

Masters in Computer Science (Semester System)
EXAMINATION 2019-20

M.Sc.(IT) Previous Session 2018-19
M.Sc.(IT) Final Session 2019-20

Masters in Computer Science (Semester System)

EXAMINATION 2019-20

SCHEME OF EXAMINATION

1. ELIGIBILITY FOR ADMISSION

2. Graduates possessing 50% marks in any faculty of any statutory university shall be eligible for admission to the M.Sc. Computer Science Course (Relaxation to SC/ST etc. as per Prevailing Rules)

3. PASS CRITERIA

4. For passing in the examination, a candidate is required to obtain at least 25% in each paper (Internal + External) and 36% marks in the total aggregate in theory and practical separately (in each semester examination).

5. CLASSIFICATION OF SUCCESSFUL CANDIDATE

Division	Total Marks
First Division	60% and above
Second Division	Above 48% and below 60%
Pass	Above 36% and below 48%
Fail	Below 36%

6. BACKLOG

7. INSTRUCTIONS TO PAPER SETTER

The question paper contains 3 sections. **Section-A** consists of 10 questions (at least 3 questions from each unit of syllabus). **Section-B** will consist of 9 questions (3 questions from each unit of syllabus). **Section-C** will consist of 6 questions (2 questions from each unit of syllabus).

The word limit of part A, B and C are 50, 200 and 500 respectively

8. WORKLOAD

At least 3 classes for theory class and 3 classes for practical lab should be assigned per week for each paper.

9. INSTRUCTIONS FOR PRACTICAL EXAMINATION

Marks Distribution for Practical Exam -

1. Each practical exam is to be conducted by two examiners one External and one Internal. External examiner should be senior lecturer from jurisdiction of other universities. Marks distribution for external practical of 40 marks is as under
 - a) Practical Examination exercise of 3 questions 30 marks
 - b) Viva-Voce 5 marks
 - c) Laboratory Exercise File 5 marks
2. Marks distribution for External Project report of 40 marks is as under
 - a. External Evaluation-
 - i. Research Project/ Case Study 25 marks
 - ii. Presentation 10 marks
 - iii. External Viva Voce 5 marks
 - b. Internal Evaluation- Dissertation 10 Marks

10. INSTRUCTIONS FOR STUDENTS

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- The student has to complete two months career oriented summer training from any firm/organization. If the student does not get chance to go for training, he/she can chose a research topic and can complete dissertation under the supervision of any of the faculty in his college.
- The student who has opt training, has to provide a signed certificate from the firm/organization authority stating that the student has spent two months as a trainee in his organization/firm. The student who have opt dissertation, has to submit his/her dissertation report with a certificate from his supervisor.
- In both the cases student has to present his work in front of all the faculty members and fellow students at the starting of the next session.
- At least 3 hours for lectures and one hour for tutorial should be allotted per week for each theory paper.
- A slot of 2 hours per week should be allotted for each practical paper.

*** An Academic/ Industrial Tour shall be organized by the college in every session. A Tour Report shall be prepared and submitted by the students after a study tour to industries/academic institutions of repute.**

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Scheme of Examination

Semester I						
Paper Code	Paper Name	Exam Hours	Maximum Marks		Total Marks	Minimum Passing Marks
			Internal Marks	External Marks		
Theory Papers						
MCS 101	Mathematics for Computer Science	3	10	40	50	13 (25%)
MCS 102	Internet Programming	3	10	40	50	13 (25%)
MCS 103	Computer Organization	3	10	40	50	13 (25%)
MCS 104	C++ Programming	3	10	40	50	13 (25%)
Total of Theory			40	160	200	72 (36% aggregate)
Practical Papers						
MCS 105	Internet Programming Lab	2	10	40	50	13 (25%)
MCS 106	C++ Lab	2	10	40	50	13 (25%)
Total of Practical			20	80	100	36 (36% aggregate)
Grand Total					300	108 (36% aggregate)
Semester II						
Paper Code	Paper Name	Exam Hours	Maximum Marks		Total Marks	Minimum Passing Marks
			Internal Marks	External Marks		
Theory Papers						
MCS 201	Database Management System	3	10	40	50	13 (25%)
MCS 202	Data Communication and Networking	3	10	40	50	13 (25%)
MCS 203	Operating System	3	10	40	50	13 (25%)
MCS 204	PHP	3	10	40	50	13 (25%)
Total of Theory			40	160	200	72 (36% aggregate)
Practical papers						
MCS 205	DBMS and Linux Lab	3	10	40	50	13 (25%)
MCS 206	PHP Lab	3	10	40	50	13 (25%)
Total of Practical			20	80	100	36 (36% aggregate)

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Grand Total					300	108 (36% aggregate)
Semester III						
Paper Code	Paper Name	Exam Hours	Maximum Marks		Total Marks	Minimum Passing Marks
			Internal Marks	External Marks		
Theory Papers						
MCS 301	Data Structures	3	10	40	50	13 (25%)
MCS 302	Java	3	10	40	50	13 (25%)
MCS 303	Software Engineering & Research Methodology	3	10	40	50	13 (25%)
MCS 304	Computer Graphics & Multimedia	3	10	40	50	13 (25%)
Total of Theory			40	160	200	72 (36% aggregate)
Practical Papers						
MCS 305	Java Lab	3	10	40	13	(25%)
MCS 306	Data Structure Lab	3	10	40	13	(25%)
Total of Practical			20	80	100	36 (36% aggregate)
Grand Total					300	108 (36% aggregate)
Semester IV						
Paper Code	Paper Name	Exam Hours	Maximum Marks		Total Marks	Minimum Passing Marks
			Internal Marks	External Marks		
Theory Papers						
MCS 401	(a) Search Engine Optimization (b) Data Mining (c) Python	3	10	40	50	13 (25%)
MCS 402	(a) Android Programming (b) Advanced Web Programming (c) Advanced Java	3	10	40	50	13 (25%)
MCS 403	(a) Artificial Intelligence (b) Cloud Computing (c) Internet of Things	3	10	40	50	13 (25%)
MCS 404	Research Project/ Case Study	3	10	40	50	13 (25%)
Total marks of Theory			40	160	200	72 (36% aggregate)
Practical Papers						

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MCS 405	SEO/ Python/Data Mining Lab	3	10	40	50	13 (25%)
MCS 406	Android/ Advanced Web Programming/ Advanced Java Lab	3	10	40	50	13 (25%)
Total marks of Practical			20	80	100	72 (36% aggregate)
Grand Total					300	108 (36% aggregate)

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Semester I

Paper Code: MCS-101

Paper Name : Mathematics for Computer Science

Scheme of Examination

Maximum Marks: 50

Duration: 3 Hours

Minimum Passing Marks: 13

The question paper contains 3 sections. **Section-A** consists of 10 questions (at least 3 questions from each unit of syllabus). **Section-B** will consist of 9 questions (3 questions from each unit of syllabus). **Section-C** will consist of 6 questions (2 questions from each unit of syllabus). The word limit of part A, B and C are 50, 200 and 500 respectively

Unit – I

Sets: different types of sets, set operations; Basic Counting Principles, Pigeonhole Principle, Binomial Coefficients, Binomial Theorem, Permutations, Combinations; **Matrices:** addition, multiplication; **Vectors:** Position vector, addition, subtraction and products of vectors.

