediction, Data Analysis, Satellite Image Processing, CRM and ERP, Social networking. Cloud Application- Scientific Application, Business Application.

Recommended Text / Reference Books:

1. Cloud Computing ,Principle and Paradigms, Edited By RajkumarBuyya, JemesBroberg, A. Goscinski, Pub.- Wiley-2016
2. Kumar Saurabh, "Cloud Computing" , Wiley Pub 2016
3. Distributed and Cloud Computing, Kai Hawang , GeofreyC.Fox, Jack J. Dongarra Pub: Elservier, 2013
4. Krutz , Vines, "Cloud Security " , Wiley Pub,2010
5. Velte, "Cloud Computing- A Practical Approach" ,TMH Pub,2009
6. Katarina Stanoevska-Slabeva, Thomas Wozniak, SantiRistol, "Grid and Cloud Computing – A Business Perspective on Technology and Applications", Springer,2010

MCA-302 : .NET Frame Work and ASP.NET

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:

1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I

Introduction to .Net framework: Advantages and Components of .NET Framework, Features of .NET Framework, Managed Code and the CLR, Intermediate Language, Metadata and JIT Compilation, Automatic Memory Management.

Language Concepts and the CLR: Visual Studies .Net, Using the .Net Framework,
The Framework Class Library: .Net objects- ASP.NET, .NET web services, Windows Forms.
Elements, Data types, Control and Looping structures.

Unit-II

Windows Programming: Creating windows forms, windows controls, Mouse Events, Menus and Dialog Boxes.

Working with Data Controls : Basics of ADO.NET, Architecture of ADO.NET, ADO.NET providers, Connection, Command, Data Adapter, Dataset, Connecting to Data Source, Accessing Data with Data set and Data reader, Create an ADO.NET application, Using Stored Procedures.

Unit-III

ASP.NET Framework : Client and server architecture, All standard Controls, Validation Controls. Rich Web Controls, Creating and Implementing User and Custom Controls, Designing Website wwith Master Pages.

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ASP.NET Configuration : Session and Application Management, of States and Structure; Change the Home Directory in IIS, Caching, Security-Authentication and Authorization,Localization and Globalization, Exception handling using AJAX Control toolkit.

Creating Web Controls: Web Controls, HTML Controls, Using Internist Control, Using Input Validation Controls, Selecting Controls for Applications, Data Controls and Adding web controls to a page. Creating Web Forms: Server Controls, Types of Server Controls, Adding ASP.NET Code to a page.

Unit-IV

Overview of XML : XML Serialization in the .NET Framework-SOAP Fundamental-Using SOAP with the .NET Framework.

Web Services and WCF : Web Services protocol and standards – WSDL Documents-Overview of UDDI – Calling a Web Service from a Browser-Calling a Web Service by Using a proxy – Creating a simple web service – Creating and Calling a Web Service by Using Visual Studio.NET Architecture of WCF, WCF Client.

Recommended Books :

1. Mathew Mac Donald: Beginning ASP.NET 4.0 in C# 2010, 3rd Edition, A Pres.
2. Bill Evjen Scott Hanselman, Devin Rader: Professional ASP.NET4, 2010, Willey.
3. George Shepherd: Microsoft ASP.NET Step by step, 2010 Microsoft Press.
4. Imar Spaanjaars: Beginning ASP.NET 4: in C# and VB (Wrox Programming to Programmer) , 2010 Wiely Publishing.
5. Steven Holzner; ASP.NET 4.0 (Cover C# & VB) Black Book; Dreamtech Press.
6. Steven Holzner; .NET Programming Black Book; Dreamtech Press.

MCA-303 : Mobile Application Development

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:

1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I

INTRODUCTION: Introduction to mobile applications – Market and business drivers for mobile applications – Difficulties in Mobile Development- Mobile Myths- When to Create an App– Types of Mobile App. Design Constraints for mobile applications both HW and SW related, Architecting mobile applications, user interfaces for mobile applications, touch events and gestures.

Unit-II

ADVANCED DESIGN: Designing applications with multimedia and web access capabilities Integration with GPS and social media networking applications – Accessing applications hosted in a cloud computing environment – Design patterns for mobile applications – Understanding Application users, Information Design, Achieving quality constraints-Performance, Usability, Security, Availability and modifiability.

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Unit-III

TECHNOLOGY I ANDROID: Establishing the development environment Android architecture Android Application Structure, Emulator- Android virtual device, UI design, Fragments, Activity, Services, broadcast receiver, Intents/Filters, Content provider-SQLite Programming, SQLITE open, Helper, SQlite Database, Interaction with server side application

Unit-IV

Advanced Android: Using Google Maps, GPS and Wi-Fi Integration, Android Notification, Audio Manager, Bluetooth, Camera and Sensor Integration, Sending SMS, Phone Calls, Publishing Android Application.

Recommended Text / Reference Books:

1. Jeff McWherter and Scott Gowell, "Professional Mobile Application Development", Wrox, 2012
2. Charlie Collins, Michael Galpin and Matthias Kappler, "Android in Practice", DreamTech, 2012
3. David Mark, Jack Nutting, Jeff LaMarche and Frederic Olsson, "Beginning iOS 6 Development: Exploring the iOS SDK", Apress, 2013.
4. James Dovey and Ash Furrow, "Beginning Objective C", Apress, 2012
5. Paul Deitel, Harvey Deitel, Abbey Deitel and Michel Morgano, "Android for Programmers an App-Driven Approach", Pearson, 2012
6. Neil Smyth "Android studio 2.2 Development Essentials 7th Edition" Payload Media 2017
7. Jerome Dimarzio "Beginning Android Programming with Android Studio" Wiley Publication

MCA-304 : Artificial Intelligence

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:

1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I

General Issues and overview of AI : The AI problems: what is an AI technique, Characteristics of AI applications Problem Solving, Search and Control Strategies General Problem solving, Production systems, Control strategies, forward and backward chaining Exhaustive searches: Depth first, Breadth first search.

Heuristic Search Techniques : Hill climbing, Branch and Bound technique, Best first search and A* algorithm, AND/OR Graphs, Problem reduction and AO* algorithm, Constraint Satisfaction problems Game Playing Min Max Search procedure, Alpha-Beta cutoff, Additional Refinements.

