

# REGULATIONS

## Master of Computer Applications (2 Years)

### (A) Preamble

1. The regulations herein specified are applied to Master of Computer Applications (MCA) programme offered by the Vinoba Bhave University, Hazaribag, through the University Department of Computer Applications, herein after referred to as the University Department.
2. The MCA programme covered by these regulations is correlated courses of study, the successful completion of which would enable the participants of the programme to qualify for the award of MCA degree.
3. A participant of the programme is a student who is duly admitted to an institute/department of the university and who has registered himself/herself for a course of study and attains the same.

### (B) Time scale for academic activity

1. The basic units of time for academic activity for the MCA programme shall be a semester (July to December and January to June). A basic contact period is of 60 minutes duration.
2. The department may schedule a summer programme during long vacation of the department. There will be in general no formal classes in the summer programme.

### (C) Courses of study

The university shall offer courses during a semester indicated mainly from consideration of minimum enrollment and facilities available. The competent authority comprising of the University/Department shall have the right to cancel any or all course of study if the requirements are not satisfied.

### (D) Registration for course of study

1. Every participant of the MCA programme, shall first register himself/herself for the courses of study he/she intends to pursue provided he/she possesses the minimum qualifications as laid down by the University Department of Computer Applications.
2. Fees payable by the participants including fees payable for examination shall be as laid down in administrative instructions issued from time to time by the University/Department for the purpose.

(E) Measurement of Academic Achievement of the participating student in the MCA programme shall be measured in terms of grade obtained by him/her in the examinations. The overall performance of the students in the semester examination shall be evaluated in terms of grade point average as specified later.

### (F) Assessment

In total 120 credits represent the workload of a session (4 semesters) for MCA program.

Total Credits=120, 1 Credit = 10 lectures Hrs, 100 Marks

SUBJECT (L-T-P)	= (4-0-0) CREDITS
SESSIONAL (L-T-P)	= (0-0-2) CREDITS
MAJOR PROJECT (L-T-P)	= (0-0-18) CREDITS

Semester	–	I	30 Credits
Semester	–	II	30 Credits
Semester	–	III	30 Credits
Semester	–	IV	30 Credits

## **(G) Scheme of Instruction**

The scheme of instruction in Post-Graduate Programme shall be of the following forms of academic activity:

- a) Theory
- b) Sessional
- c) Practical Training and Project Work
- d) Seminar and Tutorial

### **a. Theory**

A theory type of academic activity shall involve concepts, fundamental ideas and techniques, as laid down in text books or literature and which can be grasped through lectures and assignments. A theory type of course with about 40 contact periods in a semester shall enable participating student to earn one unit of academic credit provided that he/ she fulfils the attendance, and grade requirements as specified hereinafter.

### **b. Sessional**

The following type of academic work will be covered in sessional:

- i) Laboratory Experiment
- ii) Design Exercise
- iii) Project
- iv) Term paper or any other academic work, the purpose of which would be to train the student by practice, repeated use and hands on experience.

A sessional course of 2 contact periods a week and about 30/40 contact period during a semester shall enable a participating student to earn one unit of academic credit provided that he/she fulfils the attendance and grade requirements as specified hereinafter.

### **c. Practical Training and Project Work**

After second semester during summer break either student should undergo Practical Training or do Mini Project. During the fourth semester of study, a student will be examined in the course "Project work".

1. Project work may be done individually or in groups in case of bigger projects. However if project is done in groups, each student must be given a responsibility for a distinct module and care should be taken to see the progress of individual modules is independent of others.
2. Students should take guidance from an internal guide and prepare a Project Report on "Project Work" in 2 copies to be submitted to the Director of the Institute/Department by April. A separate file containing source-code listings should also be submitted. Before start of the project, every student should submit project synopsis in predefined format.
3. The Project Synopsis should contain an Introduction to Project, which should clearly explain the project scope in detail. Also, Data Dictionary, DFDs, ERDs, File designs and a list of output reports should be included.
4. The Project Work should be of such a nature that it could prove useful or be relevant from the commercial/management angle.
5. The Project report will be duly assessed by the internal guide and marks will be communicated by the Director to the University along with the marks of the internal credit for theory and practical.

6. The project report should be prepared in a format prescribed by the University, which also specifies the contents and methods of presentation.
7. The major project work carries 450 marks. Distribution of Marks: Documentation-100, Design-100, Coding-100, Presentation-100, Viva-50. The Project Evaluation shall be conducted by two external examiners.
8. Project work can be carried out in the Institute/Department or outside with prior permission of the Institute/Department.
9. Project viva-voce by the University panel will be conducted in the month of May.

**(H) Attendance Requirement**

All students must attend every lecture, practical classes and other activities of the Department. However, the attendance requirement will be a minimum of 75% of the classes actually held.

**Absence during the semester**

- a. A student must inform the Director concerned immediately of any instance of continuous absence from classes.
- b. A student who is absent due to illness should approach the teachers concerned for makeup quizzers, assignment and laboratory work.
- c. A student who remains absent from a Sessional test due to illness approach the teacher concerned for makeup test immediately on return to class. The request should be supported with a medical certificate issued by a registered medical practitioner.
- d. If a student is continuously absent from the Institute/Department for more than four weeks without permission of the head of the department concerned, his/her name will be removed from Institute/Department rolls.

**(I) Examination Assessment**

- 1) The examination of each paper shall have two components- External evaluation (End Semester Exam) at the end of the semester carrying 70 marks to be conducted by the university and Internal evaluation of 30 marks to be evaluated by Teachers. Internal evaluation shall comprise of
  - Written Examination - 20 marks of a paper
  - Attendance - 5 marks
  - Assignment - 5 marks

Theory Paper----- 70 marks + 30 marks  
 70 marks ----- External evaluation (End Semester Exam)  
 30 marks----- Internal evaluation

- 2) Sessional Examination----- 50 Marks  
 There should be one External and one internal examiner for each sessional Examination.

3) **Question Paper Pattern:**

The question paper shall consist of two sections: A and B. Section A will have eight (08) questions from the respective units of the syllabus (In syllabus description, [Q-n] indicates n number of questions from the unit). Out of which four (04) questions will be required to be answered and will carry 10 marks each. Section B (Compulsory) will consist of 10 short answer type questions which will cover the entire syllabus uniformly and will carry 30 marks in all, each short-answer type questions carrying 3 marks. The candidates are required to give answer of each short type question in 50 words.

**(J) Student Discipline**

Every student is required to observe a polite and disciplined behavior both inside and outside the campus and should not indulge in any activity which would tend to bring down the prestige of the Institute/Department or disturb the peaceful and congenial environment of the campus.

An act of indiscipline on the part of the student may result into adequate discredit and a mention in his/her academic grade card and/or transcript.

**Note:** The department in consultation with the university shall have the right to change/modify any regulation or part thereof in the academic interest of the students.

**(K) Duration of Curriculum and Calendar**

1. Master of Computer Applications (MCA) programme is of Two years duration. Each year shall be divided into two semesters. First semester shall normally begins in July and ends in December. Second semester shall normally begins in January and ends in June.
2. Each year, the university shall draw an academic calendar and the same shall be non negotiable and strictly adhered to the academic calendar for the first year shall be handed over to each admitted student along with his/her university registration card. Second year academic calendar shall be made available during registration for third semester.
3. The curriculum and syllabus shall be modified with approval of the academic council once in every two years to keep the same up-to-date. However, minor modifications can be done as and when necessary with the approval of Vice-Chancellor. The modification so done shall be placed to the immediate next academic council meeting for ratification.
4. A candidate may be permitted to complete MCA degree requirements in not more than 4 years i.e. maximum in 8 semesters.

**(L) Eligibility Criteria for Admission**

1. The candidate must hold a bachelor's degree (with mathematics at 10+2 level) or BCA/B.Sc.( Computer Science) / B.Sc. (Information Technology) of a recognized University incorporated by an act of the central or state legislatures in India or other educational institutions established by an act of parliament registered under section (2f)/12(B) of UGC act 1956 or declared to be deemed of an university under section 3 of UGC act, 1956 or passed an equivalent qualification recognized by the ministry of HRD, Government of India.
2. The candidate must have secured at least 50% of marks in aggregate at the graduation level.

3. Candidates appearing for the final examination of their bachelor's programme can also apply and if selected can join the programme provisionally. At the time of counseling they must bring the certificates in original.
4. At the time of the counseling candidates will be required to show their original certificates and mark sheets of 10+2 and graduation level, MCA test admit card, caste certificate and any special category certificate, if any.

**(M) Eligibility for Appearing in Semester Examination**

1. A student shall be eligible in an examination provided he/she pursues a regular course of study and attends at least 75% of class in each theory and sessional subject during the semester. The attendance shall be considered from the date of admission of the candidate in the institution. Attendance record will be compiled at the time of each test and the students with poor attendance will be informed through notification. The guardian will also be informed through a letter before he/she is debarred for appearing university examination due to shortage of attendance.
2. Concessions: A student who has been absent for short periods on medical ground or due to participation in cultural, sports, other academic/official assignments in the interest of the Department/University with prior written permission of the head of the institution shall be permitted a maximum of additional concession of 10% in attendance and shall be eligible for appearing in examination with a minimum 65% of attendance in semester.
3. A student shall be admitted to any examination in a subject only if he/she has been registered for that subject.
4. A candidate shall be allowed in an examination only if he/she is issued an admit card for the relevant examination by the University/Department.

**(N) Promotion**

Promotion to the next Semester shall be permitted only with a maximum of Two Backlog Papers from the preceding Semester. Further, entry to the next Semester shall be regulated as per the university norms.

**Provision of Special examination:**

Students keeping one or two backlogs in 3<sup>rd</sup> or 4<sup>th</sup> Semester can be given one special opportunity after declaration of 4<sup>th</sup> Semester result to clear their backlog papers so that they may go to Job.