Unit - II

Mathematical Induction; **Logic:** Propositions and logical operations, Conditional statements, Tautologies and Contradictions, Logical Equivalence, quantifiers.

Unit - III

Relations: Representation of Relations, Properties of relations, transitive closure; **Ordered Sets:** poset, Properties, Hasse Diagram, Extremal elements of posets ; **Functions:** Types of Functions, Asymptotic notations; **Co-ordinate Systems:** representation of points, straight lines, standard equation of circles.

Suggested Readings

1. Discrete Mathematics and its applications by K.H. Rosen, seventh edition
2. Discrete Mathematical Structures by Kolman, Busby and Ross, Sixth Edition, PHI.
3. Schaum's Outline Of Theory and Problems of Discrete Mathematics, Third Edition. SEYMOUR LIPSCHUTZ
4. NCERT Mathematics textbook for class XI and XII
5. Elements of Discrete Mathematics, TMH, C L Liu
6. Foundation Mathematics for Computer Science: A Visual Approach, John Vince, Springer
7. Calculus and Analytic Geometry, George B. Thomas and Ross L. Finney, Addison Wesley

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EXAMINATION 2019-20

Paper Code: MCS-102

Paper Name : Internet Programming

Scheme of Examination

Maximum Marks: 50

Duration: 3 Hours

Minimum Passing Marks: 13

The question paper contains 3 sections. **Section-A** consists of 10 questions (at least 3 questions from each unit of syllabus). **Section-B** will consists of 9 questions (3 questions from each unit of syllabus). **Section-C** will consist of 6 questions (2 questions from each unit of syllabus). The word limit of part A, B and C are 50, 200 and 500 respectively

Unit I

Internet Basics: Evolution of Internet, Basic internet terms and applications. ISP, Anatomy of an e-mail Message, basic of sending and receiving, E-mail Protocol; Mailing List-Subscribing, Unsubscribing. Introduction to World Wide Web and its work, Web Browsers, Search Engine, Downloading, Hyper Text Transfer Protocol (HTTP), URL, Web Servers, FTP, Web publishing- Domain Name Registration, Space on Host Server for Web Site, Maintain and Updating.

Unit - II

HTML: Elements of HTML & Syntax, Comments, Headings, Paragraph, Span, Pre Tags, Backgrounds, Formatting tags, Images, Hyperlinks, div tag, List Type and its Tags, Table Layout, div, frame, Use of Forms in Web Pages. CSS: Introduction to Cascading Style Sheets, Types of Style Sheets (Inline, Internal and External), using Id and Classes, CSS properties: Background Properties, Box Model Properties, Margin, Padding, List Properties, Border Properties, Positioning Properties,

Unit - III

Java Script: Introduction to Client Side Scripting, Introduction to Java Script, Comments, Variables in JS, Global Variables, Data types, Operators in JS, Conditions Statements (If, If Else, Switch), Java Script Loops (For Loop, While Loop, Do While Loop), JS Popup Boxes (Alert, Prompt, Confirm), JS Events, Onload, Onunload, Onsubmit, Onfocus, Onchange Event, Onblur Event, Onmouseover, Onclick, Ondblclick Events, JS Arrays, Working with Arrays, JS Objects, Window object, Document object, JS Functions, getElementById, innerHTML property, innerText property, form validation, email validation.

Suggested Readings

1. Thomas A. Powell , "HTML: The Complete Reference", Osborne/McGraw-Hill
2. Deitel, Deitel and Nieto : Internet & WWW. How to program, 2nd Edition, Pearson Education Asia.
3. E Stephen Mack, Janan Platt : HTML 4.0 , No Experience Required, 1998, BPB Publications.
4. "HTML Complete" by Sybex, BPB Publications, 2001.
5. Internet and Web Page Designing By V.K Jain (BPB)
6. Web Enabled Commercial Application Development Using HTML, DHTML , java script, Perl CGI By Ivan Bayross (BPB)

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EXAMINATION 2019-20

Paper Code: MCS-103

Paper Name : Computer Organization

Scheme of Examination

Maximum Marks: 50

Duration: 3 Hours

Minimum Passing Marks: 13

The question paper contains 3 sections. **Section-A** consists of 10 questions (at least 3 questions from each unit of syllabus). **Section-B** will consists of 9 questions (3 questions from each unit of syllabus). **Section-C** will consist of 6 questions (2 questions from each unit of syllabus). The word limit of part A, B and C are 50, 200 and 500 respectively

Unit I

Components of a Computer: Processor, Memory, Input-Output Unit, Difference between Organization and Architecture, Hardware Software Interaction. **Number System:** Concept of Bit and Byte, types and conversion. **Complements:** 1's complement, 2's complement. **Binary Arithmetic:** Addition, overflow, subtraction, multiplication (booth's algorithm) and division algorithm. **Logic gates:** Boolean Algebra, Map Simplification.

Unit II

Combinational circuits: Half Adder, Full Adder, Decoders, Multiplexers. **Sequential circuits:** Flip Flops- SR, JK, D, T Flip-Flop, Excitation Tables, State Diagram, State Table,, Registers, Counters.

Input Output Organization: Peripheral devices, I/O Interface, Asynchronous Data Transfer, Modes of Data Transfer, Priority Interrupt, Direct Memory Access, I/O Processor.

Memory Organization: Types and capacity of Memory, Memory Hierarchy, Associative Memory, Buffer, Cache Memory, Virtual Memory.

Unit III

Intel 8085 Microprocessor: Introduction, ALU, Timing and Control Unit, Register Set, Data and Address Bus, Addressing modes, Complete Intel 8085 Instruction set, Instruction format, Opcode and Operand, Word Size, Instruction Cycle, Pin Configuration, Intel 8085 programs.

Suggested Readings

1. Computer System Architecture, By M. Morris Mano (Pearson, Prentice Hall)
2. J.P. Hayes, "Computer Architecture & Organization", Tata McGraw Hill
3. Digital Computer Electronics By Malvino Leach, Jerald A. Brown(McGraw Hill)
4. Microprocessor Architecture, Programming, and Application With the 8085 By Ramesh Gaonkar (PENRAM)
5. Fundamentals of Microprocessor and Microcomputes By B.Ram (Danpat Rai Publications)

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EXAMINATION 2019-20

Paper Code: MCS-104

Paper Name : C++ Programming

Scheme of Examination

Maximum Marks: 50

Duration: 3 Hours

Minimum Passing Marks: 13

The question paper contains 3 sections. **Section-A** consists of 10 questions (at least 3 questions from each unit of syllabus). **Section-B** will consists of 9 questions (3 questions from each unit of syllabus). **Section-C** will consist of 6 questions (2 questions from each unit of syllabus). The word limit of part A, B and C are 50, 200 and 500 respectively

Unit I

Object Oriented System Object Oriented Paradigm: need, characteristics, applications. Basics of C++, branching, looping and jump statements. **Functions** : need, types, passing arguments by value and reference, recursive function, pointers and functions. **Arrays**: need, types, array and function, array and pointers.

