SYLLABUS AND SCHEME OF EXAMINATIONS
MASTER OF TECHNOLOGY (M.TECH) COMPUTER SCIENCE
W.E.F. 2016-17

Programme Specific Outcomes:

The students upon completion of M.Tech.(Computer Science) Programme will be able:

PSO1 To apply knowledge of recent computing technologies, skills and current tools of computer science and engineering.
PSO2 To design and conduct experiments, as well as to analyze and interpret data.
PSO3 To Understand the contemporary research issues in the different areas of computer science & engineering.
PSO4 To explore research gaps, analyze and carry out research in the specialized/emerging areas.
PSO5 To design software systems, components or processes to meet identified needs within economic, environmental and social constraints.
PSO6 To express/present ideas in an impressive and professional manner.
PSO7 To recognize the need to engage in lifelong learning through continuing education and research
PSO8 To work in multidisciplinary and multicultural environment, become entrepreneur based upon societal needs, understanding of professional, social and ethical responsibilities.

Semester I

Paper Code	Course	University Exams	Internal Assessment	Total Marks	Credits (L:T:P)
16MTC21C1	Advanced Data Structures Using C++	80	20	100	3:1:0
16MTC21C2	Advanced Databases and Data Analytics	80	20	100	3:1:0
16MTC21C3	High Performance Networks	80	20	100	3:1:0
16MTC21C4	Advanced Computer Architecture	80	20	100	3:1:0
16MTC21CL1	S/W Lab – I (based on 16MTC21C1)	100*	----	100	0:0:2
16MTC21CL2	S/W Lab – II(based on 16MTC21C2)	100*	----	100	0:0:2
		Total Credits			**20**

Semester II

Paper Code	Course	University Exams	Internal Assessment	Total Marks	Credits (L:T:P)
16MTC22C1	Visual Programming and .NET Technology	80	20	100	3:1:0
16MTC22C2	Advanced JAVA Programming	80	20	100	3:1:0
	Elective-I as given in the table below	80	20	100	3:1:0
	Elective-II as given in the table below	80	20	100	3:1:0
16MTC22CL1	S/W Lab – I (based on 16MTC22C1)	100*	----	100	0:0:2
16MTC22CL2	S/W Lab – II(based on 16MTC22C2)	100*	----	100	0:0:2
		Total Credits			**20**

Discipline Specific Elective Papers (D)	
Elective- I (Any one)	**Elective-II (Any one)**
16MTC22DA1 Big Data Analytics	16MTC22DB1 Advanced Optimization and Simulation Techniques
16MTC22DA2 Software Quality Management	16MTC22DB2 Cloud Infrastructure and Services
16MTC22DA3 Soft Computing	16MTC22DB3 Security in Computing

Foundation Elective (F)	**Credits**
To be Chosen from the pool of Foundation Electives provided by the University.	2
Open Elective (O)	
To be Chosen from the pool of Open Electives provided by the University (excluding the open elective prepared by the Department of Comp Sc. & Appls.)	3
Total Credits	**25**

*20 marks out of 100 will be based on the evaluation/assessment of the candidate in Test(s) and Assignment(s) during the semester, which will be forwarded by the Head of Dept./Director to the Examiner(s). Further, both practical exams of a semester may be conducted on the same day in 2 sittings each maximum of 3 hours.

Semester III

Paper Code	Course	University Exams	Internal Assessment	Total Marks	Credits (L:T:P)
17MTC23C1	Mobile Computing	80	20	100	3:1:0
17MTC23C2	Object Oriented Analysis and Design Using UML	80	20	100	3:1:0
	Elective-I as given in the table below	80	20	100	3:1:0
	Elective-II as given in the table below	80	20	100	3:1:0
17MTC23CL1	S/W Lab – I (based on 17MTC23C1)	100*	----	100	0:0:2
17MTC23CL2	S/W Lab – II (based on 17MTC23C2)	100*	----	100	0:0:2
				Total Credits	**20**

Discipline Specific Elective Papers (D)	
Elective-I (Any one)	**Elective-II (Any one)**
17MTC23DA1 Theory of Computation	17MTC23DB1 Data Mining and Knowledge Management
17MTC23DA2 Software Testing	17MTC23DB2 Natural Language Processing
17MTC23DA3 Digital Image Processing	17MTC23DB3 Web Analytics and Intelligence

To be Chosen from the pool of Open Electives provided by the University (excluding the open elective prepared by the Department of Comp Sc. & Appls.)	3
Total Credits	**23**

*20 marks out of 100 will be based on the evaluation/assessment of the candidate in Test(s) and assignment(s) during the semester, which will be forwarded by the Head of Dept./Director to the Examiner(s). Further, both practical exams of a semester may be conducted on the same day in 2 sittings each maximum of 3 hours.