**Moderation of result:**

Notwithstanding anything contained elsewhere in the Regulations, the University shall have power to moderate the MCA results on the recommendations of the Examination Board and/or the academic council.

**(O) Final Result**

**Cumulative Grade Point Average**

The Cumulative Grade Point Average (CGPA) will be calculated on the 10 point grading scale as follows:

Grade Point	Parentage of Marks	Grade Symbol	Grade Meaning
10	91 – 100	O	Outstanding
09	81 –90	A+	Excellent
08	71 –80	A	Very Good
07	61 –70	B+	Good
06	51 –60	B	Above Average
05	41 –50	C	Average
04	40	P	Pass
00	Below 40	F	Fail or Absent

**a. For each Semester**

$$\text{Semester Grade Point Average (SGPA) } S(j) = \frac{\sum_i C(i) \cdot G(i)}{\sum_i C(i)}$$

Where , C(i) denotes the total credits of the i<sup>th</sup> course. G(i) denotes the grade point earned by a student in i<sup>th</sup> course and j indicates the semester.

**b. For full course**

$$\text{Cumulative Grade Point Average CGPA} = \frac{\sum_j C(j) \cdot S(j)}{\sum_j C(j)}$$

Where, C(j) denotes the total credits of the j<sup>th</sup> semester.  
S(j) denotes the SGPA of the j<sup>th</sup> semester.

**(P) Conversion of Grades into Percentage and Equivalent Class/Distinction:**

For the purpose of awarding class, the CGPA shall be converted to percentage marks using the formula,  
Percentage Marks = CGPA x 10

Category	CGPA	Class/Distinction
<i>Students who successfully complete the MCA programme.</i>	7.5 and above	First Class with Distinction
	6.0 and above	First Class
	5.0 and above	Second Class
	4.0 and above	Pass

The concerned teacher shall maintain all records for inspection by the University for at least one semester.

**Others**

- a) Other provisions not covered under the present regulations shall be governed by the regulation for Master Examination in Arts, Science and Commerce of the university and if needed may be reviewed.
- b) Any dispute or case not covered under the above regulations shall be referred to the Vice Chancellor whose decision shall be final.

**UNIVERSITY DEPARTMENT OF COMPUTER APPLICATIONS (MCA)  
VINOBA BHAVE UNIVERSITY, HAZARIBAG**

**COURSE STRUCTURE**

**CHOICE BASED CREDIT SYSTEM (CBCS)**

The proposed CBCS system has the potential of providing a choice of a wide spectrum of subjects/branches of subjects to students in pursuit of achieving their cherished goals. This system has been globally accepted and now has become the need of the day. The UGC also has provided guidelines to the Universities for consideration and implementation of CBCS.

The University Department of Computer Applications proposes the following courses and credits to be initiated at MCA w.e.f. the session 2020-22. The proposed system may be modified/improved in future according to the requirements.

**CORE Papers**

**Semester-1<sup>st</sup>**

<b>Paper Code</b>	<b>Title</b>	<b>Credit</b>	<b>Marks</b>
MCA C1001	Fundamentals of Computers	4.0	100
MCA C1002	Data Structures through C	4.0	100
MCA C1003	Operating System Concepts	4.0	100
MCA C1004	Database Management System	4.0	100
MCA C1005	Computer Organization & Architecture	4.0	100
MCA C1006	Management Information System	4.0	100
<b>Sessionals</b>			
MCA P1007	Fundamentals of Computers Lab	2.0	50
MCA P1008	Data Structures Lab	2.0	50
MCA P1009	Database Management System Lab	2.0	50

**Semester-2<sup>nd</sup>**

<b>Paper Code</b>	<b>Title</b>	<b>Credit</b>	<b>Marks</b>
MCA C2001	Advance Java Programming	4.0	100
MCA C2002	Design and Analysis of Algorithms	4.0	100
MCA C2003	Data Communication & Computer Networks	4.0	100
MCA C2004	Discrete Mathematics	4.0	100
MCA C2005	Software Engineering	4.0	100
	Elective- I	4.0	100
<b>Sessionals</b>			
MCA P2006	Advance Java Lab	2.0	50
MCA P2007	Algorithms Lab	2.0	50
MCA P2008	Computer Networks Lab	2.0	50

**Semester-3<sup>rd</sup>**

<b>Paper Code</b>	<b>Title</b>	<b>Credit</b>	<b>Marks</b>
MCA C3001	Data Warehousing & Data Mining	4.0	100
MCA C3002	Compiler Design	4.0	100
MCA C3003	Programming in Python	4.0	100
MCA C3004	Soft Computing	4.0	100
MCA C3005	Financial Accounting	4.0	100
	Elective –II	4.0	100
<b>Sessionals</b>			
MCA P3006	Python Lab	2.0	50
MCA P3007	Tally Lab	2.0	50
MCA P3008	Mini Project/ Practical Training	2.0	50

**Semester-4<sup>th</sup>**

<b>Paper Code</b>	<b>Title</b>	<b>Credit</b>	<b>Marks</b>
MCA C4001	Computer Graphics	4.0	100
MCA C4002	Operations Research	4.0	100
<b>Sessionals</b>			
MCA P4003	Personality Development	2.0	50
MCA P4004	Android Application Development	2.0	50
MCA P4005	Major Project	18.0	450

**Elective Papers****Elective – I**

<b>Paper Code</b>	<b>Title</b>	<b>Credit</b>	<b>Marks</b>
MCA E2009	Cyber Security	4.0	100
MCA E2010	Artificial Intelligence	4.0	100
MCA E2011	Cloud Computing	4.0	100

**Elective – II**

<b>Paper Code</b>	<b>Title</b>	<b>Credit</b>	<b>Marks</b>
MCA E3009	Big Data Analytics	4.0	100
MCA E3010	Software Testing	4.0	100
MCA E3011	Machine Learning	4.0	100



# FUNDAMENTALS OF COMPUTERS (MCA C1001)

**TIME-3 Hrs.**

**FULL MARKS-70**

**CREDIT-4**

The question paper shall consist of two sections: A and B. **Section A** will have eight (08) questions, out of which four (04) questions will be answered and will carry 10 marks each. **Section B (Compulsory)** will consist of 10 short answer type questions which will cover the entire syllabus and will carry 30 marks in all., each short-answer type question carrying 3 marks.

## **Unit 1: Introduction to Computers and Computer Network:**

Introduction, Characteristics of Computers, Evolution of Computers, Generations Of Computers, Classification of Computers, The Computer System, Application of Computers, Introduction, Data Communication, Transmission Media, Multiplexing, Switching, Computer Network, Network Topologies, Communication Protocols, Network Devices. [Q-2]

## **Unit 2: Number Systems, Logic Gates and Computer Architecture:**

Introduction, Number Systems, Conversion between Number Bases, Arithmetic System, Concept of Overflow, Binary Coding, Logic Gates, Boolean algebra, Combination of Logic Gates. Central Processing Unit, Memory, Communication between Various Units of a Computer System, Processor Speed, Multiprocessor Systems. [Q-2]

## **Unit 3: Primary Memory, Secondary Memory and Operating System:**

Introduction, 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 Operating System, Evolution of Operating System, Types of Operating System, Functions of an Operating System, Modern Operating Systems. [Q-2]

## **Unit 4: Computer Languages & Computer Software:**

Introduction, Evolution of Programming Languages, Classification of Programming Languages, Generations of Programming Languages, Features of a Good Programming Language, Selection of a Programming Language, Software: Definition, Relationship between Software and Hardware, Software Categories, System Software, Application Software, Software Terminology. [Q-1]

## **Unit 5: Internet Basics:**

Introduction, Evolution of Internet, Basic Internet Terms, Getting Connected To Internet, Internet Applications, Electronic Mail- An Introduction, How Email Works, Search Engines, Languages of Internet, Internet and viruses. [Q-1]

## **Text Book:**

1. Introduction to Computer Science- ITL Education Solutions Limited, Pearson Education, 2004.

## **Reference Books:**

- 1.N.Nilsan&S.Schochen-The Elements of Computing Systems
- 2.Fundamentals of Information Technology by Deepak Bharihoke

## DATA STRUCTURE THROUGH C (MCA C1002)

**TIME - 3 Hrs.**

**FULL MARKS -70**

**CREDIT- 4**

The question paper shall consist of two sections: A and B. **Section A** will have eight (08) questions, out of which four (04) questions will be answered and will carry 10 marks each. **Section B (Compulsory)** will consist of 10 short answer type questions which will cover the entire syllabus and will carry 30 marks in all., each short-answer type question carrying 3 marks.