Unit II

Class: Basics, static data members, Inline Function, Constructors and Destructors: need, types, usage, **Inheritance** - need, usage, types, compile time and run time polymorphism, overloading and overriding, virtual function, friend function, abstract class. **Operator overloading**: need, rules, through member function and through friend function.

Unit III

String handling, String class, Templates, Searching and Sorting: **Searching**: Linear Search, Binary Search. Sorting: Insertion Sort, Selection Sort, Quick Sort, Bubble Sort, Heap Sort, Shell Sort, Merge sort, Radix Sort, Counting Sort, Bucket Sort.

Suggested Readings

1. Object Oriented Programming With C++ By E. Balagurusamy (Tata Mcgraw Hill)
2. C++ The Complete Reference By Herbert Schildt (Tata Mcgraw Hill)
3. Object Oriented Programming With C++ By Schaum Series (Tata Mcgraw Hill)

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Semester II

Paper Code: MCS-201

Paper Name : Database Management System

Scheme of Examination

Maximum Marks: 50

Duration: 3 Hours

Minimum Passing Marks: 13

The question paper contains 3 sections. **Section-A** consists of 10 questions (at least 3 questions from each unit of syllabus). **Section-B** will consist of 9 questions (3 questions from each unit of syllabus). **Section-C** will consist of 6 questions (2 questions from each unit of syllabus). The word limit of part A, B and C are 50, 200 and 500 respectively

Unit I

Introduction: Characteristics of database approach, Advantages, Database system architecture, Overview of different types of Data Models and data independence, Schemas and instances, Database languages and interfaces; **E-R Model** : Entities, Attributes, keys, Relationships, Roles, Dependencies, E-R Diagram; Normalization: Definition, Functional dependencies and inference rules, 1NF, 2NF, 3NF and BCNF.

Unit II

Introduction to Relational model, Constraints: Domain, Key, Entity integrity, Referential integrity; Keys: Primary, Super, Candidate, Foreign; **Relational algebra**: select, project, union, intersection, minus, cross product, different types of join, division operations; aggregate functions and grouping; **SQL**: Data Types, statements: select, insert, update, delete, create, alter, drop; views, SQL algebraic operations, nested queries; Stored procedures: Advantages, Variables, creating and calling procedures, if and case statements, loops, Cursors, Functions, Triggers.

Unit III

Transactions processing: Definition, desirable properties of transactions, serial and non-serial schedules, concept of serializability, conflict-serializable schedules; **Concurrency Control:** Two-phase locking techniques, dealing with Deadlock and starvation, deadlock prevention protocols, basic timestamp ordering algorithm; Overview of database recovery techniques; concept of data warehousing.

Suggested Readings

1. Fundamentals of Database Systems, Ramez A. Elmasri, Shamkant Navathe, 5th Ed (Pearson)
2. Database System Concepts By Korth, Silberschatz, Sudarshan (Mcgraw Hill)
3. An Introduction to Database Systems By Bipin C. Desai (Galgotia Publication.)
4. SQL, PL/SQL Programming By Ivan Bayross (BPB)
5. Commercial Application Development Using Oracle Developer 2000 By Ivan Bayross (BPB)

Web Resources

1. <http://www.mysqltutorial.org/mysql-stored-procedure-tutorial.aspx>

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EXAMINATION 2019-20

Paper Code: MCS-202

Paper Name : Data Communication and Networking

Scheme of Examination

Maximum Marks: 50

Duration: 3 Hours

Minimum Passing Marks: 13

The question paper contains 3 sections. **Section-A** consists of 10 questions (at least 3 questions from each unit of syllabus). **Section-B** will consist of 9 questions (3 questions from each unit of syllabus). **Section-C** will consist of 6 questions (2 questions from each unit of syllabus). The word limit of part A, B and C are 50, 200 and 500 respectively

Unit - I

Data Communication and Networking: Overview, Network Types, LAN Technologies, Topologies, Models- OSI Model, TCP/IP Stack, Security

Physical Layer: Introduction, Impairments, Performance, Digital Transmission, modes, digital to digital, analog to digital, Analog Transmission, digital to analog, analog to analog, Transmission media, Wireless Transmission, Multiplexing, FDM, TDM, CDM, WDM,

Switching techniques: Circuit Switching, Packet switching, Datagram, Virtual circuit and Permanent Virtual Circuit, Connectionless and connection oriented communication, Message switching,

Unit - II

Data Link Layer: Introduction, Error detection and Correction, Data Link Control: Line Discipline- Enq/Ack, Poll/Select, **Flow Control** : Stop And Wait, Sliding Window, **Error Control** : ARQ, Stop and Wait ARQ, Sliding Window ARQ.

Network Layer: Introduction, Network Addressing, Routing, Internetworking, Tunneling, Packet Fragmentation, Network Layer Protocols, ARP, ICMP, IPv4, IPv6

Transport Layer: Introduction, Function, End to end communication, Transmission Control Protocol, User Datagram Protocol

Application Layer: Introduction, Client-Server Model, Application Protocols, Network Services

Unit - III

Cyber Security: definition, cybercrime and information security, cybercriminals, classification of cybercrime. Cyber offences: categories of cybercrime.

Tools and methods used in cybercrime: phishing, types of phishing, types and techniques of ID theft, password cracking, keyloggers and spywares, backdoors, steganography, DoS, SQL Injection.

Cybercrime on mobile and wireless devices: attacks on wireless networks, Authentication security service, attacks on mobile phones. Cyber Law, The Indian IT Act, Digital Signatures, Anti- Cybercrime Strategies, Cyberterrorism, Indian ITA 2000.

Suggested Readings

1. Cyber Security by Nina Godbole & sunit Belapure
2. Data Communication and Networking By Forozan (Tata McGraw Hill)
3. Data Communication And Computer Networks By Dr. Madhulika Jain, Satish Jain (BPB)
4. William Stallings, "Data and Computer Communications", Pearson Education, 2008.
5. A. S. Tanenbaum, "Computer Networks", Fourth Edition, Pearson Education.

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EXAMINATION 2019-20

Paper Code: MCS-203

Paper Name : Operating System

Scheme of Examination

Maximum Marks: 50

Duration: 3

Hours

Minimum Passing Marks: 13

The question paper contains 3 sections. **Section-A** consists of 10 questions (at least 3 questions from each unit of syllabus). **Section-B** will consists of 9 questions (3 questions from each unit of syllabus). **Section-C** will consist of 6 questions (2 questions from each unit of syllabus). The word limit of part A, B and C are 50, 200 and 500 respectively

Unit I

Introduction to Operating System, layered Structure, Functions, Types; Process: Concept, Process States, PCB; Threads, System calls; Process Scheduling: types of schedulers, context switch, CPU Scheduling, Pre-Emptive Scheduling, Scheduling Criteria- CPU Utilization, Throughput, Turnaround Time, Waiting Time, Response Time; Scheduling Algorithms- FCFS, SJF, Priority Scheduling, Round Robin Scheduling, MLQ Scheduling, MLQ With Feedback.