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Unit-II

Knowledge Representation : First Order Predicate Calculus, Resolution Principle and Unification, Inference Mechanisms Horn's Clauses, Semantic Networks, Frame Systems and Value Inheritance, Scripts, Conceptual Dependency AI Programming Language- Introduction to PROLOG.

Unit-III

Natural Language Processing: Origins and challenges of NLP, overview of Linguistics, Syntactic analysis: Context-Free Grammars, Grammar rules for English, Normal Forms for grammar – Dependency Grammar, Syntactic Parsing, transition networks, Semantics analysis and representation structures -Requirements for representation, Syntax-Driven Semantic analysis, Semantic attachment-Word Senses, Relations between Senses, Natural Language Generation

Unit-IV

Probability and Expert Systems: Probabilistic Reasoning and Uncertainty, Probability theory, Bayes Theorem and Bayesian networks, Certainty Factor.

Introduction to Expert Systems: Architecture of Expert Systems, Expert System Shells, Knowledge Acquisition, Case Studies, MYCIN, Learning, Rote Learning, Learning by Induction, explanation based learning.

Recommended Text / Reference Books:

1. Elaine Rich and Kevin Knight, "Artificial Intelligence", Tata McGraw Hill, 3rd edition, 2009.
2. Dan W. Patterson, "Introduction to Artificial Intelligence and Expert Systems", Prentice Hall of India, 1st edition, 1997.
3. Winston, Patrick, Henry, "Artificial Intelligence", Pearson Education, 3rd edition, 2004
4. SubhasreeBhattacharjee, "Artificial Intelligence for Student" Shroff Publishers and Distributors Pvt.LTD., 1st Edition, 2016
5. Daniel Jurafsky, James H. MartinSpeech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, Pearson Publication, 2014.
6. Steven Bird, Ewan Klein and Edward Loper, Natural Language Processing with Pythonll, First Edition, OReilly Media, 2009.
7. Nils J. Nilsson, "Principles of Artificial Intelligence (Symbolic Computation / Artificial Intelligence)", reprint edition, 2014.
8. Stuart Russell, Peter Norving, "Artificial Intelligence: A Modern Approach", Pearson Education, 3rd edition, 2010.

Practical Examination

Each practical paper shall be of 3 hours duration on one day and carry 100 marks for the practical examination. The practical examination will involve 3 exercises, each of 20 marks, practical record of 15 marks and viva-voce examination of 25 marks.

MCA 311 : .NET Lab

Practical Lab : Examination : Practica
l Examination
Lab Exercise based on Theory Paper MCA 302.

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MCA 312 : Mobile Application Development Lab

Practical Lab : Examination : Practical Examination
Lab Exercise based on Theory Paper MCA 303.

1. **Introduction to Android Studioand setting Emulator**
   - Setting up development environment
   - Launching emulator, Editing emulator settings, Emulator shortcuts
   - Logcat usage

2. **Application Structure**
   - Look at Basic Building blocks – Activities, Services, Broadcast, Receivers & Content ,UI Components-Views & notifications
   - AndroidManifest.xml, Uses-permission & uses-sdk ,Android API levels (versions & version names),Providers ,Components for communication -Intents & Intent Filters
   - Activity/services/receiver declarations, Resources & R.java, Assets, Layouts & Draw able Resources. Activities and Activity lifecycle.
   - Introduction to DDMS, File explorer, Explicit Intents.

3. **Basic UI design, Styles & Themes**
   - Form widgets, Text Fields, Layouts, styles.xml,
   - draw able resources for shapes, gradients(selectors), style attribute in layout file, Applying themes via code and manifest file

4. **Dialog boxes**
   - Alert Dialogs,
   - Toast,Time and Date

5. **Images and media, Composite**
   - ListView and ListActivity, Custom listview
   - GridView using adapters,
   - Gallery using adapters.

6. **Menu**
   - Option menu, Context menu,
   - Sub menu, menu from xml,
   - menu via code

7. **Adapters**
   - ArrayAdapters
   - BaseAdapters

8. **Receivers and services**
   - Alarm Via services,
   - Broadcast Receiver

9. **Content Providers**
   - SQLiteDatabase and SQLiteOpenHelper
   - DB programming using 2 and 3 tier architecture
   - Reading and updating Contacts, Reading bookmarks

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MCA 313 : Communication and Soft Skill Lab

Practical Lab : Examination : Practical Examination

Contents:

1. **Verbal & Non-verbal Communication** :Listening, Speaking, Reading and Writing. Verbal and Non-verbal Communication. Intra, inter-personal and group communication skills. Gestures, postures, Proxemics, Kinesics. Listening to Lectures, Discussions, Talk Shows, News Programs.

2. **Writing Skills** :Formal & Informal writings, report writing, creative writing. Composition, Resume Writing, Cover letters, Business Letter Writing, Persuasive Letters, Job Applications and Official Correspondence, E-Mail etiquette, Precise writing.

3. **Presentation Skills** :Elements of effective presentation, structure of presentation, external factors and content.Debates, Seminar, Speeches, Lectures, Interviews, Mock Interviews, Commonly asked questions in interviews.

4. **Group Discussion** : Structure of GD, Moderator led and other GDs, Strategies in GD, Team work body language, Mock GD, Problem solving, Reflective thinking, Critical thinking, Negotiation skills.

5. **Career Skills** : SWOT Analysis, IQ, EQ and SQ, Art of giving feedback, Decision making, Time Management, Team Management and Leadership Skills, 8 habits of successful people.

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Elective Theory Papers for Elective Group-1 of MCA III Sem

MCA A01 : Big Data Analytics

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:

1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I

Understanding Big Data : Introduction, Need, convergence of key trends, structured data Vs. unstructured data , industry examples of big data, web analytics – big data and marketing, fraud and big data, risk and big data, credit risk management, big data and algorithmic trading, big data and its applications in healthcare, medicine, advertising etc.

Mining Data Streams: - Introduction To Streams Concepts – Stream Data Model and Architecture - Stream Computing - Sampling Data in a Real Time Sentiment Analysis- Stock Market Predictions.

Unit-II

Big Data Technologies: Hadoop : Open source technologies, cloud and big data, Crowd Sourcing Analytics, inter and trans firewall analytics .