### **Unit 1: Introduction, Operators, Decision Making & Branching, Array and String**

History and Importance of C, Sample programming, Basic Structure and execution of C programs, Constants, Variables, and Data Types and various type of declarations, Different type operators and Expressions, Operator Precedence and Associability, Mathematical and Character Functions., Decision Making and Branching, Looping. One – dimensional Arrays and their declaration and Initializations, Two-dimensional Arrays and their initializations, Multidimensional Arrays, Dynamic Arrays, String handling functions. [Q-1]

### **Unit 2: Function, Structure, Union and Pointer**

Need and Elements for user –defined Functions, Definition of Functions, Return values and their types, Function calls and Declaration, Arguments and corresponding return values, Functions that return multiple values, Nesting of functions, Recursion, Defining Structure, Declaring Structure Variable and Accessing Structure Members, Initialization of Structure, Comparing Structure Variables, Arrays of Structures, and Structures within structures, Unions, Understanding Pointers, Accessing the Address of a Variable, Declaration and Initialization of Pointer Variables, Accessing a Variable through its Pointer, File Management in C. [Q-2]

### **Unit 3: Introduction to Data Structure, Lists, Stacks and Queues**

Need of Data Structure, Algorithm, Complexity, Asymptotic Notations, Introduction to linked lists; Linked list types, operations on linked list; Introduction and primitive operations on stack; Stack application; Infix, postfix, prefix expressions; Evaluation of postfix expression; Conversion between prefix, infix and postfix, introduction and primitive operation on queues. [Q-2]

### **Unit 4: Trees, m –Way Trees and Graphs**

Introduction, Tree terminology; Traversal of binary trees; Recursive algorithms for tree operations such as traversal, insertion, deletion; Binary Search Tree. The invention of B-Tree; Example for creating a B-Tree, B+ Tree, AVL tree. Graph Definition and Terminology, Directed and Undirected graph with adjacency Matrix; Weighted Graph, Graph Linked representation, DFS and BFS. [Q-2]

### **Unit 5: Sorting & Searching Techniques**

Sorting : Insertion sort, Selection sort, Merge sort, Bubble sort, Heap Sort  
Searching Techniques: Linear search & Binary search [Q-1]

### **Text Book:**

1. E. Balagurusamy – Programming in ANSI C, 3rd Edn. , TMH, New Delhi ; 2004
2. Seymour Lipschutz, Data Structure With C, Schaum’s Outline Series, TMH, 2017

### **Reference Book:**

1. Y.Langsam ET. Al., “Data Structures using C and C++”, PHI, 1999
2. Y. Kanetkar – Let us C, 4th Edition, BPB Publication , New Delhi; 2002
3. E.Horowitz and S.Sahani, “Fundamentals of Data structures”, Galgotia Book source Pvt. Ltd., 2003
4. R.S.Salaria, “Data Structures & Algorithms”, Khanna Book Publishing Co. (P) Ltd., 2002

## OPERATING SYSTEM CONCEPTS (MCA C1003)

**TIME- 3 Hrs.**

**FULL MARKS-70**

**CREDIT-4**

The question paper shall consist of two sections: A and B. **Section A** will have eight (08) questions, out of which four (04) questions will be answered and will carry 10 marks each. **Section B (Compulsory)** will consist of 10 short answer type questions which will cover the entire syllabus and will carry 30 marks in all., each short-answer type question carrying 3 marks.

### **Unit 1: Introduction:**

Introduction to OS Operating system functions, evaluation of O.S., Different types of O.S. batch, multi-programmed, time-sharing, real-time, distributed, parallel. System Structure Computer system operation, I/O structure, storage structure, storage hierarchy, different types of protections, operating system structure (simple, layered, virtual machine), O/S services, system calls. [Q-1]

### **Unit 2: Processes:**

Concept of processes, process scheduling, operations on processes, operating processes, inter-process communication. Process Synchronization: background, critical section problem, critical region, synchronization hardware, classical problems of synchronization, semaphores. Threads: overview, benefits of threads, user and kernel threads. CPU scheduling : scheduling criteria, preemptive & non-preemptive scheduling, scheduling algorithms, multi-processor scheduling. [Q- 2]

### **Unit 3: Deadlocks:**

System model, deadlock characterization, methods for handling deadlocks, deadlock prevention, deadlock avoidance, deadlock detection, recovery from deadlock. Memory Management: background, logical vs. physical address space, swapping, contiguous memory allocation, paging, segmentation, segmentation with paging. Virtual Memory : background, demand paging, performance, page replacement, page replacement algorithms, allocation of frames, thrashing. [Q-2]

### **Unit 4: File Systems:**

File concept, access methods, directory structure, file system structure, allocation methods (contiguous, linked, indexed), free-space management (bit vector, linked list, grouping), directory implementation (linear list, hash table), efficiency & performance .I/O Management: I/O hardware, polling, interrupts, DMA, application I/O interface (block and character devices, network devices, clocks and timers, blocking and non-blocking I/O), kernel I/O subsystem (scheduling, buffering, caching, spooling and device reservation, error handling), performance. [Q-2]

### **Unit 5: Disk Management:**

Disk structure, disk scheduling, disk reliability, disk formatting, boot block, bad blocks. Protection & Security: Protection & Security Goals of protection, domain of protection, security problem, authentication, one time password, program threats, system threats, threat monitoring, encryption.[Q-1]

### **Text Book:**

1. A. Silberschatz, Galvin,-Operating System Concepts, 6th Edn, John Wiley, Indian Reprint,2003.

### **Reference Books:**

1. C.Cronsley-Operating Systems: A Design-Oriented Approach, TMH, New Delhi, 2002

## DATABASE MANAGEMENT SYSTEMS (MCA C1004)

**TIME-3 hr**

**FULL MARKS-70**

**CREDIT-4**

The question paper shall consists of two sections: A and B. **Section A** will have eight (08) questions, out of which four (04) questions will be answered and will carry 10 marks each. **Section B (Compulsory)** will consists of 10 short answer type questions which will cover the entire syllabus and will carry 30 marks in all., each short-answer type questions carrying 3 marks.

### **Unit 1: Introduction:**

File systems versus Database systems, Advantages of DBMS, DBMS classification/types, DBMS structure, three schema DBMS architecture, Data Models, Data Independence, Data abstraction, Database Users, Database Schemas and Database Instances, Views and its advantages, Data dictionary, DBA and its functions, RDBMS, Difference between DBMS and RDBMS. [Q-2]

### **Unit 2: E-R-Model & Relational Model:**

Entities and Entity Sets, Relationships and Relationship Sets, Mapping Cardinality, ER Diagram, Reducing ER Diagram to tables, Specialization, Generalization and Aggregation. Codd's rule, RDBMS Concepts, Types of Keys, Constraints Types, Relational database Scheme, Procedural & Non Procedural Languages, Relational Algebra, Relational Calculus. [Q-2]

### **Unit 3: SQL/PLSQL:**

Basic Concepts, Basic SQL, Advance SQL, Database languages, Set operations, Aggregate Functions, Null Values, views, Sub-queries, Integrity Constraints(Entity integrity, Referential integrity and Domain constraint), SQL Constraints Types , Indexing , Cursors, Stored procedures and triggers. [Q-1]

### **Unit 4: Database Design:**

Pitfalls in relational database design, Normalization using functional dependency, Multivalued and join dependencies, Atomic values, Full and Partial Functional Dependency, 1NF, 2NF, 3NF, BCNF, 4NF, 5NF. [Q-2]

### **Unit 5: Transaction Processing and Concurrency Control:**

DBMS Transaction, ACID Properties, States of Transaction, Serializability, DBMS Concurrency control, DBMS deadlock, Deadlock avoidance, Deadlock detection, Deadlock Prevention, , Schedules and Recovery, Locking and Timestamp Ordering for concurrency control. [Q-1]

### **Text Book:**

1. Fundamentals of Database Systems "RamezElmasri", Pearson Education.

### **Reference Books:**

1. Database Systems Concepts "A. Silberschatz,Korth", McGraw Hill.
2. Database Management Systems by RaghuRamakrishnan and Johannes Gehrke
3. SQL Solutions for IBM DBMS (Vnr Computer Library) by Bruce L. Larson
4. Database Management Systems (DBMS) by Icon Group International
5. Database Systems Concepts "KORTH"

# COMPUTER ORGANIZATION AND ARCHITECTURE (MCA C1005)

**TIME- 3 Hrs.**

**FULL MARKS-70**

**CREDIT-4**

The question paper shall consist of two sections: A and B. **Section A** will have eight (08) questions, out of which four (04) questions will be answered and will carry 10 marks each. **Section B (Compulsory)** will consist of 10 short answer type questions which will cover the entire syllabus and will carry 30 marks in all., each short-answer type question carrying 3 marks.

## **Unit 1: Fundamentals of Digital Logic Design:**

Axioms and laws of Boolean algebra, Reduction of Boolean expressions, Logic gates, Conversion between canonical forms, Karnaugh map (4 variable), Combinational Circuits: Half Adder, Full adder, Decoder, Encoder, Multiplexer, Sequential Circuits: Flip-flop, SR, JK, T, D-Latch, Master slave. [Q-2]

## **Unit 2: Computer System:**

Comparison of Computer Organization & Architecture, Von-Neumann concept, Computer Components and Functions, Interconnection Structures. Bus Interconnections, Input / Output: I/O Module, Programmed I/O, Interrupt Driven I/O, Direct Memory Access. [Q-2]

## **Unit 3: Memory Organization:**

Classification and design parameters, Memory Hierarchy, RAM, SRAM and DRAM, Associative Memory. Cache Memory: Design Principles, Cache Memory mappings, Cache performance, Cache Coherence. [Q-1]

## **Unit 4: Processor Organization:**

Instruction Formats, Instruction Sets, Addressing Modes, Addressing Modes Examples with Assembly Language [8085/8086 CPU], Processor Organization, Structure and Function. Register Organization, Instruction Cycle, Multiplication algorithm (Booth's), Divide algorithms (Restoring & Non-Restoring), Floating point representation.

**Control Unit:** Micro-Operations, Functional Requirements, Processor Control, Hardwired Implementation, Micro-programmed Control. [Q-2]

## **Unit 5: Pipelining:**

Instruction Pipelining, Pipelining Hazards, Pipeline Performance Evaluation, RISC and CISC Architecture, Flynn's classification –SISD, SIMD, MISD, MIMD. [Q-1]

## **Text Book:**

1. William Stallings- Computer Organization & Architecture: Designing for Performance, 7th Edn, Pearson Education, New Delhi-2006.

## **Reference Books:**

1. C. Hamacher- Computer Organization, 5th Edn, McGraw Hill, International Education, New Delhi-2002.
2. M.M.Mano- Computer System Architecture, 3rd Edn, PHI/Pearson Education, New Delhi-2006.
3. J.P.Hayes- Computer Architecture and Organization, 3rd Edn, McGraw Hill, Internal Edn, New Delhi-1998.