Unit II

Synchronization: Critical Section Problem, Requirements for a solution to the critical section problem; Semaphores, simple solution to Readers-Writers Problem. Deadlock: Characterization, Prevention, Avoidance, Banker's Algorithm, Recovery from Deadlock. Memory Management: Physical and virtual address space, Paging, Overview of Segmentation; Virtual Memory Management: Concept, Page Replacement techniques- FIFO, LRU, Optimal

Unit III

Linux: features of Linux, steps of Installation, Shell and kernel, Directory structure, Users and groups, file permissions, commands- ls, cat, cd, pwd, chmod, mkdir, rm, rmdir, mv, cp, man, apt, cal, uname, history etc. ; Installing packages; Shell scripts: writing and executing a shell script, shell variables, read and expr, decision making (if else, case), for and while loops.

Suggested Readings

1. Operating System Principals By Abraham Silberschatz, Peter Baer Galvin (John Wiley And Sons Inc.)
2. Operating System Concepts And Design By Milan Milen Kovic (Tata Mcgraw Hill)
3. Modern Operating System Andrew S. Tanenbaum, Herbert Bos
4. Linux in easy steps, Mike McGrath, in easy steps limited
5. Unix concepts and applications , TMH, Sumitabha Das

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Paper Code: MCS-204

Paper Name : PHP

Scheme of Examination

Maximum Marks: 50

Duration: 3 Hours

Minimum Passing Marks: 13

The question paper contains 3 sections. **Section-A** consists of 10 questions (at least 3 questions from each unit of syllabus). **Section-B** will consists of 9 questions (3 questions from each unit of syllabus). **Section-C** will consist of 6 questions (2 questions from each unit of syllabus). The word limit of part A, B and C are 50, 200 and 500 respectively

Unit – I

PHP: Installation of PHP. **Building Blocks of PHP:** Variables, data types, Operators & Expressions, Constants, Switching, Flow, Loops. **Functions:** Meaning, Calling, Defining a function. Return value from user defined function. **Arrays:** Creating arrays, Array related functions. **Working with String, Date & Time:** Formatting String with PHP, Using Date and time Functions with PHP. Working with file and Directories.

Unit – II

Forms: Creating simple input Form. Accessing Form input with user defined arrays, HTML and PHP Code on a single page. Redirecting User. Working with File Upload. Uploading & Downloading. **State management:** Using query string(URL rewriting), Using Hidden field, Using cookies, Using session. **Email:** Sending Email, Headers. **Exception Handling:** Understanding Exception and error, Try, catch, throw

Unit – III

Connecting to the MYSQL: Selecting a database, Adding data to a table, Displaying returned data on Web pages, Inserting data, Deleting data, Entering and updating data, Executing multiple queries, executing stored procedures.

Suggested Readings

1. Teach Yourself PHP, MYSQL & Apache By Meloni, Pearson Education.
2. Open Source Development with LAMP: Using Linux, Apache, MySQL, Perl & PHP By James Lee, Pearson Education.
3. PHP: A Beginner's Guide By Vaswani, Vikram Tata Mc-Graw Hill.

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Semester III

Paper Code: MCS-301

Paper Name : Data Structures

Scheme of Examination

Maximum Marks: 50

Duration: 3 Hours

Minimum Passing Marks: 13

The question paper contains 3 sections. **Section-A** consists of 10 questions (at least 3 questions from each unit of syllabus). **Section-B** will consist of 9 questions (3 questions from each unit of syllabus). **Section-C** will consist of 6 questions (2 questions from each unit of syllabus). The word limit of part A, B and C are 50, 200 and 500 respectively

Unit I

Algorithm: Efficiency & Analysis Algorithm: Time and Space complexity of Algorithm.
Abstract Data Type: Linked List- Linear, Circular, Two Way List, Basic Operation on Linked Lists, Application of Linked List.

Unit II

Stack : primitive operations, stack Application- Infix, postfix, prefix and Recursion Array and Linked Representation of Stack. **Queue:** Primitive operation, Circular Queue, Priority Queue, D-queue, Array and Linked Representation of Queue.

Unit III

Trees : Basic terminology, **Binary Tree :** Representation as Array and link List, Basic operation, **Tree Traversal :** Inorder, Preorder, Postorder, Application of Binary Tree. B-tree, Height Balance Tree (AVL Tree) **Graph :** Basic Terminology, Directed, Undirected, Weighted, Representation of Graphs, **Graph Traversal :** Depth First Traversal, Breadth First Search.

Suggested Readings

1. Expert Data Structure with 'C' By R.B Patel (Khana Book Publishing Co.(P))
2. Data structure By Lipschutz (Tata McGraw Hill)
3. Data Structure By Yashvant Kanitkar (BPB)
4. An Introduction to Data Structures with Applications By Jean-Paul Tremblay, Paul G.Sarerson (Tata McGraw Hill)
5. Data Structure Using C and C++ By Yedidyah Langsam, Moshe J.Augenstein, Arora M. Tenenbaum (Prentice- Hall India)

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EXAMINATION 2019-20

Paper Code: MCS-302

Paper Name : Java

Scheme of Examination

Maximum Marks: 50

Duration: 3 Hours

Minimum Passing Marks: 13

The question paper contains 3 sections. **Section-A** consists of 10 questions (at least 3 questions from each unit of syllabus). **Section-B** will consists of 9 questions (3 questions from each unit of syllabus). **Section-C** will consist of 6 questions (2 questions from each unit of syllabus). The word limit of part A, B and C are 50, 200 and 500 respectively

Unit I

Introduction to java: evolution, features, comparison with C and C++; Java program structure; tokens, keywords, constants, variables, data types, type casting, statements, Operators and Expression; Conditional Statements and Loop Statements. **Class:** syntax, instance variable, class variables, methods, constructors, overloading of constructors and methods.

Unit II

Inheritance: types of inheritance, use of super, method overriding, final class, abstract class, wrapper classes.

Arrays, Strings and Vectors, Packages and Interfaces, visibility controls

Unit III

Errors and Exceptions: Types of errors, Exception classes, Exception handling in java, use of try, catch, finally, throw and throws. Taking user input, Command line arguments.

Multithreaded Programming: Creating Threads, Life cycle of thread, Thread priority, Thread synchronization, Inter-thread communication, Implementing the Runnable Interface;

Applet: Applet Life Cycle, Applet Tag, Adding Applet to HTML File; Passing Parameters to Applets, Getting Input From User.