Introduction to Hadoop: Introduction, Data format, analyzing data with Hadoop, scaling out, Hadoop streaming, Hadoop pipes. Design of Hadoop distributed file system (HDFS), HDFS concepts – Java interface, data flow, Data Ingest with Flume and Sqoop. Hadoop I/O – data integrity, compression, serialization,
Avro – file-based data structures.

Unit-III

Hadoop Related Tools: Introduction to Hbase: The Dawn of Big Data, the Problem with Relational Database Systems. Introduction to Cassandra: Introduction to Pig, Hive – data types and file formats – HiveQL data definition – HiveQL data manipulation – HiveQL queries.

NOSQL Data Management: Introduction to NoSQL, aggregate data models, key-value and document data models, relationships, graph databases, schemaless databases, materialized views, distribution models, sharding, master-slave replication, peer-peer replication Consistency: relaxing consistency, version stamps.

Unit-IV

Predictive Analytics: Simple linear regression- Multiple linear regression- Interpretation 5 of regression coefficients. Visualizations - Visual data analysis techniques- interaction techniques - Systems and applications.

Map Reduce Applications: MapReduce workflows, unit tests with MRUnit, test data and local tests, anatomy of MapReduce job run, classic Map-reduce – YARN, failures in classic Map-reduce and

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YARN – job scheduling, shuffle and sort, task execution, MapReduce types – input formats – output formats, MapReduce – partitioning and combining, Composing MapReduce Calculations.

Recommended Text / Reference Books:

1. Big Data, Black Book, DT Editorial Services, Dreamtech Press 2015
2. Professional NOSQL, Shashank Tiwari, Wrox, September 2011
3. Hadoop in Practice, Alex Homes, Dreamtech Press, 2015
4. HBase: The Definitive Guide, Lars George, O'Reilley, 2011.
5. Cassandra: The Definitive Guide, Eben Hewitt, O'Reilley, 2010.
6. Programming Pig, Alan Gates, O'Reilley, 2011.
7. NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, P. J. Sadalage and M. Fowler, Pearson Education, Inc. 2012.
8. Programming Hive, E. Capriolo, D. Wampler, and J. Rutherglen, O'Reilley, 2012
9. Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.
10. Tom White "Hadoop: The Definitive Guide" Third Edition, O'reilly Media, 2012

MCA A02 : E-Commerce

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:

1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I

Business Environment : Organizational Structure and Design, Dependence on Technology, Integrating Technology with Business Environment, IT and Corporate Strategy, Sustaining a Competitive Edge through application of IT in Management Functions.

E-Commerce : Definition, Objectives, Components, Advantages and disadvantages, Scope, E-Commerce Opportunities for Industries, Growth of E-Commerce, e-Commerce Applications- E-Marketing, E-Customer Relationship Management, E-Supply Chain Management, E-Governance, E-Buying, E-Selling, E-Banking, E-Retailing.

Unit-II

E-Commerce Models: Business to consumer, Business to Business, Consumer to Consumer, Government to Citizen, Features and Benefits, Portal Vs. Website.

Other Models: Brokerage Model, Aggregator Model, Info-Mediary Model, Community Model and value chain Model. Mobile-commerce,

Unit-III

E-Payments : Introductions, Special features, Types of E-Payment Systems (EFT, E-Cash, E-Cheque, Credit/Debit Card, Smart Card, Digital Tokens and Electronic Purses/ Wallets).

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Security issues in E-Commerce : Security risk of E-Commerce, Types of threats, Security Tools, Cyber Laws, Business Ethics, EDI Architecture, EDI Standards, EDI Application in business.

Unit-IV

ERP : Introduction, Needs and Evolution of ERP Systems, ERP Domain, ERP Benefits, ERP and Related Technologies, Relevance to Data Warehousing and Data Mining, ERP Drivers, Evaluation Criterion for ERP product, ERP Life Cycle: Adoption decision, Acquisition, Implementation, Use & Maintenance, Evolution and Retirement Phases, ERP Modules, ERP Success & Failure Factors.

Recommended Books :

1. Ravi Kalakota, "Electronic Commerce: A Manager's Guide", Addison-Wesley Professional, Edition 2012.
2. Ian Daniel, "E-Commerce get it Right", Neuro Digital Publication, 2011.
3. Dr. K Abirami Devi & Dr. M Alagammai, "E-Commerce Essentials", Margham Publication, 2012.
4. Kenneth C. Laudon, Karol Traver, "E-Commerce 2014", Prentice Hall Publication, 2013.
5. Lexis Leon; Enterprise Resource Planning;TMH
6. Brady, Manu, Wegner; Enterprise Resource Planning; TMH
7. N. K. Venkitakrishnan, Vinod Kumar Garg; Enterprise Resource Planning : Concepts and Practice; PHI Learning.
8. Dimpi Srivastava, Arti batra; ERP Systems; I K International Publishing House
9. Enterprise Resource Planning Systems System, Lifecycle, Electronic Commerce and Risk by Daniel E.O. Leary, 2011
10. Henry C. Lucas, Information Technology for Management, McGraw Hill, International Edition, July 2001.

MCA A03 : Computer Graphics

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:

1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I

Introduction: Elements of graphics workstation , Video Display Devices. Raster Scan Systems. Random Scan systems. Input devices, Graphics Software Coordinate Representations.
Algorithms: Line drawing algorithms- DDA Algorithm. Bresenham's Line Algorithm. Frame buffers. Midpoint Circle Algorithm. Midpoint Elipse Algorithm, Sean-Line polygon fill algorithm. Inside-Outside tests Scan-Line fill of curved Boundary Areas. Boundary fill algorithms. Flood fill Algorithm.

Unit-II

Graphics Primitives: Primitive Operations, The display file interpreter, Normalized Device Coordinates. Attributes of output primitives: Line attributes, Color and gray scale levels. Colortables. Gray scale. Area-Fill Attributes, Fill styles. Pattern fill. Soft fill. Character Attributes.

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Geometric Transformations: Matrices. Scaling Transformations. Sin and Cos Rotation. Homogeneous Co-ordinates and Translation. Co-ordinate Translations. Rotation about an arbitrary point. Inverse Transformations, Scaling Transformation, Reflection and Shear transformations, Transformations Routines.