Semester IV

Paper Code	Course	University Exams		Internal Assessment	Total	Credits
17MTC24C1	Dissertation	Evaluation	200	100	**450**	**20**
		Presentation and Viva-Voce	150			

Overall Credits = 88

Dissertation

The supervisor for dissertation should be allocated to the student in the very beginning of the second semester facilitating the identification of dissertation topic, reviews of literature, etc. The one external examiner will evaluate dissertation and viva-voce will be conducted jointly by external examiner and the internal examiner (i.e. supervisor of the student).

PAPER CODE: 16MTC21C1
SUBJECT: ADVANCED DATA STRUCTURES USING C++

Course Outcomes:
By the end of the course the students will be able to:

CO1 Knowledge of Object-Oriented features of C++.
CO2 Knowledge of stacks, queues, recursion, linked lists and their implementation in C++.
CO3 Knowledge of Binary tree, B-tree, m-ary tree, Random Search trees.
CO4 Knowledge of Graph, its representation in computers, and shortest paths algorithms.
CO5 Knowledge of Spanning trees algorithms, Kruskal and Prim's algorithms, Hashing and collision handling techniques and Greedy Method.

Maximum marks: 100 (**External: 80**, **Internal: 20**) **Time:** 3 hours
Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (objective type/short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit- IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT – I

Introduction to C++: Object-Oriented features of C++, Class and Objects, Static data members and member functions, Pointers, Dynamic memory allocation and de-allocation, constructors and destructors, Dynamic objects, Array of pointers to object, local and global class, Console I/O, Operator Overloading , Friend Function and Type Conversion , Inheritance, Virtual Functions, Generic Programming & Exception Handling, and File Handling; Introduction to Basic Data Structure; Importance and need of good data structures and algorithms, Abstract Data Types.

UNIT – II

Stack: operations, implementation and applications, polish notation & inter conversions, evaluation of postfix expression, Queue: operations implementations and applications, Dequeue and circular queue implementation and applications, Linear Linked List implementation and applications, Circular Linked List implementation and applications, Recursive and Doubly Linked List implementation and applications, Dynamic Implementation of Stack, Queue, Dequeue, Priority queues , Binomial queue, Recursion and Backtracking, Applications of Recursion.

UNIT – III

Algorithms complexity and analysis: Searching(Linear search, Binary Search, Heuristic Binary Search and sorting(Selection Sort, Bubble sort, Insertion sort, Shell sort, Merge sort, Quik sort, Radix sort, Heap sort) techniques in C++.Binary Search Trees operations, implementation and applications, recursive and non-recursive traversals, Binary threaded Trees implementation and traversal, Balanced Trees: node balanced and height balanced (AVL) trees implementation, Converting general trees into binary tree, Complete Binary tree, B-tree, m-ary tree, Random Search trees.

UNIT – IV

Graphs and its representation in computers: Types of Graphs, paths and circuits; Euler's Graphs, Hamiltonian path and circuit; Adjacency matrix based, incidence matrix based, adjacency lists, linked representation, Depth first search (DFS) and Breadth first search (BFS) traversal, shortest paths algorithms: Bellman Ford , Dijkstra's and Warshall's algorithms, Spanning trees algorithms: Kruskal and Prim's algorithms, Hashing and collision handling techniques.
Greedy Method: General method, Knapsack problem, Job sequencing deadlines, Minimum spanning trees, Single source path and analysis of these problems.

Text Books-

1. Robert Lafore, "Object Oriented Programming in C++", SAMS Publishing Company.
2. Bjarne Stroustrup, " The C++ Programming Lenguage", Addison Wesley Publication, New York.
3. Seymour Lipschutz, "DATA STRUCTURERS", Tata McGraw- Hill Publishing Company Limited,Schaum's Outlines, New Delhi..
4. Yedidyah Langsam, Moshe J. Augenstein, and Aaron M. Tenenbaum, "DATA STRUCTURES USING C and C++", Prentice- Hall of India Private Ltd., New Delhi.
5. Michael T. Goodrich, Roberto Tamassia, David M. Mount, "Data Structures and Algorithms in C++",John Wiley Publications, New York.
6. Sahni Sartaj, " Data Structures , Algorithms and Applications in C++", WCB McGrraw Hill, New York.