Suggested Readings

1. The Complete reference Java Ninth Edition By Herbert Schildt (Tata McGraw Hill)
2. Beginning Programming with Java For Dummies by Burd, For Dummies; 3 edition
3. Java: A Beginner's Guide, Sixth Edition: A Beginner's Guide by Herbert Schildt, McGraw-Hill Osborne MediaProgramming in JAVA By E. Balagurusamy (TMH)
4. JAVA 2 programming Black Book By Steven Holzner et al. (Dreamtech Press)
5. Programming in JAVA By E. Balagurusamy (TMH)

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EXAMINATION 2019-20

Paper Code: MCS-303

Paper Name : Software Engineering & Research Methodology

Scheme of Examination

Maximum Marks: 50

Duration: 3 Hours

Minimum Passing Marks: 13

The question paper contains 3 sections. **Section-A** consists of 10 questions (at least 3 questions from each unit of syllabus). **Section-B** will consists of 9 questions (3 questions from each unit of syllabus). **Section-C** will consist of 6 questions (2 questions from each unit of syllabus). The word limit of part A, B and C are 50, 200 and 500 respectively

Unit I

Software : Software Characteristics, Software Process, Process Characteristics, **Software Process Model** : Linear Sequential Model, Prototyping Model, Spiral Model, Software Quality, McCall's Quality Factors, **Software Requirement Analysis and Specification (SRS)** : Need Characteristics and Components.

Unit II

Planning a Software Project: COCOMO Model, Project Monitoring Plan and Risk Management. **Design Principle** : Abstraction, Modularity, Cohesion and Coupling, **Software Management** : Size Oriented Matrices, Function Oriented Matrices. **Testing** : Testing Fundamental, Functional Testing (Black Box), Structural Testing (White Box), Alpha And Beta Testing, **Testing Process** : Comparison of Different Testing, Level of Testing.

Unit III

Research Methodology: Meaning of Reaserch, Objective of Research, Types of Research, Research Approaches, Significance of research, Research Methods versus Methodology, Research Process, Criteria of Good Research, , What is Research Problem, Selecting the problem, Necessity of defining the problem, Technique involved in defining a problem.

Suggested Readings

1. Software Engineering: A Practitioner's Approach By Roger S. Pressman, McGraw Hill.
2. Software Engineering: A Precise Approach by Pankaj Jalote, Wiley Precise textbook Series
3. Research Methodology Methods and Techniques by C. R. Kothari, New Age International Publisher

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EXAMINATION 2019-20

Paper Code: MCS-304

Paper Name : Computer Graphics & Multimedia

Scheme of Examination

Maximum Marks: 50

Duration: 3 Hours

Minimum Passing Marks: 13

The question paper contains 3 sections. **Section-A** consists of 10 questions (at least 3 questions from each unit of syllabus). **Section-B** will consist of 9 questions (3 questions from each unit of syllabus). **Section-C** will consist of 6 questions (2 questions from each unit of syllabus). The word limit of part A, B and C are 50, 200 and 500 respectively

Unit I

Basic elements of Computer Graphics, Graphics display devices, Applications of Computer Graphics, Raster and random scan; Color Models :RGB, CMY, HSV; Graphics Standard : OpenGL; Scan Conversion: DDA line algorithm, Mid-point circle Algorithm. 2D Transformation: Translation, Rotation, Scaling, Homogenous Co-ordinates and Matrix Representation of 2D Transformation, Composite Transformation.

Unit II

3D Graphics: Matrix Representation of 3D transformations, Translation, Rotation, Scaling, Composite Transformation. Overview of concepts: Clipping, orthographic and parallel projection, hidden surface removal, lighting , transparency, modelling and texturing, rendering ; Animations : Principles of animations ,keyframing,concept of 2D and 3D animation .

Unit III

Blender: GUI Interface, Selecting,rotating and Translating Objects, Using Snap to move objects precisely, Creating mesh primitives and extrusions, Subdividing meshes, Creating a simple creature, Joining mesh objects and stitching vertices , Organizing a scene with layers, groups, and hierarchies, Assigning glossy and reflective materials to objects, Creating bump maps, Creating sky and ambient light, Understanding ambient occlusion, Adding motion blur and depth of field, Editing animation in the Graph Editor, Building and animating a simple character.

Suggested Readings

1. Computer Graphics (Principles and Practice) by Foley, van Dam, Feiner and Hughes, Addison Wesley (Indian Edition)
2. Computer Graphics by D Hearn and P M Baker, Printice Hall of India (Indian Edition).
3. Mathematical Elements for Computer Graphics by D F Roger.
4. Introduction to Computer Graphics By Krihsnamurthy N (Tata McGraw Hill)
5. Theory and Problems of Computer Graphics (Schaum's Outline) By Zhigang X. and Plastock Ra. (Tata McGraw Hill)

Web Resources

1. <https://www.cs.duke.edu/brd/Teaching/Previous/Animation/animation.html>
2. [http://zikky.lecturer.pens.ac.id/Produksi 3D untuk Designer/Beginning Blender-book.pdf](http://zikky.lecturer.pens.ac.id/Produksi%203D%20untuk%20Designer/Beginning%20Blender-book.pdf)
3. <http://www.blenderhd.com/wp-content/uploads/2015/08/BeginnersGuideToBlender.pdf>
4. https://people.sc.fsu.edu/~gerlebacher/gd/blender/blender/blender_noob_to_pro.pdf
5. [http://download.blender.org/documentation/pdf/John M Blain - An Introduction To Blender 3D - A Book For Beginners \(2011\).pdf](http://download.blender.org/documentation/pdf/John%20M%20Blain%20-%20An%20Introduction%20To%20Blender%203D%20-%20A%20Book%20For%20Beginners%20(2011).pdf)
6. http://www.cdschools.org/cms/lib04/PA09000075/Centricity/Domain/81/BlenderBasics_4thEdition2011.pdf
7. <https://docs.blender.org/manual/en/dev/index.html>

Masters in Computer Science (Semester System)

EXAMINATION 2019-20

Semester IV

Paper Code: MCS-401(a)

Paper Name : Search Engine Optimization

Scheme of Examination

Maximum Marks: 50

Duration: 3 Hours

Minimum Passing Marks: 13

The question paper contains 3 sections. **Section-A** consists of 10 questions (at least 3 questions from each unit of syllabus). **Section-B** will consist of 9 questions (3 questions from each unit of syllabus). **Section-C** will consist of 6 questions (2 questions from each unit of syllabus). The word limit of part A, B and C are 50, 200 and 500 respectively

Unit – I

Basics for SEO: What is Domain, Basic Knowledge of World Wide Web, Difference between Portal and Search Engines, What is SEO, Types of SEO Techniques, Black hat techniques, White Hat techniques, How Search Engine works. **SEO Research & Analysis:** Market Research, Keyword Research and Analysis, Keyword opportunity, Competitors Website Analysis, SWOT Analysis of Website, How to Choose Best Keywords, Tools available for Keyword Research. **Website Design SEO Guidelines:** Content Research, Content Guidelines, Content Optimization, Design & Layout, XML Sitemap / URL List Sitemap.