Unit-III

2-D Viewing – The viewing pipeline, Viewing co-ordinate, Reference Frame. Windows to view ports. Co-ordinate transformation 2-D Viewing functions. Clipping operations point clipping. Line clipping. Cohen-Sutherland. Line Clipping. Polygon clipping. Sutherland Hodge man clipping.

3-D concepts: Three dimensional Display Methods, Parallel projection. Perspective projection. Visible line and surface identification. Surface rendering. Three Dimensional Object representations. Bezier curves and surfaces. B-Spline curves and surfaces. Visibility, Image and Object Precision Z-buffer algorithm.

Unit-IV

Computer Animation: Design of Animation Sequence, General computer Animation Function-Raster animations, Key Frame system, Morphing, Simulating Accelerations, Motion Specifications, Kinematics and Dynamics.

Recommended Text / Reference Books:

1. Hearn D., Baker P.D.: Computer Graphics; 2nd editions; Pearson.2003.
2. Foley J.D.; Van D.A. : Fundamentals of Interactive Computer Graphics; 2nd Edition; Addision-Viley,2000
3. Ronger D.F. ; Elements of Computer Graphics;
4. Giloi W.K. ; Interactive Computer Graphics; PHI
5. Mewman W, Sproul R.F. ; Principles of Interactive Computer Graphics; Mc Graw Hill.

MCA 403 : Computer Oriented Numerical Methods

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:

1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I

Floating Point Arithmetic-Representation, Operation, Normalization, Pitfalls of Floating – point Representation, Errors in Numerical computation, Measures of Accuracy.
Locating Roots of Equations: Bisection Method, Newton's Method, Secant Method, Muller's Method.

Unit-II

Interpolation and Numerical differentiation: Newton's Forward Difference Interpolation, Newton's Backward Difference Interpolation, Langrange's Interpolation Formula.

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Numerical Integration Definite Integral, Trapezoid Rule, Simpson's Rule, Romberg Algorithm, Adaptive Simpson's Scheme, Gaussian Quadrate Formulas.

Unit-III

Solution of Linear Equations: Gaussian Elimination, Gaussian Elimination with Scaled Partial Pivoting, Iterative Solution of Linear Systems, Gauss-Seidel Iteration Method, Power Methods, Eogenvalues and Eignevectors.

Ordinary differential Equations Initial-Value Problem: Analytical vs. Numerical Solution, Taylor Series Methods, Runge-Kutta Methods, Euler method.

Unit-IV

Smoothing of Data and the Method of Least squares, Least Squares curve fitting, Straight line and non Linear curve fitting, Cubic splines, Chebyshev polynomials.

Random Numbers, Estimation of Areas and Volumes by Monte Carlo Techniques.

Recommended Books;

1. Rajaraman V : Compouter Orinted Numerical Methods, 3rd Edition; PHI.2005.
2. R.S. Salaria; Computer Orinted Numrical Methods; 4th Edition; Khanna Pub.
3. Balagurusamy E; Numerical Methods; 1 Edition; Mc Graw Hill.,2010
4. Sastri; Introductory methods of Numrical Analysis; 3rd Edition; PHI,2001.
5. K. Sankara Rao, Numerical Methods for scientists and Engineers, Prentice Hall India.
6. Cheney and David Kincaid, Numerical Methods and Computing, Brooks/Ie, 2004
7. Krishnamurthy E. V., Sen S.K. Computer Based Numerical Algorithms, East-West Press

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Elective Theory Papers for Elective Group-2 of MCA III Sem

MCA B01 : Theory of Computation

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:

1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

UNIT-I

Automata : Introduction of automata, computability, and complexity; mathematical notations and terminology; finding proofs and types of proofs.
Automata and Languages: Regular languages, finite automata, formal definition of a finite automaton, formal definition of computation, designing finite automata.

UNIT-II

Non-deterministic finite automata: Equivalence of NFAs and DFAs, closure under the regular operations, Regular Expressions: formal definition of a regular expression, equivalence with finite automata, nonregular languages: pumping lemma for regular languages.

UNIT-III

Push down Automata and Context free languages: Context free grammars, designing context free grammar, ambiguity in CFG and its removal, Chomsky normal form push down automata: formal definition, graphical notations, Languages accepted by PDA, Equivalence of PDA and CFG, Non-context free languages.

UNIT-IV

Turing Machines and Computability: Formal definition of turing machines with examples, graphical notations, variants of turing machines, church-turing thesis, Hubert's problem.
Decidability, undecidability and reducibility: Decidable languages; decidable problems concerning regular languages and context free languages, the halting problem, undecidable problems, mapping reducibility, decidability of logical theories, turing reducibility.

Recommended Books:

1. Michael Sipser, "Introduction to the Theory of Computation", Second Edition, 2007, CENGAGE learning India Pvt. Ltd., New Delhi.
2. John E. Hopcroft, Rajeev Motwani & Jeffrey D. Ullman, "Introduction to Automata Theory,Languages, and Computation", Third Edition, 2007, Pearson Education Inc
3. K.L.P Mishra & N.Chandrasekaran,"Theory of Computer Science", PHI Learning
4. Michael Sipsev,"Theory of Computation",Cenage Learning
5. John C Martin, "Introdution to languages and theory of computation", McGraw Hill
6. Daniel I.A. Cohen,"Introduction to Computer Theory",Wiley India.
7. Kohavi,"Switching & Finite Automata Theory",TMH

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MCA B02 : Soft Computing

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:

1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

UNIT-I

Introduction to Soft Computing : Introduction of Hard and Soft Computing, Unique features of Soft computing, Components of Soft computing, Fuzzy Computing, Evolutionary Computation, Genetic Algorithm, Swarm Intelligence, Ant Colony Optimizations, Neural Network, Machine Learning , Associative Memory, Adaptive Resonance Theory, Introduction to Deep Learning.

UNIT-II

Fuzzy Logic : Basic concepts of fuzzy logic, Fuzzy sets and Crisp sets, Fuzzy set theory and operations, Properties of fuzzy sets, Fuzzy and Crisp relations, Fuzzy to Crisp conversion, Membership functions, interference in fuzzy logic, fuzzy if-then rules, Fuzzy implications and Fuzzy algorithms, Fuzzyfications & Defuzzificataions, Fuzzy Inference Systems, Mamdani Fuzzy Model, Sugeno Fuzzy Model, Fuzzy Controller, applications.