The question paper shall consist of two sections: A and B. **Section A** will have eight (08) questions, out of which four (04) questions will be answered and will carry 10 marks each. **Section B (Compulsory)** will consist of 10 short answer type questions which will cover the entire syllabus and will carry 30 marks in all., each short-answer type question carrying 3 marks.

**Unit 1: Introduction to MIS:**

Systems, data, Information and knowledge, importance of MIS in competitive business environment  
Introduction to information technology: Database management system, Networking, System and application software. [Q-2]

**Unit 2: Types of information systems:**

Management information systems, Transaction processing systems, decision support systems, expert systems, Office automation systems and knowledge-based systems. [Q-1]

**Unit 3: Decision Making:**

Structured decision making, Unstructured decision making and semi structured decision making. [Q-1]

**Unit 4: Functional information system:**

Marketing, Finance, HR, Production / Operations information systems [Q-2]

**Unit 5: Enterprise Resource Planning:**

Process Mapping, Implementation management, ERP System, Information systems Value and Effectiveness [Q-2]

**Text Book:**

1. John Wiley and Sons – “ Software Engineering – Principles and Practice –2<sup>nd</sup>Edn., Haus Van Vliet.
2. Ian Sommerville – “Software Engineering”, 7th Edn., Pearson Education.

**Reference Books:**

1. John Wiley and Sons – “ Software Engineering – Principles and Practice –2<sup>nd</sup>Edn., Haus Van Vliet.
2. Ian Sommerville – “Software Engineering”, 7th Edn., Pearson Education.
3. *Karl E. Wiegers* Software Requirements (2nd Edition)
4. *Grady Booch, etc.* Object-Oriented Analysis and Design with Applications (3rd Edition)
5. *Cem Kaner*, Testing Computer Software (2nd Edition)

The question paper shall consists of two sections: A and B. **Section A** will have eight (08) questions, out of which four (04) questions will be answered and will carry 10 marks each. **Section B (Compulsory)** will consists of 10 short answer type questions which will cover the entire syllabus and will carry 30 marks in all., each short-answer type questions carrying 3 marks.

**Unit 1: Principles of Object-oriented Programming:**

Object-oriented Programming, Paradigm, Basic Concepts of Object-oriented Programming, Benefits of OOPs, Application of OOP, Data Types , Operators , Control Structure and looping Classes and Objects: Defining a Class, Adding Variables and Methods, Creating Objects, Accessing Class Members, Constructors, Methods Overloading, Static Members, Nesting of Methods, Arrays within a Class, Memory Allocation for Objects, Static Data Member, Static Member Functions, Arrays of Objects, Objects as Function Arguments. [Q-2]

**Unit 2: Inheritances:**

Inheritance: Extending a Class, Overriding Methods, Final Variables and Methods, Final Classes, Finalize Methods, Abstract methods and Classes, Visibility Control. Interface & Packages : One-Dimensional & two Dimensional Array, Strings, Vectors, wrapper Classes, Defining Interface, Extending Interface, Implementing Interface, Accessing Interface, System Packages, Using System Package, Adding a Class to a Package, Hiding Classes. [Q-2]

**Unit 3: Threads:**

Creating Threads. Extending the Threads Class, Stopping and Blocking a Thread, Life-Cycle of a Thread, Using Thread Methods, Thread Exceptions, Thread Priority, Synchronization, Implementing the Runnable Interface. [Q-1]

**Unit 4: Components and Facilities or Rich Graphical User Interfaces:**

Programming with the JFC, Swing API Components, component Class, Windows, Dialog Boxes, and Panels, Labels, Buttons, and Check Boxes, Menus, Toolbars, and Actions, Sliders, Spinners, Progress Bars, and Scrollbars, Lists and Combo Boxes, Text-Entry Components, Color and File Choosers, Tables and Trees, Printing with the 2D API, Java Print Service API. [Q-1]

**Unit 5: Using Relational Database:**

Introduction, Best Practices for Programming for Databases, JDBC Drivers for RDBM Systems, SQL to Java Type Mappings, Understanding the Database used in this chapter, Using the java.sql API, Coding Transactions, Working with Sockets. [Q-1]

**Unit 6: Building Web Applications:**

Introduction, The Technology of the Web, J2EE Web Application Packaging, Servlets, The Servlet API, The User Experience, Building a Web App with Continuity, Java Server Pages, JSP Tags and API, How the Server Processes JSPs, Java Coding in JSPs, Frameworks for Building Web Applications, Building Robust,WebApps. [Q-1]

**Text Book:**

1. Wigglesworth & McMillan – JavaTM Programming Advanced Topics, 3rd Edn., India Edition, Thomson Education, New Delhi, 2007
2. Richard A. Johnson, “ An Introduction to Java Programming and Object-Oriented Application Development”, 1st Edn.,Thomson Learning, New Delhi – 2007

**Reference Books:**

1. Simply Java and Introductions to JAVA Programming, James R Levenick
2. Java 6 Programming Black Book, Dream Teach

## DESIGN AND ANALYSIS OF COMPUTER ALGORITHMS (MCA C2002)

**TIME-3 Hrs.**

**FULL MARKS-70**

**CREDIT-4**

The question paper shall consist of two sections: A and B. **Section A** will have eight (08) questions, out of which four (04) questions will be answered and will carry 10 marks each. **Section B (Compulsory)** will consist of 10 short answer type questions which will cover the entire syllabus and will carry 30 marks in all., each short-answer type question carrying 3 marks.

### **Unit 1 Introduction:**

Algorithms and structured programming, analysing algorithms, asymptotic behaviour of an algorithm, Order notations, time and space complexities (polynomial, logarithmic and exponential), average and worst case analysis, lower and upper bounds. [Q-1]

### **Unit 2 Advanced data structures:**

Threaded trees, B-trees, Heaps and heapsort, sets and relations, Graphs, Hashing. Basic search & Traversal Techniques (Breadth first and Depth first traversals of Graphs). [Q-2]

### **Unit 3 Algorithm design strategies:**

Divide and conquer (Mergesort, Quicksort, matrix multiplication). Greedy method: General method, knapsack problem, job sequencing with deadlines, minimum cost spanning trees). Dynamic programming (0/1 knapsack, travelling salesman problem). [Q-2]

### **Unit 4 Backtracking**

8 - Queens problem, Sum of Subsets, Graph coloring, 0/1 Knapsack. Branch & Bound (0/1 knapsack, Travelling salesman). [Q-2]

### **Unit 5 Approximation algorithms:**

Polynomial Time Approximation Schemes. Complexity: - NP-Hard and NP-complete Problems - Cook's theorem, NP completeness reductions. [Q-1]

### **Text Book:**

1. E.Horowitz. et.al.- Fundamentals of Computer Algorithms, Galgotia Publication Pvt.Ltd., New Delhi, 2004
2. J.Kleinberg & E. Tardos – Algorithm Design, Pearson Education, New Delhi, 2006

### **Reference Books:**

1. T.H. Cormen et.al. – Introduction to Algorithms – PHI, New Delhi, 2005
2. S. Dasgupta et.al. – Algorithm, TMH, New Delhi – 2007
3. S. Sahani – Data Structures, Algorithms and Applications in C++ 2nd Edition, Universities Press (India) Pvt. Ltd., 2005



# DATA COMMUNICATIONS AND COMPUTER NETWORKS (MCA C2003)

TIME-3 Hrs.

FULL MARKS-70

CREDIT-4

The question paper shall consist of two sections: A and B. **Section A** will have eight (08) questions, out of which four (04) questions will be answered and will carry 10 marks each. **Section B (Compulsory)** will consist of 10 short answer type questions which will cover the entire syllabus and will carry 30 marks in all., each short-answer type question carrying 3 marks.

## Unit 1: Data Communication basics:

Introduction: Definition and Uses of Computer Network, Criteria for a Data Communication Network, Classification of Computer network, Network Architecture, OSI Reference Model. Data communication: Data Communication, Transmission Impairments, Transmission Medium. Data Encoding: Line Encoding, Types of Line Coding, Analog-to-Digital Conversion- Pulse code modulation (PCM), Delta modulation (DM); Transmission Modes. [Q-2]

## Unit 2: Data Link Layer:

Data Link Layer Basics. Error Detection and Correction- One and two dimensional parity checks, Hamming code, Cyclic redundancy check (CRC); Framing- Character stuffing, Bit stuffing; Flow and Error Control Protocols: Stop-and-wait ARQ, Go back N ARQ, Selective repeat ARQ. MAC and LLC Sub-layers-Channel Allocation Problem, Pure ALOHA and Slotted ALOHA, Persistent and non-persistent CSMA. Ethernet and Wired LANs: IEEE 802 Standards, Standard Ethernet, Changes in the Standard, Fast Ethernet, Gigabit Ethernet. [Q-2]

## Unit 3: Network Layer:

IP Addressing Scheme, Subnet Addressing, Subnet Masks, IPV4 Addressing, IPV6 Addressing, Address Resolution Protocol (ARP), Reverse Address Resolution Protocol (RARP). Unicast Routing: Routing Characteristics, Routing Algorithms, Routing Table, Comparison of Routing Algorithms. [Q-1]

## Unit 4: Transport Layer:

Services of Transport Layer, Connection Establishment, Connection Release, Transport Layer Protocols- TCP protocol, UDP protocol. [Q-1]

## Unit 5: Traffic Engineering Principles:

Congestion Control Algorithms- General principles of congestion control, Congestion prevention policies; Quality of Service- Traffic shaping, Leaky bucket algorithm, Token bucket algorithm; Integrated Services. [Q-1]

## UNIT 6: Application Layer:

Client-Server Model: Socket Interface, Domain Name System (DNS), Electronic Mail (SMTP), and File Transfer (FTP), HTTP and WWW, Multimedia. [Q-1]

## Text Book:

1. Forouzan B, ;Data Communications and Networking , 2nd Edition, Tata McGraw-Hill, New Delhi, India 2006

## Reference Books:

1. Stallings W;Data and Computer Communications, 7th Edition, Prentice Hall India, New Delhi – 2007
2. P.C. Gupta- Data Communications and Computer Networks, PHI, New Delhi,2006.