Unit - II

On-page Optimization: The Page Title, Meta Descriptions & Meta Keywords, Headings, Bold Text, Domain Names & Suggestions, Canonical Tag, Meta Tags, Images and Alt Text, Internal Link Building, The Sitemap, Invisible Text, Server and Hosting Check, Robots Meta Tag, Doorway Pages, 301 Redirects, 404 Error, Duplicate content.

Unit – III

Off-page Optimization: Page Rank, Link Popularity, Link Building in Detail, Directory Submission, Social Bookmark Submission, Blog Submission, Articles, Links Exchange, Reciprocal Linking, Posting to Forums, Submission to Search Engine, RSS Feeds Submissions, Press Release Submissions, Forum Link Building, Competitor Link Analysis. **Analytics:** Google Analytics, Advanced Reporting, Webmaster Central & Bing/Yahoo, Open Site Explorer, Website Analysis using various SEO Tools available. **SEO Tools:** Keyword Density Analyzer Tools, Google Tools, Yahoo / Bing Tools, Rich Snippet Text Tools, Comparison Tools, Link Popularity Tools, Search Engines Tools, Site Tools, Miscellaneous Tools.

Suggested Readings

1. The Art of SEO (Theory in Practice) - Eric Enge, Stephen Spencer, Jessie Stricchiola, and Rand Fishkin (O'REILLY)
2. Search Engine Optimization All-in-One For Dummies by Bruce Clay
3. SEO Step-by-Step by Caimin Jones

Masters in Computer Science (Semester System)

EXAMINATION 2019-20

Paper Code: MCS-401(b)

Paper Name : Data Mining

Scheme of Examination

Maximum Marks: 50

Duration: 3 Hours

Minimum Passing Marks: 13

The question paper contains 3 sections. **Section-A** consists of 10 questions (at least 3 questions from each unit of syllabus). **Section-B** will consist of 9 questions (3 questions from each unit of syllabus). **Section-C** will consist of 6 questions (2 questions from each unit of syllabus). The word limit of part A, B and C are 50, 200 and 500 respectively

Unit I

Data mining Introduction: Definition, Data mining tasks, Data mining as a step of Knowledge discovery process, Applications of Data mining; Data objects and types of attributes, Recalling mean, median, mode and weighted arithmetic mean, Data quality, overview of data preprocessing.

Unit II

Classification analysis- definition, Overview of various classification techniques; Decision tree induction- working, examples, specifying attribute test conditions, Measures of node impurity, measures for selecting best split; Evaluating the performance of a classifier- Holdout method, Random subsampling, cross-validation, Bootstrap.

Unit III

Association analysis: support, confidence, association rules, Frequent Item sets; Frequent itemset generation - Apriori principle, Apriori algorithm and examples, FP growth algorithm and examples; Closed and maximal frequent itemsets. Cluster analysis: Definition, overview of basic clustering methods, Density based methods-DBSCAN.

Suggested Readings

1. Data Mining: Concepts and Techniques, 3rd edition, Jiawei Han and Micheline Kamber
2. Introduction to Data Mining, Pang-Ning Tan, Michael Steinbach, Vipin Kumar, Pearson Education.
3. Data Mining: A Tutorial Based Primer, Richard Roiger, Michael Geatz, Pearson Education 2003.
4. Introduction to Data Mining with Case Studies, G.K. Gupta, PHI 2006
5. Insight into Data mining: Theory and Practice, Soman K. P., DiwakarShyam, Ajay V., PHI 2006
6. Data Mining:: Practical Machine Learning Tools and Techniques (Morgan Kaufmann Series in Data Management Systems) by Witten, Frank, Hall

Masters in Computer Science (Semester System)

EXAMINATION 2019-20

Paper Code: MCS-402(c)

Paper Name : Python

Scheme of Examination

Maximum Marks: 50

Duration: 3 Hours

Minimum Passing Marks: 13

The question paper contains 3 sections. **Section-A** consists of 10 questions (at least 3 questions from each unit of syllabus). **Section-B** will consist of 9 questions (3 questions from each unit of syllabus). **Section-C** will consist of 6 questions (2 questions from each unit of syllabus). The word limit of part A, B and C are 50, 200 and 500 respectively

Unit I

Overview of Programming : Structure of a Python Program, Python Interpreter, Using Python as calculator, Python shell, Indentation. Identifiers and keywords, data types, Operators. Creating Python Programs : Input and Output Statements, if-else statements, Loops(while, for) and Control Statements (continue, break), nested loops.

Unit II

Functions and scoping. Iteration and Recursion, Stack diagrams for recursive functions, Multiple assignment, Implementing 2-D matrices. Strings and Lists: String as a compound data type, Length, Traversal, String slices, String comparison, find function, Looping and counting, List values, Accessing elements, List length, List membership, Lists and for loops, List operations, List deletion. Cloning lists, Nested lists . Exception handling.

Unit III

Basic File Operations in Python, Object Oriented Programming: Introduction to Classes, Objects and Methods, Standard Libraries. Tuples, sequences and dictionaries. Overview of sets, stacks and queues. Overview of packages: networkx, matplotlib.pyplot, numpy. Applications of Python in real world.

Suggested Readings

1. T. Budd, Exploring Python, TMH, 1st Ed, 2011
2. Introduction to Computation and Programming Using Python. By John V. Guttag, MIT Press.
3. Learning Python , Mark Lutz, David Ascher, O'Reilly

Web Resources

1. http://files.swaroopch.com/python/byte_of_python.pdf
2. <https://www.cs.uky.edu/~keen/115/Haltermanpythonbook.pdf>
3. <http://greenteapress.com/thinkpython/thinkpython.pdf>
4. Python tutorials: <https://docs.python.org/3/tutorial/index.html>

Masters in Computer Science (Semester System)

EXAMINATION 2019-20

Paper Code: MCS-402(a)

Paper Name : Android Programming

Scheme of Examination

Maximum Marks: 50

Duration: 3 Hours

Minimum Passing Marks: 13

The question paper contains 3 sections. **Section-A** consists of 10 questions (at least 3 questions from each unit of syllabus). **Section-B** will consists of 9 questions (3 questions from each unit of syllabus). **Section-C** will consist of 6 questions (2 questions from each unit of syllabus). The word limit of part A, B and C are 50, 200 and 500 respectively

Unit - I

java (Exception handling & Packages & interfaces & JVM & .jar file extension & Multi threading. Database(DML&DDL) , What is Android & Setting up development environment & various editors. Application Structure (AndroidManifest.xml , uses-permission & uses-sdk , Resources & R.java , Assets & Layouts &Drawable Resources , Activities and Activity lifecycle.

Unit - II

Eclipse editor :(Menu , Option menu , Context menu , Sub menu , menu from xml , menu by code). SQLite Programming , SQLiteOpenHelper , SQLiteDatabase. Adapters and Widgtes (Adapters:- a. ArrayAdapter b. BaseAdapters , ListView and ListActivity , Custom listview , GridView using adapters , Gallery using adapters).

Unit - III

Notifications (Broadcast Receivers , Services and notifications , Toast , Alarms). Advanced o Live Folders (Using sdcards , XML Parsing , JSON Parsing , Maps, GPS, Location based Services, Accessing Phone services :(Call, SMS, MMS)).