UNIT-III

Neural Networks : Introduction and Architecture: Neuron, Nerve structure and synapse, Artificial Neuron and its model, Neural network architecture: single layer and multilayer feed forward networks, recurrent networks. Back propagation networks architecture: perceptron model, solution, single layer artificial neural network, multilayer perception model; back propagation learning methods, back propagation algorithm, applications.

UNIT-IV

Genetic Algorithms : Basic concepts of GA, working principle, procedures of GA, flow chart of GA, Genetic representations, (encoding) Initialization and selection, Genetic operators, Mutation, Generational Cycle, applications.
Hybrid Systems : Integration of neural networks, fuzzy logic and genetic algorithms. GA Based Back Propagation Networks, Fuzzy Back Propagation Networks, Fuzzy Associative Memories, Simplified Fuzzy ARTMAP.

Recommended Text / Reference Books:

1. S. Rajasekaran and G.A.Vijaylakshmi Pai,"Neural Networks Fuzzy Logic, and Genetic Algorithms", Prentice Hall of India 2004.
2. K.H.Lee. First Course on Fuzzy Theory and Applications, Springer-Verlag.

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MCA B03 : Computer Based Optimization Techniques

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:

1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I

Linear Programming Problems (LPP): formulation of an LPP, Solution of an LPP using graphics method and simplex method, Slack, Surplus & Artificial Variables, Two-phase and big-M method.

Special cases in LPP: alternate optimum solution, an unbounded solution, infeasible Solution, Duality in LPP, Revised Simplex method.

Unit-II

Transportation Problem: Definition, methods for finding initial basic feasible solutions – North West corner rule, least cost cell entry method, Vogel's approximation method, methods for finding optional solution – MODI Method.

Assignment Problems; Definition & concept, solution of an assignment problem for optimum solution – Hungarian Method.

Sequencing: Job – problems for processing N Jobs on 2 machines, processing N jobs on 3 machines, processing N jobs on processing M machines, processing 2 jobs on M machines (Graphic Method).

Unit-III

Inventory Models: What is inventory? Types of Inventories, Inventory Decisions, Cost involved in inventory problems, Controlled & Uncontrolled variables, deterministic inventory control system, concept of an average inventories, concept of economic order quantity (EOQ) . (In short Model-I, II and Model III).

Replacement Models; introduction – The replacement problem, replacement of items that deteriorate (with money value), replacement of items that fail completely (Mortality theorem).

Unit-IV

Project Management by PERT & CPM: Introduction – Historical Development of CPM/PERT, Application of PERT – CPM techniques network diagram representation, rules for drawing network, time estimation & critical path in network analysis

Queuing theory: Introduction queuing system, queering problem, transient & steady states, traffic intensity, distribution of queuing system (Birth & Death Process), Queuing Models – I,II & III.

Recommended Text / Reference Books:

1. Gillette B.E.: Introduction to Operations Research – A Computer Oriented Algorithmic approach, Tat McGraw Hill Pub.Co, New Delhi.
2. Taha Hatndy: A Operation Research- An Introduction, Fifth Edn. PHI, New Delhi.
3. Metal K.V. & Mohan C: Optimization Methods in Operations Research and system Analysis, 3rd Edn. New age international Publishers, New Delhi.

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4. Hiller, F.S. & Limrman, G.L. : Introduction to Operations research, 2nd Edn. Holden day inc., London, 1974.
5. Sharma S.D. Operations Research, Kedar Nat R. & Com. Meerut, 2003
6. Kapoor V.K.: Operations Research, Sultan Chand & Sons, 1999.
7. P.K. Gupta & D.S. Hira : Operation Research, S.Chand & Company Ltd. New Delhi 2000

MCA B04 : Cryptography & Network Security

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:

1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit I

Introduction to Security Attacks : Cryptography, Security Attacks, Security Services and Mechanism.
Classical Encryption Techniques : Classical Techniques, Conventional Encryption Model, Classical Encryption Techniques.
Modern Techniques: Simplified DES, Block Ciphers Principles, DES Standards, DES Strength, Differential & Linear Cryptanalysis, Block Cipher Design Principles, Block cipher Modes of Operation.

Unit II

Conventional Encryption Algorithms: Triples DES, International Data Encryption Algorithm, RC5, RC2 placement & Encryption Function, Key Distribution, Random Number generation, Placement of Encryption Function.
Public Key Encryption: Public Key Cryptography: Principle of public key Cryptosystems, RSA algorithm, Key Management, Fermat's Theorem & Euler's Theorem.

Unit III

Message Authentication & Hash Function: Authentication Requirements, Authentication Function, Message Authentication Codes, Hash Function, Birthday Attacks, Security of Hash Function & MAC's, MD5 Message Digest algorithm, Secure Hash Algorithm(SHA).
Digital Signatures: Digital Signature, Authentication Protocol, Digital Signature Standard(DSS), proof of digital signature algorithm.

Unit IV

Network and System Security: Authentication Application- Kerberos x.509, Dictionary Authentication Services, Electronic Mail Security, Pretty Good Privacy (PGP), S/mime. Security: Architecture, Authentication Header, Encapsulation security payloads, combining security association, Key Management. **Web Security**: Secure socket layer & Transport layer security, Secure electronic transaction (SET). System Security: Intruders, viruses, firewall Design principle, Trusted Systems.

Recommended Text / Reference Books:

1. Willium Stalling; Cryptography and Network Security, Fifth Edn, Pearson.;
2. Atul Kahate; Cryptography and network Security; Tata McgrawHill.
3. V.K. Pachghare; Cryptography and Information Security; PHI.
4. Matt Bishop, Sathyanarayana; Introduction to Computer Security;Pearson.

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Note :

1. Papers MCA 401, MCA 402, MCA 411, MCA 412 and MCA 413 are compulsory(CCC) and Paper MCA 403 is elective(ECC).
2. Continuous assessment(Internal) will be done by the concerned teacher on the basis of test papers, regularity in the class and performance of the student. Maximum marks in continuous assessment of each paper is 100.