## DISCRETE MATHEMATICS (MCA C2004)

**TIME-3 Hrs.**

**FULL MARKS-70**

**CREDIT-4**

The question paper shall consist of two sections: A and B. **Section A** will have eight (08) questions, out of which four (04) questions will be answered and will carry 10 marks each. **Section B (Compulsory)** will consist of 10 short answer type questions which will cover the entire syllabus and will carry 30 marks in all., each short-answer type question carrying 3 marks.

### **Unit 1 Logic & Counting:**

Propositions and Logical Operations, Conditional Statements, Mathematical Induction. Permutation, Combination, Pigeonhole Principle, Elements of Probability. [Q2]

### **Unit 2 Relations and Digraphs:**

Relations and partition, Graph, Relations and Digraphs, Paths in a Digraph, Matrix Representation of Relations and Digraphs, Operations on Relations, Transitive Closure, Euler's graph, Hamiltonian graph, Planar graph. [Q2]

### **Unit 3 Lattice and Boolean Algebra:**

Partial Ordered Sets, External Elements of Partially Ordered Sets, Lattices, Finite Boolean Algebra, Circuit Design. [Q2]

### **Unit 4 Trees:**

Trees, Labelled Trees, Tree Searching, Minimum Spanning Trees Prim's and Kruskal's algorithms. [Q1]

### **Unit 5 Semigroups and Groups:**

Binary Operations, Semigroups, Products and Quotients of Semigroups, Groups, Products and Quotients of Groups. [Q1]

### **Text Book:**

1. Discrete Mathematical Structures, Kolman, Busby, Ross, 5<sup>th</sup> Edition, Pearson Education.

### **Reference Books:**

1. R.Johnsonbargh- Discrete Mathematics, 6<sup>th</sup> Edn, Pearson Education, New Delhi- 2007.
2. K.H.Rosen- Discrete Mathematics and Its Applications, 4<sup>th</sup> Edn, TMH, New Delhi-2001

The question paper shall consists of two sections: A and B. **Section A** will have eight (08) questions, out of which four (04) questions will be answered and will carry 10 marks each. **Section B (Compulsory)** will consists of 10 short answer type questions which will cover the entire syllabus and will carry 30 marks in all., each short-answer type questions carrying 3 marks.

**Unit 1: Introduction to Software Engineering:**

Software Engineering – A layered Technology, Software Characteristics, Software Application, Software Engineering Process and SDLC Model, Waterfall Model, Prototype Model, Incremental Process Models, V Model, RAD Model, Spiral Model, Agile Process Model. [Q-2]

**Unit 2: Requirement & Design Engineering:**

Requirement Analysis and Software Requirement Specifications, Requirements Gathering Methods, Data Flow Diagrams, Data Dictionaries, Entity-Relationship Diagram, Software Design Introduction, Coupling and Cohesion, Function Oriented Design and Object Oriented Design. [Q-1]

**Unit 3: Testing Strategies and Testing Tactics:**

Strategic Approach to software Testing, Verification and Validation Testing, White Box Testing, Basic Path Testing, Control Structure Testing, Black Box Testing, Unit Testing, Integration Testing, Bottom-up and Top-down Testing, System Testing, Function Testing, Performance Testing, Acceptance Testing, Installation Testing, Test Case Generation. [Q-2]

**Unit 4: Software Metrics and Project Management:**

Issues in Project Management, Management Functions, Software Project Management Plan, Software Management Structure, Software Project Complexity, Software Metrics – Basic Consideration, Size Oriented metrics and Function Point Oriented metrics; Software Cost Estimation Techniques, The COCOMO Model, Project Scheduling, Software Project Planning.[Q-2]

**Unit 5: Software Quality and Configuration Management:**

Software Quality Concepts, Software Quality Assurance and Quality Control, Software Reliability, Software Configuration Management, SCM Repository, and SCM Process. [Q-1]

**Text Book:**

1. Roger S. Pressiman – “Software Engineering – A Practitioner’s Approach”, 6th Edn., McGraw Hill.

**Reference Books:**

1. John Wiley and Sons – “ Software Engineering – Principles and Practice –2<sup>nd</sup>Edn., Haus Van Vliet.
2. Ian Sommerville – “Software Engineering”, 7th Edn., Pearson Education.
3. *Karl E. Wiegers* Software Requirements (2nd Edition)
- 4 *Grady Booch, etc.* Object-Oriented Analysis and Design with Applications (3rd Edition)
5. *Cem Kaner*, Testing Computer Software (2nd Edition)

The question paper shall consist of two sections: A and B. **Section A** will have eight (08) questions, out of which four (04) questions will be answered and will carry 10 marks each. **Section B (Compulsory)** will consist of 10 short answer type questions which will cover the entire syllabus and will carry 30 marks in all., each short-answer type question carrying 3 marks.

**Unit-1: Introduction:**

Fundamentals of data mining, Data Mining Functionalities, Classification of Data Mining systems, Major issues in Data Mining, Data Warehouse and OLAP Technology for Data Mining Data Warehouse, Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, Further Development of Data Cube Technology, From Data Warehousing to Data Mining . [Q-1]

**Unit-2: Data Preprocessing:**

Needs Preprocessing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and Concept Hierarchy Generation, Online Data Storage. Data Mining Primitives, Languages, and System Architectures: Data Mining Primitives, Data Mining Query Languages, Designing Graphical User Interfaces Based on a Data Mining Query Language Architectures of Data Mining Systems. [Q-2]

**Unit-3: Concepts Description:**

Characterization and Comparison: Data Generalization and Summarization-Based Characterization, Analytical Characterization: Analysis of Attribute Relevance, Mining Class Comparisons: Discriminating between Different Classes, Mining Descriptive Statistical Measures in Large Databases. [Q-1]

**Unit-4: Mining Association Rules in Large Databases:**

Association Rule Mining, Mining Single-Dimensional Boolean Association Rules from Transactional Databases. Mining Multilevel Association Rules from Transaction Databases, Mining Multidimensional Association Rules from Relational Databases and Data Warehouses, From Association Mining to Correlation Analysis, Constraint - Based Association Mining. [Q-2]

**Unit-5 : Classification and Prediction:**

Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Classification by Back propagation, Classification Based on Concepts from Association Rule Mining, Other Classification Methods, Prediction, Classifier Accuracy. **Cluster Analysis Introduction:** Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods, Density-Based Methods, Grid-Based Methods, Model-Based Clustering Methods, Outlier Analysis. [Q-2]

**Text Books:**

1. Data Mining – Concepts and Techniques - Jiawei Han & Micheline Kamber Harcourt India.
2. Data Mining Techniques – Arun K Pujari, University Press
3. Building the Data Warehouse- W. H. Inmon, Wiley Dreamtech India Pvt.Ltd..

**Reference Books:**

1. Data Warehousing in the Real World – Sam Anahory & Dennis Murray. Pearson Edn Asia.
2. Data Warehousing Fundamentals – Paulraj Ponnaiah Wiley Student Edition
3. The Data Warehouse Life cycle Tool kit – Ralph Kimball Wiley Student Edition
4. Data Mining Introductory and advanced topics – Margaret H Dunham, Pearson Education

## COMPILER DESIGN (MCA C3002)

TIME-3 Hrs.

FULL MARKS-70

CREDIT-4

The question paper shall consist of two sections: A and B. **Section A** will have eight (08) questions, out of which four (04) questions will be answered and will carry 10 marks each. **Section B (Compulsory)** will consist of 10 short answer type questions which will cover the entire syllabus and will carry 30 marks in all., each short-answer type question carrying 3 marks.

### Unit 1: Introduction to Compiler:

Compilers, Analysis of the source program, The phases of the compiler, Major data structures in a Compiler, Issues in a Compiler Structure, Bootstrapping and Porting **Scanning** : Scanning Process.[Q-1]

### Unit 2: Regular Expressions and Finite Automata:

Regular languages and Regular Expressions, Memory required to recognize a language, Finite Automata, Deterministic Finite Automata, Non-Deterministic Finite Automata, NFA with  $\epsilon$ -moves, regular sets, Equivalence of DFA and NFA, **Regular and Non-regular languages**: Criterion for Regularity, Minimal Finite Automata, **Context Free Grammars**: Introduction, definition, Regular Grammar, Derivation trees, Ambiguity, Simplified forms and Normal Forms. [Q-2]

### Unit 3: Parsing

**Top-down Parsing**: Top down Parsing by Recursive Descent, LL(1), First and Follow sets, Recursive Descent Parser for a Tiny language, Error Recovery in Top-down Parser.

**Bottom-up Parsing** : Overview of Bottom-up Parsing, LR(0) items and LR(0) Parsing, SLR(1), General LR(1) and LALR(1) Parsing, YACC, Error Recovery in Bottom-up Parser. [Q-2]

### Unit 4: Semantic Analysis:

Attributes and Attribute Grammars, Algorithms for Attribute Computation, Symbol Table, Data types and Data type Checking, Semantic Analyzer for Tiny language. **Run-time Environments**: Memory organization during program execution, Fully static run-time environment, Stack-based run-time environments, Dynamic memory, Parameter passing mechanism, Run-time environment for Tiny language. [Q-2]

### Unit 5: Code Generation:

Intermediate code and data structures for code generation, Basic code generation techniques, Code generation of Control statements and Logical expressions. [Q-1]

### Text Book:

1. Kenneth C. Louden -“Compiler Construction – Principle and Practice”, Thomson2007.
2. John Martin -“Introduction to Languages and the Theory of Computation”, 3rd edition, TMH.