Suggested Readings

1. Android Programming for Beginners by John Horton Publisher: Packt Publishing
2. Learn Java for Android Development (2nd edition) by Jeff Friesen Publisher: Apress
3. Android application development for java programmers. By James C. Sheusi. Publisher: Cengage Learning, 2013.
4. Beginning Android Programming with Android Studio, Fourth Edition by Jerome F. DiMarzio Publisher: John Wiley & Sons
5. Android Programming: The Big Nerd Ranch Guide by Kristin Marsicano , Chris Stewart , Bill Phillips Publisher: Big Nerd Ranch Guides

Masters in Computer Science (Semester System)

EXAMINATION 2019-20

Paper Code: MCS-402(b)

Paper Name : Advanced Web Programming

Scheme of Examination

Maximum Marks: 50

Duration: 3 Hours

Minimum Passing Marks: 13

The question paper contains 3 sections. **Section-A** consists of 10 questions (at least 3 questions from each unit of syllabus). **Section-B** will consists of 9 questions (3 questions from each unit of syllabus). **Section-C** will consist of 6 questions (2 questions from each unit of syllabus). The word limit of part A, B and C are 50, 200 and 500 respectively

Unit -I

Basic of the .NET framework: .NET Architecture, managed code, assemblies, clr, execution of assemblies code, il, jit, net framework class library, common type system, common language specification. Overview C#, similarities and differences from JAVA, Structure of C# program. Language features- Type system, boxing and Unboxing, flow controls, Classes, Properties, Indexers, Constructors, Inheritance, Interfaces, Delegates.

Unit -II

Understanding ASP.NET Controls: Web forms, Buttons, Text Box, Labels, Checkbox, Radio Buttons, List Box etc. Running a web Application, creating a multiform web project, Form Validation Controls- Required Field, Compare, Range. Calendar Control, Ad Rotator Control, State Management-View State, Session State, Application State.

Unit -III

Architecture Of ADO.NET, Connected and Disconnected Database, Create Connection Using ADO.NET Object Model, Connection Class, Command Class, DataReader Class, Data adapter Class, Dataset Class. Display Data on Bound Controls and Gridview. Database Accessing on Web Applications: Insert records in database, delete and update records from database, Display a particular record and all records on web form.

Suggested Readings

1. ASP.NET 2.0 Black Book By RudrakshBatra, CharulShukla (Dream Tech Press)
2. ASP. NET Bible By MridulaParihar and et al. (Hungry Minds, New York)
3. Andrew Troelsen – “C# and the .Net Platform” – Apress – 2001.(Unit I and II)
4. Alex Homer et. al. – “Professional ASP .NET 1.1” – Wiley-dreamtech India Pvt. Ltd. – 2004.
5. ASP.NET Developer’s Guide By G Buezek (TMH)
6. .NET Framework Essentials 3rd Edition (O’Reilly)

Masters in Computer Science (Semester System)

EXAMINATION 2019-20

Paper Code: MCS-402(c)

Paper Name : Advanced Java

Scheme of Examination

Maximum Marks: 50

Duration: 3 Hours

Minimum Passing Marks: 13

The question paper contains 3 sections. **Section-A** consists of 10 questions (at least 3 questions from each unit of syllabus). **Section-B** will consists of 9 questions (3 questions from each unit of syllabus). **Section-C** will consist of 6 questions (2 questions from each unit of syllabus). The word limit of part A, B and C are 50, 200 and 500 respectively

Unit I

AWT : AWT Classes, Working With Frame Windows, Working With Graphics, Working With Colour, Adding And Removing Controls, Responding To Controls, Labels, Buttons, Checkbox, Checkbox Group, Choice Control, Lists, Scroll Bars, Text Field, Text Area. Menus, Dialog Box Handling Events. **Swings** : Icons and Labels, Text Field, Buttons, Combo box.

Unit II

JDBC : Class Methods, JDBC Components, Driver, Connecting to Database, Insert, delete and update records in database, Processing Results.

Unit III

Servlet: architecture, life cycle of a Servlet, initialization, Servlet and HTML, retrieving data in Servlet, GET and POST methods;

JavaServer Pages (JSP): Introduction, JavaServer Pages Overview, A First JavaServer Page Example, Implicit Objects, Scripting, Standard Actions, Directives, Custom Tag Libraries

Suggested Readings

1. The Complete reference Java Ninth Edition By Herbert Schildt (Tata McGraw Hill)
2. Introduction to Java Programming, Comprehensive Version (9th Edition) by Y. Daniel Liang, Prentice Hall
3. Effective Java by Joshua Bloch, Second Edition,
4. JAVA 2 programming Black Book By Steven Holzner et al. (Dreamtech Press)

Masters in Computer Science (Semester System)

EXAMINATION 2019-20

Paper Code: MCS-403(a)

Paper Name : Artificial Intelligence

Scheme of Examination

Maximum Marks: 50

Duration: 3 Hours

Minimum Passing Marks: 13

The question paper contains 3 sections. **Section-A** consists of 10 questions (at least 3 questions from each unit of syllabus). **Section-B** will consist of 9 questions (3 questions from each unit of syllabus). **Section-C** will consist of 6 questions (2 questions from each unit of syllabus). The word limit of part A, B and C are 50, 200 and 500 respectively

Unit I

Definition, History, Agents and environment, Defining the problem as a state and space search, What is Intelligence? Types of Intelligence, Difference between Human and Machine Intelligence, The Structure of Intelligent Agents. Solving problems by searching: Uninformed search strategies- Brute-Force, Breadth-First, Uniform-cost search Depth-First, Depth-limited search, depth-first search, Bidirectional search. Informed (heuristic) search strategies- Greedy best-first search, A*, AO* Memory-bounded heuristic search.

Unit II

Heuristic functions, local search algorithms- Hill-climbing search, Simulated annealing, Local beam search. Knowledge Based System: Knowledge, Procedure V/S Declarative Knowledge, Knowledge Representation: Using Procedural and Predicate Logic, Inference in First order logic: Unification and Lifting, Forward Chaining, Backward Chaining, Resolution. Rule based System, Frames, Scripts, and Semantic Nets.