MCA-401 : Analysis and Design of Algorithms

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:

1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I

Introduction: Algorithm Definition and Specifications, Design of Algorithms and Complexity of Algorithms, Asymptotic Notations, Growth function, Recurrences and Performance Analysis.
Divide and Conquer Algorithms: General method, Binary search, Merge sort, Quick Sort.

Unit II

Greedy Methods: General method, Knapsack Problem, Job Selection with Deadline problem, A task scheduling problem ,Minimum Cost Spanning Tree, Single Source Shortest Path.
Dynamic Programming: General method, Multistage graphs, Optimal Binary Search trees, 0/1 Knapsack, Travel Salesman Problem, Flow Shop Scheduling.

Unit III

Advanced data structure: Red-Black Tree, M-way trees, B-trees, Binomial Trees, Fibonacci Heaps, Data Structure for Disjoint Sets.
Backtracking: General method, 8 Queens Problem, Sum of Subsets, Graph Colouring, Hamiltonian Cycles, Knapsack Problem.

Unit IV

Branch and Bound: 0/1 Knapsack Problem, Travel Salesman Problem.
Randomized Algorithms, String Matching, NP-Hard and NP-Completeness, Approximation Algorithms, Vertex Cover Problem, Set Cover Problem, Hamiltonian Cycle, Clique Problem.

Reference Books:

1. Thomas H Cormen, C.E. Leiserson, R.L. Rivest,C.Stein; Introduction to Algorithms, 3 ed; PHI.
2. E. Horowitz,S. Sahni, S. Raja Sekaran ; Fundamentals of computer Algorithms;
3. Aho A.V , J.D Ulman: Design and analysis of Algorithms, Addison Wesley

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Elective Theory Papers for Elective Group-3 of MCA IV Sem

MCA-C01 : Data Science with R

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:

1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I

Introduction to Data Science : What is Data Science, Need for Data Science, Components of Data Science, Big data, Facets of data: Structured data, Unstructured data, Natural Language, Machine-generated data, Graph-based or network data, Audio, image and video, Streaming data, The need for Business Analytics, Data Science Life Cycle, Applications of data science.

Unit-II

Data Science Process : Overview of data science process, setting the research goal, Retrieving data, Cleansing, integrating and transforming data, Exploratory data analysis, Data Modeling, Presentation and automation, Types of Analytics: Descriptive analytics, Diagnostic analytics, Predictive analytics, Prescriptive analytics.

Unit-III

Statistics : Basic terminologies, Population, Sample, Parameter, Estimate, Estimator, Sampling distribution, Standard Error, Properties of Good Estimator, Measures of Centers, Measures of Spread, Probability, Normal Distribution, Binary Distribution, Hypothesis Testing ,Chi-Square Test , ANOVA.

Unit-IV

Data Science Tools and Algorithms : Basic Data Science languages- R, Python, Knowledge of Excel, SQL Database, Introduction to Weka, Regression Algorithms: How Regression Algorithm Work, Linear Regression, Logistic Regression, K-Nearest Neighbors Algorithm, K-means algorithm.

Recommended Books :

1. Samuel Burns, "Fundamentals of Data Science: Take the first Step to Become a Data Scientist" , Amazon KDP Printing and Publishing, First Edition, 2019
2. Davy Cielen, Arno D.B. Meysman, Mohamed Ali, "Introducing Data Science", Manning Publications, 2016
3. Cathy O'Neil and Rachel Schutt, "Doing Data Science, Straight Talk From The Frontline", O'Reilly. 2014.

MCA-C02 : Machine Learning

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:

1. Candidate has to attempt five questions in all. All questions carry equal marks.

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2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I

Introduction : Machine Learning, Machine Learning Foundations-Overview, Applications, Types of Machine Learning, Basic Concepts in Machine Learning – Examples of Machine Learning, Perspectives/Issues in Machine Learning, Designing a learning system.
Concept Learning : Introduction, a concept learning task, concept learning as search, Find-S algorithm, Version space and Candidate-Elimination algorithm, Inductive bias

Unit-II

Supervised Learning : Introduction, Linear Models of Classification – Decision Trees, Naïve Bayes Classification, Linear Regression – Logistic Regression, Bayesian Logistic Regression, Probabilistic Models, Artificial Neural Network- perceptron, multilayer networks and back propagation algorithm, Ensemble Methods – Random Forest – Bagging – Boosting.

Evaluating Hypothesis : estimating hypothesis accuracy, basics of sampling theory, comparing learning algorithms.

Unit-III

Unsupervised Learning : Clustering, K-Means Clustering, EM (Expectation Maximization), Mixtures of Gaussians, EM algorithm in General, The Curse of Dimensionality, Dimensionality Reduction, Factor Analysis, Principal Component Analysis, Probabilistic PCA, Independent Component Analysis. Challenges for Big Data Analytics.

Unit-IV

Instance based Learning-Nearest neighbor classification, k-nearest neighbor, locally weighted regression, lazy and eager learner

Reinforcement Learning-Introduction, Elements of Reinforcement Learning,Difference between Reinforcement Learning and Supervised Learning, Applications of Reinforcement Learning, The Learning Task, Q learning, Nondeterministic rewards and actions, Temporal difference learning. Model based learning, Semi-Supervised Learning, Computational Learning Theory.

Recommended Text / Reference Books:

1. Christopher Bishop, "Pattern Recognition and Machine Learning", Springer 2006
2. EthemAlpaydin, "Introduction to Machine Learning", Prentice Hall of India, 2005
3. Joel Grus, "Data Science from Scratch- First Principles with Python", O'Reilly, 2015
4. Tom Mitchell, " Machine Learning", McGraw-Hill, 1997
5. Stephen MarsLand, "Machine Learning-An Algorithmic Perspective", CRC Press, 2009
6. Kevin P. Murphy, "Machine Learning: A Probabilistic Perspective", MIT Press, 2012
7. M. Gopal, "Applied MACHINE LEARNING", McGraw-Hill, 2018
8. Mark Summerfield, "Programming in Python 3: A Complete Introduction to the Python Language", Addison Wesley, 2010

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MCA-C03 : Digital Marketing

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:

1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I

Digital Marketing Fundamentals : Marketing v/s Sales, Marketing Mix and 4 Ps, What is Digital Marketing, CRM platform, CRM models, CRM platform, Marketing Automation, Inbound vs Outbound Marketing, Content Marketing, Understanding Traffic, Understanding Leads, Strategic Flow for Marketing Activities.