Reference Books:

1. Herbert Schildt, "C++ - The Complete Reference", Tata McGraw-Hill publishing Company Limited,New Delhi.
2. John Berry, The Waite group,s C++ Programming , Addison-Wesley Longman Publishing Co., Inc.Boston, MA, USA.
3. N.S. Kutti and P.Y. Padhye ,"Data Structures in C++" ,Prentice Hall of India Pvt., Ltd., New Delhi
4. D.S.Malik, "Data Structure using C++", Course Technology -Thomson Carrer & Professional Group,Boston, MA , USA.
5. Trembley, J.P. And Sorenson P.G., "An Introduction to Data Structures with Applications", McGraw-Hill International Student Edition, New York.
6. Vic Broquard , "Advanced Data Structure in C++", Broquard e Books.

PAPER CODE: 16MTC21C2
SUBJECT: ADVANCED DATABASES AND DATA ANALYTICS

Course Outcomes:-

By the end of the course the students will be able to:

- CO1 Understand the fundamentals of DBMS and conceptual design using EER model with prerequisite .
- CO2 Understand differences between OODBMS and ORDBMS with their various features.
- CO3 Learn the concepts of Client-Server technology , Parallel and distributed database with their architectures and concepts..
- CO4 Learn how to retrieve information and analysis of data using mining approach.
- CO5 To understand the concepts of advance databases and emerging technologies such as cloud computing and big data with their various framework..

Maximum marks: 100 (**External: 80**, **Internal: 20**) **Time:** 3 hours

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (objective type/short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit- IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT-I

Advance Database: EER model, OODBMS with its architecture and storage issues, ORDBMS, Client-Server architectures, Parallel and Distributed database.

Enhanced Data Models: Active database with syntax and semantics (Oracle, DB2), Temporal database, Spatial database, Deductive database, Mobile database, Multimedia database, XML and Internet database.

UNIT-II

Data Warehouse: Introduction, needs, goals and characteristics of data warehouse, Data Mart, Data warehouse architecture, ETL process, Designing of DWH, fact and dimension data, Designing fact tables, partitioning strategy.

OLAP Technology: Multidimensional data models, OLAP operations, OLAP Server, Data warehouse implementation, Computation of data cubes, processing of OLAP queries, indexing OLAP data.

UNIT-III

Data Mining: Data preprocessing, data integration and transformation, data reduction, Discretization and Concept hierarchy Generation, Data Mining Primitives, types and architectures of data mining, Data generation and summarization based characterization, Analytical characterization, Mining class comparison, Association, Classification, Prediction, Clustering, Applications of Data mining.

UNIT-IV

Big Data: Fundamental concepts of Big data, Types, components and architectures of Big data, Big data warehouse, Programming model for Big data: Functional and Procedural models.

Big Data Analytics: Introduction of Big data analytics, Framework and approaches for Big data analysis, ETL process in Big data, Text analytics and Predictive analysis on Big data, Concepts of Hadoop Ecosystem: HDFS and MapReduce process.

Reference Books:

1. Elmasri and Navathe, Fundamentals of Database Systems [5e], Pearson Education.
2. Korth, Silberchatz, Sudarshan, Database System Concepts[5e], McGraw-Hill.
3. Raghu Ramakrishnan, Johannes Gehrke, Database Management Systems, McGraw-Hill
4. C.J.Date, Longman, Introduction to Database Systems, Pearson Education
5. Thomas Connolly,Carolyn Begg, Database Systems, [3e], Pearson Education
6. W.H.Inmon: Building Data Ware House, John Wiley & Sons.
7. S . Anahory and D.Murray: Data warehousing, Pearson Education, ASIA.

8. Jiawei Han & Micheline Kamber: Data Mining - Concepts & Techniques, Harcourt India PVT Ltd. (Morgan Kaufmann Publishers).
9. Minnelli M., Chambers M., Dhiraj A., Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for today's Businesses, Wiley CIO.
10. Viktor Mayer-Schonberger, enneth Cukier, Big Data: A Revolution that will transform how we live,work and think.
11. Big Data Black Book by DT Editorial Services, Dreamtech Publication

PAPER CODE-16MTC21C3
SUBJECT: HIGH PERFORMANCE NETWORKS

Course Outcomes:

By the end of the course, the students will be able to:

- CO1 Solve the challenges of High Speed Networks and its related performance.
- CO2 Communicate effectively the principles used in High Performance computing.
- CO3 Explain the basics of high speed networking technologies and to demonstrate the knowledge of network planning and optimization
- CO4 Describe the key components and technologies involved in building the state of art network design applications, concepts to optimize performance of high-speed networks
- CO5 Design and configure networks to support a specified set of applications