### Reference Books:

1. K.L.P Mishra & N. Chandrasekharan -“Theory of Computer Science”, PHI
2. Aho, Sethi, Ullman -“Compiler Principles, Techniques and Tools”, Pearson Education, 2007.
3. The Compiler Design Handbook: Optimizations and Machine Code Generation, Second Edition by Y.N. Srikant and Priti Shankar

## PROGRAMMING IN PYTHON (MCA C3003)

**TIME-3 Hrs.**

**FULL MARKS-70**

**CREDIT-4**

The question paper shall consist of two sections: A and B. **Section A** will have eight (08) questions, out of which four (04) questions will be answered and will carry 10 marks each. **Section B (Compulsory)** will consist of 10 short answer type questions which will cover the entire syllabus and will carry 30 marks in all., each short-answer type question carrying 3 marks.

### **Unit 1: Introduction to Python Programming Language:**

Programming Language, History and Origin of Python Language, Features of Python, Limitations, Major Applications of Python, Getting, Installing Python, Setting up Path and Environment Variables, Running Python, First Python Program, Python Interactive Help Feature, Python differences from other languages. [Q-1]

### **Unit 2: Python Data Types & Input/Output:**

Keywords, Identifiers, Python Statement, Indentation, Documentation, Variables, Multiple Assignment, Understanding Data Type, Data Type Conversion, Python Input and Output Functions, Import command. Operators and Expressions: Operators in Python, Expressions, Precedence, Associativity of Operators, Non Associative Operators. Control Structures: Decision making statements, Python loops, Python control statements. [Q-1]

### **Unit 3: Python Native Data Types:**

Numbers, Lists, Tuples, Sets, Dictionary, Functions & Methods of Dictionary, Strings (in detail with their methods and operations). Python Functions: Functions, Advantages of Functions, Built-in Functions, User defined functions, Anonymous functions, Pass by value Vs. Pass by Reference, Recursion, Scope and Lifetime of Variables. [Q-2]

### **Unit 4: Python Modules:**

Module definition, Need of modules, Creating a module, Importing module, Path Searching of a Module, Module Reloading, Standard Modules, Python Packages. Exception Handling: Exceptions, Built-in exceptions, Exception handling, User defined exceptions in Python. [Q-2]

### **Unit 5: File Management in Python:**

Operations on files (opening, modes, attributes, encoding, closing), read() & write() methods, tell() & seek() methods, renaming & deleting files in Python, directories in Python. Classes and Objects: The concept of OOPS in Python, Designing classes, Creating objects, Accessing attributes, Editing class attributes, Built-in class attributes, Garbage collection, Destroying objects. [Q-2]

### **Text Books:**

1. Programming in Python, Pooja Sharma, BPB Publications, 2017.
2. Core Python Programming, R. Nageswara Rao, 2nd Edition, Dreamtech.
3. Python in a Nutshell, A. Martelli, A. Ravenscroft, S. Holden, OREILLY.

### **Reference Books:**

1. Python, The complete Reference, Martin C. Brown, Mc Graw Hill Education.

## SOFT COMPUTING (MCA C3004)

**TIME-3 Hrs.**

**FULL MARKS-70**

**CREDIT-4**

The question paper shall consist of two sections: A and B. **Section A** will have eight (08) questions, out of which four (04) questions will be answered and will carry 10 marks each. **Section B (Compulsory)** will consist of 10 short answer type questions which will cover the entire syllabus and will carry 30 marks in all., each short-answer type question carrying 3 marks.

### **Unit 1: Introduction to Artificial Intelligence:**

Role of AI in engineering, AI in daily life, Intelligence and Artificial Intelligence, Different task domains of AI, Programming methods, Limitations of AI Intelligent Agent: Agent, Performance Evaluation, task environment of agent, Agent classification, Agent architecture. [Q-1]

### **Unit 2: Concepts of Soft Computing:**

Hard computing Vs Soft Computing, Soft computing constituents – ANN, Fuzzy Logic, GA Applications of Soft Computing. [Q-2]

### **Unit 3: Neural Network:**

Artificial Neural Network- Introduction, Fundamental Concept, Artificial Neural Network, Brain vs. Computer - Comparison Between Biological Neuron and Artificial Neuron, Basic Models of Artificial Neural Network Supervised Learning Network-Linear Separability, Perceptron Networks, Adaptive Linear Neuron (Adaline), Multiple Adaptive Linear Neurons, Back-Propagation Network. Unsupervised Learning Networks- MaxNet. [Q-2]

### **Unit 4: Fuzzy Logic:**

Introduction to Fuzzy Logic, Classical Sets and Fuzzy Sets: Introduction to Fuzzy Logic, Classical Sets (Crisp Sets), Fuzzy Sets Classical Relations and Fuzzy Relations: Introduction, Cartesian Product of Relation, Classical Relation, Fuzzy Relations Membership Functions: Introduction, Features of the Membership Functions, Fuzzification, Methods of Membership Value Assignments Defuzzification: Introduction, Lambda-Cuts for Fuzzy Sets (Alpha-Cuts), Lambda-Cuts for Fuzzy Relations, Defuzzification Method. [Q-2]

### **Unit 5: Genetic Algorithm:**

Genetic Algorithm: Basic concepts, Difference between genetic algorithm and traditional methods, Simple genetic algorithm, Working principle, Procedures of GA, Genetic operators: Reproduction, Mutation, crossover. [Q-1]

### **Text Book:**

3. S. Rajasekharan & G. A. Vijayalakshmi – “Neural Network, Fuzzy Logic And Genetic Algorithm Synthesis And Applications”, Prentice Hall Of India PLT, Pai – 2004.

### **Reference Books:**

1. Jyh – Shing R Jang, C. T. Sun, E Mizutani – Neuro Fuzzy And Soft Computing – A Computational Approach To Learning And Machine Intelligence”, Prentice Hall Of India – 1997.

## COMPUTERIZED FINANCIAL ACCOUNTING (MCA C3005)

**TIME-3 hr**

**FULL MARKS-70**

**CREDIT-4**

The question paper shall consist of two sections: A and B. **Section A** will have eight (08) questions, out of which four (04) questions will be answered and will carry 10 marks each. **Section B (Compulsory)** will consist of 10 short answer type questions which will cover the entire syllabus and will carry 30 marks in all., each short-answer type question carrying 3 marks.

### **Unit 1: Introduction:**

Origin, People Interested in Accounts, Accounting Standards, Book-Keeping, Double Entry System, Classification of Business Accounts, "Golden Rules", Journal, Subsidiary Books, Ledger Posting & Balancing, Concept of Trial Balance, Errors and Omission, Final Accounts with Adjustments, Inventories and its types, Introduction to Financial Accounting, (Tally 7.2), Creating Company Master, Modification & Deletion. [Q-3]

### **Unit 2: Financial Accounting**

Definition, Aims, Traditional vs. Innovative Management Accounting Practices, Development of Throughput Accounting, An Alternative view of Management Accounting, Lean Accounting (Accounting for Lean), Fund Flow and Cash Flow Statement, C-V-P Analysis, MIS in Report Preparation, System Flow Chart and Data Flow Diagram. [Q-2]

### **Unit 3: Voucher Entry & Invoice:**

Payments Voucher, Receipt Voucher, Journal Voucher, Supporting voucher, Contra Voucher, Preparation of Invoice, Items included in the invoice, Difference between an invoice and a voucher, Tax Implication-CENVAT. [Q-1]

### **Unit 4: Report Generation:**

Ledger, Posting, Trial Balance, Trading and Profit & loss account, Balance Sheet, Subsidiary books and cash books. [Q-2]

### **Text Books:**

1. S.N. Maheshwari- Advance Accountancy, Vikas Publication

### **Reference Books:**

1. Amitabh Mukherjee & MdHanif- Modern Accountancy, TMH Publication



## COMPUTER GRAPHICS (MCA C4001)

**TIME- 3 Hrs.**

**FULL MARKS-70**

**CREDIT-4**

The question paper shall consist of two sections: A and B. **Section A** will have eight (08) questions, out of which four (04) questions will be answered and will carry 10 marks each. **Section B (Compulsory)** will consist of 10 short answer type questions which will cover the entire syllabus and will carry 30 marks in all., each short-answer type question carrying 3 marks.

### **Unit 1: Introduction to Computer Graphics:**

What is Computer Graphics?, Application of Computer Graphics, Presentation Graphics Painting and Drawing, Input and Output Devices, Touch Pane, Light Pens, Graphic Tablets, Plotters, Film Recorders, Display Devices, Refreshing Display Devices, Raster-Scan, Random-Scan, Plasma Panel and LCD panels. [Q-2]

### **Unit 2: Graphics Primitives and 2-D & 3-D Graphics:**

Points and Lines, Line-drawing Algorithms, DDA algorithm, Bresenham's line Algorithm, Circle-generating algorithm, Properties of Circles, Midpoint Circle of Algorithm, Polygon Filling Algorithm: Scan-Line. Point Clipping, Line Clipping, Cohen-Sutherland Line Clippings, Polygon Clipping: Sutherland Hodgman Algorithm, Basic Transformations, Translation, Rotation, Scaling, Shear, Composite Transformations, Rotations about a point, Reflection about a line, Homogeneous Coordinate Systems, 3-D Transformations, Viewing Transformation. [Q-2]

### **Unit 3: Projections and Modeling & Rendering Curves and Surfaces:**

Parallel Projection, Orthographic & Oblique Projections Isometric Projections, Perspective Projections. Polygon Representation Methods, Polygon Surfaces, Polygon Tables, Plane Equations, Polygon Meshes, Bezier Curves and Surfaces, Bezier Curves, Properties of Bezier Curves, Bezier Surfaces, Surface of Revolution, Visible - Surface Detection, Depth Buffer Method, Scan-Line Method, Area-Subdivision Method. [Q-2]

### **Unit 4: Multimedia and Animation**

Basic of Animation, Types of Animation, Simulating Acceleration, Computer Animation Tools, Applications, Multimedia Concepts and Applications, Concepts of Hypertext/Hypermedia, Multimedia Applications, Education, Video Conferencing, Training, Entertainment, Electronic Encyclopedia. [Q-2]

### **Text Book:**

1. Computer Graphics by Amarendra Nath Sinha, Landmark Ltd.

### **Reference Books:**

1. Basics of Computer Graphics Design by Niit, Landmark Ltd.
2. Procedural Elements for Computer Graphics by Rogers, David F., Landmark Ltd.
3. Introduction To Computer Graphics by Krishnamurthy, N, Manohar Publishers And Distributors  
Principles Of Interactive Computer Graphics by Newman, William M., Landmark Ltd

The question paper shall consist of two sections: A and B. **Section A** will have eight (08) questions, out of which four (04) questions will be answered and will carry 10 marks each. **Section B (Compulsory)** will consist of 10 short answer type questions which will cover the entire syllabus and will carry 30 marks in all., each short-answer type question carrying 3 marks.