Unit-II

Website Planning and Structure : WWW, Domains, Buying a Domain, Website Language & Technology, Core Objective of Website and Flow, One Page Website, Google Analytics, Tracking Code, Website Auditing.

Search Engine Optimization: Basic Concepts, how Search Engine works, Keywords, Keywords, titles, meta tags, On page optimization techniques, Off page Optimization techniques, SEO Audit & Future of SEO.

Unit-III

Email Marketing: Content Writing, Email Machine – The Strategy, Email Frequency,Triggers in Email using 4Ps, Sequence of Email Triggers, Email Software and Tools, Importing Email Lists, Planning Email Campaign, Email Templates and Designs, Sending HTML Email Campaigns, WebForms Lead Importing, Integrating Landing Page Forms Campaign Reports and Insights, Segmentation Strategy Segmentation, Lists Auto-Responder Series Triggering Auto – Responder Emails

Google Adwords : Basics, Google Ad Types, Pricing Models, PPC Cost Formula, Ad Page Rank, Billing and Payments, Adwords User Interface, Keyword Planning, Keywords Control, Creating Ad Campaigns, Creating Text Ads, Creating Ad Groups, Bidding Strategy for CPC.

Unit-IV

Social Media Optimization (SMO) : Introduction , Advanced Facebook Marketing, Word Press Blog Creation, Twitter Marketing, LinkedIn Marketing, Google Plus Marketing,Instagram, Social Media Analytical Tools, Scheduling Posts, Social media Events, Reply and Message. Social media Ad Campaigns: Organic v/s Paid, Ad Objective Performance Matrix , Ad Components, Youtube Marketing:Channel Links, Channel Keywords, Branding Watermark, Uploading Videos, Featured Contents on Channel

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Recommended Text / Reference Books:

1. Ian Dodson, "The Art of Digital Marketing ", Wiley, 2018
2. Seema Gupta, "Digital Marketing" Mc-Graw Hill, 1st Edition, 2017
3. **References:** Puneet Singh Bhatia, "Fundamentals of Digital Marketing", Pearson, 1st Edition, 2017
4. Vandana Ahuja, "Digital Marketing", Oxford University Press
5. Philip Kotler, "Marketing 4.0: – Moving from Traditional to Digital", Wiley, 2017

MCA-C04 : Open Source Operating System

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:

1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I

Introduction to concept of Open Source Software: Introduction to Linux , Evolution of Linux, Linux vs. UNIX, Different Distributions of Linux, Installing Linux, Linux Architecture, **Linux file system** (inode, Super block, Mounting and Unmounting), Essential Linux Commands (Internal and External Commands), Kernel, Process Management in Linux, Signal Handling, System call, System call for Files, Processes and Signals.

Unit-II

Filter-The grep family, advanced filters-sed and awk vi editor: General startup of vi editor and it modes, Creating and editing files, features of vi, screen movement, cursor movement insertion, deletion searching, submitting operations, yank put, delete commands reading & writing files, advance editing techniques vim (improved vi).

Shell: meaning and purpose of shell, introduction to types of shell. the command line, standard input and standard output, redirection pipes, filters special characters for searching files and pathnames.

Unit-III

Shell Programming: Shell Programming – Introduction to Shell, Various Shell of Linux, Shell Commands, I/O Redirection and Piping, Vi and Emacs editor, Shell control statements, Variables, if-then-else, case-switch, While, Until, Find, Shell Meta characters, Shell Scripts, Shell keywords, Tips and Traps, Built in Commands, Handling documents, C language programming, Prototyping, Coding, Compiling, Testing and Debugging, Filters.

Unit-IV

Linux System Administrations: File listings, Ownership and Access Permissions, File and Directory types, Managing Files, User and its Home Directory, Booting and Shutting down (Boot Loaders, LILO, GRUB, Bootstrapping, init Process, System services)

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Networking : Networking tools, E-mail Remote login, FTP, Network and Server setup LAN, Connection with Internet Setting-up routers, Proxy Servers, Print-Server, File server, mail Server, Web server and Database server.

Recommended Text / Reference Books:

1. Peterson Richard, " The Complete Reference Linux " Tata McGraw Hill.
2. Simitabha Das, "Unix/Linux Concepts & Applications". Tata McGraw Hill,2008
3. Forouzan B. A., Gilberg R. R., "UNIX and Shell Programming", TMH, 2nd edition, 2008.
4. Beginning Linux Programming N, Mathew, R. Stones, Wrox, Wiley India Ed.
5. Yshavant P, Kanetkar, Shell Programming
6. Linux System Programming, Robert Love, O" Reilly SPD.
7. Vijay Shekhar; Red hat Linux study guide firewall media.
8. Richard Petersen: The Complete Reference ; Linux; TMH
9. Practical Guide to Linux Commands, Editors, and Shell Programming, Sobell, Pearson, 2nd Edition, 2010.
10. A Practical Guide to Fedora and Red Hat Enterprise Linux, Sobell, Pearson, 5th Edition, 2010.

Practical Examination

Each practical paper shall be of 3 hours duration on one day and carry 100 marks for the practical examination. The practical examination will involve 3 exercises, each of 20 marks, practical record of 15 marks and viva-voce examination of 25 marks.

MCA 411 : ADA Lab

Practical Lab : Examination : Practical Examination
Lab Exercise based on Theory Paper MCA 401.

List of Experiments:

1. Linear search & binary search , Sorting Techniques
2. Stacks and queues operations (with arrays and pointers)
3. Link List and Trees operations (with arrays and pointers)
4. graphs – basic traversal and search techniques
5. Greedy method:-knapsack problem
6. Greedy method minimum cost spanning tree
7. Dynamic Programming – 0/1 Knapsack
8. Dynamic Programming – traveling salesman problem
9. Backtracking 8-Queens problem
10. Backtracking Sum of Subsets
11. Branch and Bound -0/1 Knapsack problem
12. Sequential and Dynamic Implementations

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Elective Lab Papers for Elective Group-4 of MCA IV Sem

MCA D01 : Data Science with R Lab

Practical Lab : Examination : Practical Examination
Lab Exercise based on Theory Paper MCA C01.