Unit III

Probabilistic Reasoning, Probability and Bayes Theorem, represent knowledge in uncertain domain, Certainty factors, Bayesian Networks, Dempster-Shafer theory, introduction to Fuzzy logic. Learning: types of learning, decision trees. **Expert System: types, architecture. Introduction to Artificial Neural Networks, Reinforcement learning, Natural Language Processing, Pattern Recognition and Perception.**

Suggested Readings

1. Artificial Intelligence By Rich And Knight (Tata McGraw Hill)
2. Introduction to Artificial Intelligence and Expert Systems By Patterson (Prentice-Hall India)
3. Artificial Intelligence A Modern Approach by Russell and Norvig, Prentice Hall

Masters in Computer Science (Semester System)

EXAMINATION 2019-20

Paper Code: MCS-403(b)

Paper Name : Cloud Computing

Scheme of Examination

Maximum Marks: 50

Duration: 3 Hours

Minimum Passing Marks: 13

The question paper contains 3 sections. **Section-A** consists of 10 questions (at least 3 questions from each unit of syllabus). **Section-B** will consist of 9 questions (3 questions from each unit of syllabus). **Section-C** will consist of 6 questions (2 questions from each unit of syllabus). The word limit of part A, B and C are 50, 200 and 500 respectively

Unit I

Introduction to Cloud Computing, Services provided by cloud-SaaS, PaaS, IaaS, DaaS etc. Functioning of cloud computing, Advantages, Disadvantages, Applications, Cloud Service Providers- Amazon AWS, Google App Engine, Microsoft, VMware. Virtualization concepts, Objectives, Types of Virtualization & its benefits, Introduction to Various Virtualization OS (Hypervisor). Virtualization for Enterprises

Unit II

Designing and Implementing a Data Center-Based Cloud, Industry and International Standards for Cloud Implementation, Building private cloud using open source tools, Integration of Public and Private Cloud. Private, Public & Hybrid Clouds, their Advantages & Disadvantages, On Premises and Off Premises Cloud services, installing a Cloud service.

Unit III

Cloud Security issues - Infrastructure Security, Network level security, Host level security, Application level security, Data privacy and security Issues, Jurisdictional issues raised by Data location, Access Control, Trust, Reputation, Risk and Authentication in cloud computing

Suggested Readings

1. Cloud Computing Concepts Technology and Architecture by Thomas Erl, Prentice Hall
2. Cloud Computing principles and paradigms by Rajkumar Buyya, James Broberg and Andrzej Goscinski, John Wiley and Sons, Inc. Publication
3. Cloud Computing Theory and Practice by Dan C. Marinescu, Morgan Kaufman Publication

Masters in Computer Science (Semester System)

EXAMINATION 2019-20

Paper Code: MCS-403(c)

Paper Name : Internet of Things

Scheme of Examination

Maximum Marks: 50

Duration: 3 Hours

Minimum Passing Marks: 13

The question paper contains 3 sections. **Section-A** consists of 10 questions (at least 3 questions from each unit of syllabus). **Section-B** will consist of 9 questions (3 questions from each unit of syllabus). **Section-C** will consist of 6 questions (2 questions from each unit of syllabus). The word limit of part A, B and C are 50, 200 and 500 respectively

Unit I

M2M to IoT : Introduction, Market Perspective, Architectural Overview. M2M to IOT Technology- Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, IoT analytics, Knowledge management, IOT Architecture, Architecture Reference Model, Real world design constraints.

Unit II

IOT Use Cases- Asset Management, **Industrial Automation-** Service-oriented architecture-based device integration, SOCRADES: realizing the enterprise integrated Web of Things, IMC-AESOP: from the Web of Things to the Cloud of Things, **Commercial Building Automation-** Introduction, Case study: phase one-commercial building automation today, Case study: phase two- commercial building automation in the future.

Unit III

Internet of Things Privacy, Security and Governance Introduction, Overview of Governance, Privacy and Security Issues, Contribution from FP7 Projects, Security, IOT and Smart Cities, Privacy and Trust in IoT-Data-Platforms for Smart Cities, First Steps Towards a Secure Platform, Smartie Approach. Data Aggregation for the IoT in Smart Cities, Security

Suggested Readings

1. From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence by Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, 1st Edition, Academic Press, 2014.
2. Internet of Things (A Hands-on-Approach) by Vijay Madisetti and Arshdeep Bahga, 1st Edition, VPT, 2014.
3. Rethinking the Internet of Things: A Scalable Approach to Connecting Everything by Francis daCosta, 1st Edition, Apress Publications, 2013
4. Designing the Internet of Things , Adrian McEwen (Author), Hakim Cassimally
5. Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems by Dr. Ovidiu Vermesan, Dr. Peter Friess, River Publishers
6. Internet of Things (A Hands-on-Approach) , Vijay Madisetti , Arshdeep Bahga
7. Building the internet of things with ipv6 and mipv6, The Evolving World of M2M Communications, Daniel Minoli John Wiley & Sons

Masters in Computer Science (Semester System)

EXAMINATION 2019-20

Paper Code: MCS-404

Paper Name : Project

Scheme of Examination

Maximum Marks: 50

Duration: 3 Hours

Minimum Passing Marks: 13

1. Marks distribution for External Project report of 40 marks is as under
 - a. External Evaluation-
 - i. Project Dissertation 25 marks
 - ii. Presentation 10 marks
 - iii. External Viva Voce 5 marks
 - b. Internal Evaluation- Dissertation 10 Marks

Practical Training and Project Work:

1. Project Work may be done individually or in groups in case of bigger projects. However if project is done in group each student must be given a responsibility for a distinct module and care should be taken to monitor the individual student.
2. Project Work can be carried out in the college or outside with prior permission of college.
3. The Student must submit a synopsis of the project report to the college for approval. The Project Guide can accept the project or suggest modification for resubmission. Only on acceptance of draft project report the student should make the final copies.
4. **Project Report should be hand written.**

Submission Copy:

The Student should submit spiral bound copy of the project report.

Format of the Project:

1. **Paper:**

The Report shall be typed on White Paper of A4 size.
2. **Final Submission:**

The Report to be submitted must be original.
3. **Typing:**

Font:- Times New Roman
Heading:- 16 pt., Bold
Subheading:- 14 pt, Bold
Content:- 12 pt.
Line Spacing:- 1.5 line.
Typing Side :- One Side
Font Color:- Black.
4. **Margins:**

The typing must be done in the following margin:
Left : 0.75”
Right: 0.75”
Top: 1”
Bottom: 1”
Left Gutter: 0.5”
5. **Binding:**

The report shall be Spiral Bound.

Masters in Computer Science (Semester System)

EXAMINATION 2019-20

6. Title Cover:

The Title cover should contain the following details:

Top: Project Title in block capitals of 16pt.

Centre: Name of project developer's and Guide name.

Bottom: Name of the university, Year of submission all in block capitals of 14pt letters on separate lines with proper spacing and centering.

7. Blank sheets:

At the beginning and end of the report, two white blank papers should be provided, one for the Purpose of Binding and other to be left blank.

8. Content:

- I). Acknowledgement
- II). Institute/College/Organization certificate where the project is being developed.
- III). Table of contents
- IV). A brief overview of project
- V). Profiles of problem assigned
- VI). Study of Existing System
- VII). System Requirement
- VIII). Project plan
 - o Team Structure
 - o Development Schedule
 - o Programming language and Development Tools
- IX). Requirement Specification
- X). Design
 - o Detailed DFD's and Structure Diagram
 - o Data structure, Database and File Specification
- XI). Project Legacy
 - Current Status of project
 - Remaining Areas of concern
 - Technical and Managerial Lessons Learnt
 - Future Recommendations
- XII). Nomenclature and Abbreviations.
- XIII). Bibliography
- XIV). Source Code