**Unit 1: Operation Research:**

An overview, Origin and Development of OR, Nature and Features of OR, Modeling in OR, General Solution Methods for OR models, Scientific method in OR, Methodology of OR, Application, Opportunities and Shortcomings of OR.

**Linear Programming Problem :** Introduction, Mathematical Formulation of the Problem, Graphical Solution Method, Some Exceptional Cases, General LPP, Canonical and Standard forms of LPP, Simplex Method: Introduction, Fundamental properties of solutions, the Computational Procedure, Use of Artificial variables, Solution to simultaneous Linear Equations, Inverting a Matrix using Simplex Method. [Q-2]

**Unit 2: Duality in LPP:**

Introduction, General Primal – Dual pair, formulating a Dual Problem, Primal Dual pair in Matrix form, Duality theorems, Dual simplex method, Post optimal Analysis, Introduction: Variation in cost vector, Requirement Vector, Coefficient Matrix, Structural Variation. [Q-2]

**Unit 3: Integer Programming:**

Introduction, Gomory Method, Construction of Gomory's constraints, Fractional Cut Method: All Integer & Mixed Integer, Revised Simplex Method. [Q-1]

**Unit 4: Dynamic Programming & Introduction:**

Characteristic of Dynamic Programming, Dynamic Programming Algorithm, Solution of LPP by Dynamic Programming. [Q-1]

**Unit 5: Transportation Problem:**

Introduction, Mathematical Model of Transportation Problem, The Transportation Algorithm, Methods for Finding Initial Solution.

**Assignment Problem:** Introduction, Mathematical Model of Assignment Problem, Solution Methods of Assignment Problem [Q-2]

**Text Book:**

1. Kanti Swarup, P.K. Gupta, Man Mohan – "Operations Research, Sultan Chand & Sons, New Delhi – 2001

**Reference Books:**

1. Ronald L. Rardin "Optimization in Operations Research", Pearson Education, New Delhi – 2003
2. S.S. Rao, "Optimization Theory & Application", Wiley Eastern Ltd, 1979.
3. Operations Research – J. K. Sharma

**Elective Paper**  
**CYBER SECURITY (MCA E2009)**

**TIME-3 Hrs.**

**FULL MARKS-70**

**CREDIT-4**

The question paper shall consist of two sections: A and B. Section A will have eight (08) questions, out of which four (04) questions will be answered and will carry 10 marks each. Section B (Compulsory) will consist of 10 short answer type questions which will cover the entire syllabus and will carry 30 marks in all., each short-answer type question carrying 3 marks.

**Unit 1: Introduction to Cyber Security:**

Overview of Cyber Security, Internet Governance – Challenges and Constraints, Cyber Threats:- Cyber Warfare-Cyber Crime-Cyber terrorism-Cyber Espionage, Need for a Comprehensive Cyber Security Policy, Need for a Nodal Authority, Need for an International convention on Cyberspace. [Q-1]

**Unit 2: Cyber Security Vulnerabilities and Cyber Security Safeguards:**

Cyber Security Vulnerabilities-Overview, vulnerabilities in software, System administration, Complex Network Architectures, Open Access to Organizational Data, Weak Authentication, Unprotected Broadband communications, Poor Cyber Security Awareness. Cyber Security Safeguards- Overview, Access control, Audit, Authentication, Biometrics, Cryptography, Deception, Denial of Service Filters, Ethical Hacking, Firewalls, Intrusion Detection Systems, Response, Scanning, Security policy, Threat Management. [Q-2]

**Unit 3: Securing Web Application, Services and Servers:**

Introduction, Basic security for HTTP Applications and Services, Basic Security for SOAP Services, Identity Management and Web Services, Authorization Patterns, Security Considerations, Challenges. [Q-1]

**Unit 4: Intrusion Detection and Prevention:**

Intrusion, Physical Theft, Abuse of Privileges, Unauthorized Access by Outsider, Malware infection, Intrusion detection and Prevention Techniques, Anti-Malware software, Network based Intrusion detection Systems, Network based Intrusion Prevention Systems, Host based Intrusion prevention Systems, Security Information Management, Network Session Analysis, System Integrity Validation. [Q-1]

**Unit 5: Cryptography and Network Security:**

Introduction to Cryptography, Symmetric key Cryptography, Asymmetric key Cryptography, Message Authentication, Digital Signatures, Applications of Cryptography. Overview of Firewalls- Types of Firewalls, User Management, VPN Security Security Protocols: - security at the Application Layer- PGP and S/MIME, Security at Transport Layer- SSL and TLS, Security at Network Layer-IPSec. [Q-2]

**Unit 6: Cyberspace and the Law:**

Introduction, Cyber Security Regulations, Roles of International Law, the state and Private Sector in Cyberspace, Cyber Security Standards. The INDIAN Cyberspace, National Cyber Security Policy 2013. [Q-1]

**Text Book:**

1. Cyber Law in India by Farooq Ahmad – Pioneer Books

**Reference Books:**

1. Information Technology Law and Practice by Vakul Sharma – Universal Law Publishing Co. Pvt. Ltd.

2. The Indian Cyber Law by Suresh T Vishwanathan –Bharat Law house New Delhi.

## Elective Paper

### ARTIFICIAL INTELLIGENCE (MCA E2010)

TIME-3 Hrs.

FULL MARKS-70

CREDIT-4

The question paper shall consist of two sections: A and B. **Section A** will have eight (08) questions, out of which four (04) questions will be answered and will carry 10 marks each. **Section B (Compulsory)** will consist of 10 short answer type questions which will cover the entire syllabus and will carry 30 marks in all., each short-answer type question carrying 3 marks

#### **Unit 1: Introduction, Intelligent Agents and Problem Solving Space:**

Introduction: Overview of Artificial Intelligence- Problems of AI, AI Technique, Tic-Tac-Toe Problem. **Intelligent Agents:** Agents & Environment, Nature Of Environment, Structure Of Agents, Goal Based Agents, Utility Based Agents, Learning Agents. **Problem Solving:** Problems, Problem Space & Search: Defining The Problem As State Space Search, Production System, Problem Characteristics, Issues In The Design Of Search Programs. [Q-2]

#### **Unit 2: Search Techniques:**

Solving Problems By Searching, Problem Solving Agents, Searching For Solutions; Uniform Search Strategies: Breadth First Search, Depth First Search, Depth Limited Search, Bi-directional Search, Comparing Uniform Search Strategies.

**Heuristic Search Strategies:** Greedy Best-First Search, A\* Search, Memory Bounded Heuristic Search: Local Search Algorithms & Optimization Problems: Hill Climbing Search, Simulated Annealing Search, Local Beam Search, Genetic Algorithms; Constraint Satisfaction Problems, Local Search For Constraint Satisfaction Problems. **Adversarial Search:** Games, Optimal Decisions & Strategies in Games, The Mini Max Search Procedure, Alpha-Beta Pruning, Additional Refinements, Iterative Deepening. [Q-2]

#### **Unit 3: Knowledge & Reasoning:**

Knowledge Representation Issues, Representation & Mapping, Approaches to Knowledge Representation, Issues in Knowledge Representation.

**Using Predicate Logic:** Representing Simple Fact in Logic, Representing Instant & ISA Relationship, Computable Functions & Predicates, Resolution, and Natural Deduction.

**Representing Knowledge Using Rules:** Procedural Verses Declarative Knowledge, Logic Programming, Forward Verses Backward Reasoning, Matching, Control Knowledge. [Q-2]

#### **Unit 4: Probabilistic Reasoning:**

Representing Knowledge in an Uncertain Domain, Bayesian Networks, Dempster-Shafer Theory.

**Planning:** Overview, Components of A Planning System, Goal Stack Planning, Hierarchical Planning.

**Learning:** Forms Of Learning, Inductive Learning, Explanation Based Learning, Neural Net Learning & Genetic Learning. [Q-1]

#### **Module 5: Natural Language Processing and Robotics:**

Brief introduction to Syntactic Processing, Semantic Analysis, Discourse & Pragmatic Processing.

**Robotics:** Introduction, Robot hardware, robotic perception, planning to move, planning uncertain movements, robotic software architecture, application domains. [Q-1]

#### **Text Books:**

1. Russel S. and Norvig P., Artificial Intelligence a Modern Approach, 3<sup>rd</sup> edition, Pearson Education.
2. Rich E. & Knight K., Artificial Intelligence, 3<sup>rd</sup> edition, TMH, New Delhi.