R Programming: Fundamentals, Properties & Characteristics, Data Types, Operators,Control & Looping Structures, Array & String handling, Functions, Vector & Matrices processing, Factors, Data Frames, Packages, Data Reshaping, Data and File management, Charts and Graphs.

Data science with R/Python : Overviews, data visualisation using graphics in R, GGplot 2, File format of graphics output, introduction to hypotheses, types of hypothesis, data sampling, confidence and significance level, hypothesis tests, parametric test, non-parametric test,

Regression Algorithms in R/Python : How Regression Algorithm Work, Linear Regression, Logistic Regression, K-Nearest Neighbors Algorithm, K-means algorithm.

MCA D02 : Machine Learning Lab

Practical Lab : Examination : Practical Examination
Lab Exercise based on Theory Paper MCA C02.

List of Experiments(Contents):

1. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training samples. Read the training data from a .csv file.
2. Implement working of the decision tree based ID3 algorithm using appropriate data set to classify it.
3. Develop an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data set.
4. Implement the naïve Bayesian classifier using appropriate data set and compute its accuracy, considering few data sets.
5. Implement Bayesian network considering medical data. Use this model to demonstrate the diagnosis of Heart Disease Data Set.
6. Implement EM algorithm to cluster a set of data stored in a .CSV file.
7. Implement k-means algorithm to cluster same set of data as in experiment 6 and compare the results of these two algorithms and comment on the quality of clustering.
8. Implement k-Nearest Neighbor algorithm to classify the iris data set and display both correct and incorrect predictions.
9. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Apply it on an appropriate data set and draw graph.

MCA D03 : Digital Marketing Lab

Practical Lab :
Examination : Practical Examination
Lab Exercise based on Theory Paper MCA C03.

List of Experiments(Contents):

1. Search Engine Optimization

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2. Blogs Creation
3. Website Analytics and Auditing
4. Social media Ad Structure
5. FaceBook Campaigns
6. YouTube Marketing
7. Email Marketing
8. Google Adwords

MCA D04 : Open Source OS Lab

Practical Lab :
Examination : Practical Examination
Lab Exercise based on Theory Paper MCA C04.

List of Experiments(Contents):

1. Basic Shell Commands
2. Study of Unix/Linux
   - General purpose utility command
   - File system navigation
   - File attributes
   - System's environment
   - Simple and advanced filters
3. I/O Redirections
4. Working with vi editor

Shell Programs:

5. Implementation of Shell Programming Concepts:
   - Shell programming in bash
   - Shell Variables Input concepts
   - Expression
   - Decisions and repetition
   - Special parameters and variables
   - Command line arguments
   - Case statements
   - Changing positional parameters and argument validation
   - String manipulation
   - File Operations
   - Base conversion
6. User defined functions.

Administration:

7. Installing Linux through bootable media/ through NFS
8. Creating & Managing User Accounts
9. Creating & Managing Groups.

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MCA 413 : Industrial Training (Major Project)

Practical Lab : Examination : Practical Examination

Guidelines for Preparation the Project Report:

1. **Objective : Student should able to develop a small real time application using programming languages which is part of their course curriculum or any new upcoming programming languages/technology.**
2. **Project Report Formulation:**
   a. **The project report should contain the following:**

   - Original copy of the Approved Performa and Project Proposal.
   - Bio-data of the guide with her/his signature and date.
   - Certificate of Originality (Format given).
   - Project documentation.
   - A CD consisting of the executable file(s) of the complete project should be attached on the last page of the project report. In no case, it should be sent separately. The student needs to retain the identical copy of the CD that should be carried while appearing for the viva-voce along with the project report.

   b. **Project Documentation:**

   - Project documentation may be about 100 to 125 pages (excluding coding).
   - The project documentation details should not be too generic in nature.
   - Appropriate project report documentation should be done, like, how you have done the analysis, design, coding, use of testing techniques/strategies, etc., in respect of your project.
   - The project report should normally be printed with single line spacing on A4 paper (one side only). All the pages, tables and figures must be numbered. Tables and figures should contain titles.
   - **Two copies** of the original project report in the bound form along with the CD (containing the executable file(s) of the project should be enclosed in the last page) is to be prepared at the time of final viva. One copy of the same Project Report and the CD containing the executable file(s) shall be retained by the student, which should be produced before the examiner at the time of viva-voce.

3. **MANUAL FOR PREPARATION OF MCA Project (Prescribed Format and Specification)**

4. **Essential Components of Project Report :**
   a. Title Page

   b. Certificate from Company
   c. Certificate from Guide
   d. Acknowledgement
   e. Index with printed Page Numbers

   CHAPTER 1 : INTRODUCTION

   1.1 Company/Educational Institute Profile

   1.2 Existing System and Need for System

   1.3 Scope of Work

   1.4 Operating Environment – Hardware and Software

   CHAPTER 2: PROPOSED SYSTEM

   2.1 Proposed System

   2.2 Objectives of System

   2.3 User Requirements

   CHAPTER 3: ANALYSIS & DESIGN

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3.1 Entity Relationship Diagram (ERD)
3.2 System Architecture
3.3 Database Requirements & User Interfaces
3.4 Data Flow Diagram (DFD)

3.5 Data Dictionary

3.6 Table Design
3.7 Code Design

3.6 Menu Screens

3.7 Input Screens

3.8 Report Formats

3.9 Test Procedures and Implementation

CHAPTER 4: User Manual

4.1 User Manual

4.2 Operations Manual / Menu Explanation

4.3 Forms and Report Specifications

Drawbacks and Limitations

Proposed Enhancements
Conclusions
Bibliography

Annexure:
Annexure 1: Input Forms with data
Annexure 2: Output Reports with Data
Annexure 3: Sample Code

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Format of Cover Page:

Major Project / Industrial Training

MCA-413

[UNIVERSITY LOGO]

Session: <Session>

A Project Report on

Title of the Project

Submitted for partial fulfillment of requirement for award of the degree of

Master of Computer Application (MCA 2021)

BY STUDENT

Name-
Enrollment No.-
Batch-

Under the Supervision

Name of the guide

To

University Centre for Computer Science & Information Technology (UCCS & IT)

University of Rajastha

Jaipur

Raj Kaur

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