Maximum marks: 100 (**External: 80**, **Internal: 20**) **Time:** 3 hours

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (objective type/short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit- IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT – I

The Motivation for Internetworking: Need for Speed and Quality of Service; History of Networking and Internet; Advanced TCP/IP and ATM; Internet Architecture; Interconnection through IP Routers; TCP Services; TCP format and connection management; UDP format and UDP Services; Encapsulation in IP; IP header format; IP Services; IP addressing; Classful and Classless addressing; Subnetting and Supernetting; CIDR; IPv6 overview

UNIT – II

Congestion Control and Quality of Service: Data traffic; Network performance; Effects of Congestion; Congestion Control; Congestion control in TCP and Frame Relay; Link-Level Flow and Error Control; TCP flow control.

Quality of Service: Flow Characteristics, Flow Classes; Techniques to improve QoS; Traffic Engineering; Integrated Services; Differentiated Services; QoS in Frame Relay and ATM;

Protocols for QoS Support: Resource Reservation-RSVP; Multiprotocol Label Switching; Real-Time Transport Protocol;

UNIT – III

High Speed Networks: Packet Switching Networks; Frame Relay Networks; Asynchronous Transfer Mode (ATM); ATM protocol Architecture; ATM logical connections; ATM cells; ATM Service categories; ATM Adaptation Layer.

Optical Networks: SONET networks; SONET architecture; High-Speed LANs: The Emergence of High-Speed LANs; Bridged and Switched Ethernet; Fast Ethernet; Gigabit Ethernet.

UNIT – IV

Internet Routing: Interior and Exterior gateway Routing Protocols; Routers and core routers; RIP; OSPF; BGP; IDRP; Multicast Routing; MOSPF; Routing in Ad Hoc Networks.

Error and Control Messages: ICMP; Error reporting vs Error Correction; ICMP message format and Delivery; Types of messages; IGMP; Address Resolution (ARP); BOOTP; DHCP;

Application layer protocols: Remote Logging; File Transfer and Access; Comparison of SMTP and HTTP; Comparison of IMAP and POP.

Text Books:

1. William Stallings, "High-Speed Networks and Internets, Performance and Quality of Service", Pearson Education.
2. Douglas E. Comer, "Internetworking with TCP/IP Volume – I, Principles, Protocols, and Architectures", Fourth Edition, Pearson Education.
3. George Coulouris, Jean Dollimore, Tim Kindberg, "Distributed Systems-Concepts and Design", Pearson Education.

Reference Books:

1. B. Muthukumaran, "Introduction to High Performance Networks", Vijay Nicole Imprints.
2. Wayne Tomasi, "Introduction to Data Communications and Networking", Pearson Education.
3. James F. Kurose, Keith W. Ross, "Computer Networking, A Top-Down Approach Featuring the Internet", Pearson Education.
4. Andrew S. Tanenbaum, "Computer Networks", Pearson Education.
5. Behrouz A. Forouzan, "Data Communications and Networking", Fourth Edition, McGraw Hill.
6. Mahbub Hassan, Raj Jain, "High Performance TCP/IP Networking, Concepts, Issues, and Solutions", Pearson Education.
7. Andrew S. Tanenbaum, Marten Van Steen, "Distributed Systems-Principles & Paradigms", Pearson Education

PAPER CODE-16MTC21C4
SUBJECT: ADVANCED COMPUTER ARCHITECTURE

Course Outcomes

On successful completion of this course Student will be able to:

CO1 Describe the principles of computer design and classify instruction set architectures
CO2 Describe the operation of performance enhancements such as pipelines, dynamic scheduling, branch prediction, caches, and vector processors.
CO3 Describe the operation of virtual memory.
CO4 Describe modern architectures such as RISC, CISC, Super Scalar, VLIW (very large instruction word), multi-core and multi-cpu systems.
CO5 Compare the performance of different architectures.

Maximum marks: 100 (**External: 80**, **Internal: 20**) **Time:** 3 hours

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (objective type/short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit- IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT – I

Parallel Computer Models: Evolution of computer architecture, Elements of Modern Computers, Evolution of Computer Architectures, Classification of parallel computers, System attributes to performance, Multiprocessors and Multicomputers: Shared-Memory Multiprocessors (UMA, NUMA, COMA) and Distributed-Memory Multicomputers, Multi-vector and SIMD computers.

Program and Network Properties: Conditions of Parallelism - data and resource dependences, Bernstein's conditions, hardware and software parallelism. Program partitioning and scheduling - grain sizes and latency, grain packing and scheduling. Program Flow Mechanisms - control flow versus data flow, data flow architecture, demand driven mechanisms, comparison of flow mechanisms.