#### **Reference books:**

1. Patterson Dan W., Introduction to Artificial Intelligence and Expert Systems, PHI, New Delhi, 2006.
2. Rolston D.W., Principles of AI & Expert System Development, TMH, New Delhi.

## Elective Paper

### CLOUD COMPUTING (MCA E2011)

**TIME-3 Hrs.**

**FULL MARKS-70**

**CREDIT-4**

The question paper shall consist of two sections: A and B. **Section A** will have eight (08) questions, out of which four (04) questions will be answered and will carry 10 marks each. **Section B (Compulsory)** will consist of 10 short answer type questions which will cover the entire syllabus and will carry 30 marks in all., each short-answer type question carrying 3 marks.

#### **Unit 1: Cloud Computing Fundamentals:**

Cloud Computing definition, Types of cloud, Cloud services: Benefits and challenges of cloud computing, Evolution of Cloud Computing, Applications cloud computing, Business models around Cloud – Major Players in Cloud Computing - Issues in Cloud - Eucalyptus - Nimbus - Open Nebula, CloudSim. [Q-1]

#### **Unit 2: Cloud Computing Models:**

Cluster Computing, Grid Computing, Grid Computing Versus Cloud Computing, Key Characteristics of Cloud Computing. Cloud Models: Benefits of Cloud Models, Public Cloud, Private Cloud, Hybrid Cloud, Community Cloud, Shared Private Cloud, Dedicated Private Cloud, and Dynamic Private Cloud. [Q-2]

#### **UNIT 3: Cloud Services and File System:**

Types of Cloud services: Software as a Service - Platform as a Service – Infrastructure as a Service - Database as a Service- Monitoring as a Service – Communication as services. Service providers- Google App Engine, Amazon EC2, Microsoft Azure, Sales force. [Q-2]

#### **UNIT 4: Virtualization:**

Basics of Virtualization - Types of Virtualization - Implementation Levels of Virtualization - Virtualization Structures - Tools and Mechanisms - Virtualization of CPU, Memory, I/O Devices - Virtual Clusters and Resource management – Virtualization for Data-center Automation. Introduction to MapReduce, GFS, HDFS, Hadoop Framework. [Q-2]

#### **UNIT 5: Security in the Cloud:**

Security Overview – Cloud Security Challenges and Risks – Software-as-a-Service Security – Security Monitoring – Security Architecture Design – Data Security – Application Security – Virtual Machine Security - Identity Management and Access Control – Autonomic Security. [Q-1]

#### **Text Book:**

1. Cloud Computing "A Practical Approach" Anthony T. Velte, Toby J. Velte, Robert Elsenpeter. McGraw-Hill.

#### **Reference Books:**

1. Kumar Saurabh, "Cloud Computing – insights into New -Era Infrastructure", Wiley India, 2011.
2. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.

## Elective Paper

### BIG DATA ANALYTICS (MCA E3009)

**TIME-3 Hrs.**

**FULL MARKS-70**

**CREDIT-4**

The question paper shall consist of two sections: A and B. **Section A** will have eight (08) questions, out of which four (04) questions will be answered and will carry 10 marks each. **Section B (Compulsory)** will consist of 10 short answer type questions which will cover the entire syllabus and will carry 30 marks in all., each short-answer type question carrying 3 marks.

#### **Unit 1: Introduction to big data:**

Introduction to Big Data Platform – Challenges of Conventional Systems - Intelligent data analysis – Nature of Data - Analytic Processes and Tools - Analysis vs Reporting. [Q-2]

#### **Unit 2: Mining data streams:**

Introduction To Streams Concepts – Stream Data Model and Architecture - Stream Computing - Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating Moments – Counting Oneness in a Window – Decaying Window - Real time Analytics Platform(RTAP) Applications. [Q-2]

#### **Unit 3: Case Studies:**

Real Time Sentiment Analysis- Stock Market Predictions. [Q-1]

#### **Unit 4: Hadoop:**

History of Hadoop- the Hadoop Distributed File System – Components of Hadoop Analysing the Data with Hadoop- Scaling Out- Hadoop Streaming. [Q-2]

#### **Unit 5: Design of HDFS-Java interfaces to HDFS Basics:**

Developing a Map Reduce Application-How Map Reduce Works-Anatomy of a Map Reduce Job run-Failures-Job Scheduling-Shuffle and Sort – Task execution - Map Reduce Types and Formats- Map Reduce Features Hadoop environment. [Q-1]

#### **Text Book:**

1. Michael Berthold, David J. Hand, “Intelligent Data Analysis”, Springer, 2007.
2. Tom White “Hadoop: The Definitive Guide” Third Edition, O’reilly Media, 2012.

#### **Reference Books:**

1. Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, “Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data”, McGrawHill Publishing, 2012.
2. Anand Rajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, CUP, 2012.

## Elective Paper

### TESTING METHODOLOGIES (MCA E3010)

**TIME-3 hr**

**FULL MARKS-70**

**CREDIT-4**

The question paper shall consist of two sections: A and B. **Section A** will have eight (08) questions, out of which four (04) questions will be answered and will carry 10 marks each. **Section B (Compulsory)** will consist of 10 short answer type questions which will cover the entire syllabus and will carry 30 marks in all., each short-answer type question carrying 3 marks.

#### **Unit 1: Fundamentals of Testing:**

Definition of Software Testing, Objectives of software Testing, Problem due to lack of testing, Test Environment, Responsibilities of Tester, Characteristics of tester, Test team hierarchy, Scope of Tester, Defect, Fault, Failure and Bug, Basic concept of verification and validation, criteria for completion of testing, Independent Testing, Quality Assurance versus Quality Control, Software Quality Factors, How Quality is Defined, Testing Levels: Unit Testing, Integration Testing, System Testing. [Q-2]

#### **Unit 2: Role of Testing in SDLC:**

SDLC Overview, Phases in SDLC, Popular SDLC Models (Waterfall Models, Spiral Model, RAD Model, V Model, Incremental Model, Prototype Model), Agile Methodology (Scrum and Its Uses, Structural versus Functional Testing, Mutation Testing, Object-oriented testing. [Q2]

#### **Unit 3: Test Case design:**

Test Case (Characteristics Of Good Test Case, Test Case Template, Examples On Writing Test Cases), Test Case Design Techniques (Equivalence Partitioning, Boundary Value Analysis, Cause and Effect graph and Decision Table), Test Factors, Life Cycle of Testing and its Phases, Bug Life Cycle, Preparing bug report Template, Defect Tracking Tool- Bugzilla. [Q-1]

#### **Unit 4: Approaches to Testing:**

##### **Approaches to Testing – I**

**Static Testing:** Formal review, Informal Review, Technical Review, Types of Reviews, Walkthrough, Inspection.

##### **Approaches to Testing - II**

**Dynamic Testing:** Structural, Functional and Non-Functional Testing, **White Box Testing:** Basic Path Testing (Flow graph and Cyclomatic Complexity), Statement and Branch Coverage Testing, Control Structure Testing, Data Flow graph Testing, Loop Testing, Glass Box Testing, **Black Box Testing:** Build Verification Testing (BVT), Smoke Testing, Sanity Testing, Integration Testing, Retesting, Regression Testing, Acceptance Testing, System Testing, Ad-hoc Testing, Grey Box Testing. **Non-Functional Testing:** Performance Testing (Load, Stress and Volume Testing), Security Testing, Compatibility Testing, Recovery Testing, Usability Testing.[Q-2]

#### **Unit 5: Test Management & Strategies:**

Test management Process, Test Plan, Test Design, Test Execution, Exit Criteria, Test Reporting, Test Plan Components, Test Reporting Template, Entry and Exit Criteria, Test Monitoring and Control, Configuration Management.[Q-1]

#### **Text Books:**

1. Software Testing: Principles and Practices by Srinivasan D and Gopalswamy R, Pearson Ed, 2006.

#### **Reference Books:**

1. Software Testing Techniques by Boris Beizer, Dreamtech Publications

## Elective Paper

### MACHINE LEARNING (MCA E3011)

**TIME-3 Hrs.**

**FULL MARKS-70**

**CREDIT-4**

The question paper shall consist of two sections: A and B. **Section A** will have eight (08) questions, out of which four (04) questions will be answered and will carry 10 marks each. **Section B (Compulsory)** will consist of 10 short answer type questions which will cover the entire syllabus and will carry 30 marks in all., each short-answer type question carrying 3 marks.

#### **Unit 1: Introduction to Machine learning:**

Machine Learning – what and why? Basics of Linear Algebra and Statistics, Overview of target function representations; Linear Regression. [Q-1]

#### **Unit 2: Supervised Learning:**

Basics of Feature Selection and Evaluation, Decision Tree, Overfitting and Pruning, Logistic regression, Support Vector Machine and Kernel; Noise, bias-variance trade-off, under-fitting and over-fitting concepts. [Q-2]

#### **Unit 3: Neural Networks:**

Perceptions: representational limitation and gradient descent training. Multilayer networks and back propagation. Hidden layers and constructing intermediate, distributed representations. Overfitting, learning network structure, recurrent networks. [Q-2]

#### **Unit 4: Unsupervised and Semi Supervised Learning:**

Learning from unclassified data. Clustering. Hierarchical Agglomerative Clustering. K-means partitioned clustering. Expectation maximization (EM) for soft clustering. Semi-supervised learning with EM using labelled and unlabeled data. [Q-2]

#### **Unit 5: Ensemble:**

Committees of multiple hypotheses, bagging, boosting, active learning with ensembles. [Q-1]

#### **Text book:**

1. Mitchell Tom, Machine Learning, Latest Edition, Mc-Graw Hill.

#### **Reference books:**

1. Shalev-Shwartz Shai and Ben-David Shai, Understanding Machine Learning, Cambridge University Press. 2017
2. Bishop Christopher, Pattern Recognition and Machine Learning, Springer, 2006