UNIT – II

System Interconnect Architectures: Network properties and routing, Static connection Networks –Linear Array, Ring & Chordal Ring, Barrel Shifter, Fat Tree, Mesh & Torus, Systolic Arrays, Hypercubes; Dynamic connection Networks – Digital Buses, Switch modules, MINs, Omega-, Baseline-, Crossbar-Network.

Advanced Processors: Design Space of Processors, Instruction-set Architectures, CISC Scalar Processors, RISC Scalar Processors, Superscalar Processors, VLIW Architectures, Vector and Symbolic processors.

UNIT – III

Pipelining and Superscalar Techniques: Linear pipeline processor – asynchronous and synchronous model, clocking and timing control, speedup, efficiency and throughput. Nonlinear Pipeline Processor –reservation and latency analysis, collision free scheduling. Instruction Pipeline Design – principles &mechanisms; dynamic instruction scheduling, branch handling techniques, branch prediction. Arithmetic Pipeline Design - computer arithmetic principles, static Arithmetic pipeline.

Memory Hierarchy Design: Memory hierarchy, Inclusion, coherence & locality; memory capacity planning; Virtual Memory technology – Models, TLB, Paging and Segmentation; Cache Memory Organization - Cache basics & cache performance, cache addressing models & mapping, multilevel cache hierarchies, interleaved memory.

UNIT – IV

Multiprocessor and Multicomputer Architectures: Multiprocessor System Interconnects – Hierarchical bus systems, Crossbar Switch and Multiport memory, Multistage and Combining networks; Symmetric shared memory architectures, distributed shared memory architectures, models of memory consistency, Cache coherence problem, Snoopy cache coherence protocol, directory-based protocols. Design challenges of directory protocols, memory based directory protocols, cache based directory protocols, protocol design tradeoffs, synchronization. Multicomputer Generations, Message passing mechanisms – message routing schemes, deadlock and virtual channels, flow control strategies, multicast routing algorithms.

Text Books:

1. Kai Hwang & Naresh Jotwani, "Advanced Computer Architecture"; McGraw-Hill.
2. Kai Hwang, "Advanced computer architecture"; TMH.
3. D.Sima, T.Fountain, P.Kasuk, "Advanced Computer Architecture-A Design space Approach," Addison Wesley.

Reference Books:

1. M.J Flynn, "Computer Architecture, Pipelined and Parallel Processor Design"; Narosa Publishing.
2. D. A. Patterson and J. L. Hennessey, "Computer organization and design," Morgan Kaufmann
3. J.P.Hayes, "Computer Architecture and Organization"; MGH.
4. Harvey G. Cragon, "Memory System and Pipelined processors"; Narosa Publication.
5. V.Rajaraman & C.S.R.Murthy, "Parallel computer: Architecture & Programming", PHI.
6. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, "Computer Organization", 5th Edition, MGH.
7. Kai Hwang and Zu, "Scalable Parallel computing"; MGH.

PAPER CODE: 16MTC21CL1
SUBJECT: S/W LAB – I (BASED ON 16MTC21C1)

Course Outcomes:

By the end of the course the students will be able to:

- CO1 Practical Knowledge of Object-Oriented features of C++.
- CO2 Knowledge of stacks, queues, recursion, linked lists and their implementation in C++.
- CO3 Knowledge of Binary tree, B-tree, m-ary tree, Random Search trees and their C++ programming.
- CO4 Knowledge of Graph, its representation in computers, and shortest paths algorithms and their C++ implementation.
- CO5 Knowledge of Spanning trees algorithms, Kruskal and Prim's algorithms, Hashing and collision handling techniques and Greedy Method and their C++ implementation.

PAPER CODE: 16MTC21CL2
SUBJECT: S/W LAB –II (BASED ON 16MTC21C2)

Course Outcomes:-

By the end of the course the students will be able to:

CO1 Understand the fundamentals of DBMS and conceptual design using EER model with prerequisite .

CO2 Understand differences between OODBMS and ORDBMS with their various features.

CO3 Learn the concepts of Client-Server technology , Parallel and distributed database with their architectures and concepts..

CO4 Learn how to retrieve information and analysis of data using mining approach.

CO5 To understand the concepts of advance databases and emerging technologies such as cloud computing and big data with their various framework..

Semester-II

PAPER CODE: 16MTC22C1
SUBJECT: VISUAL PROGRAMMING AND .NET TECHNOLOGY

Course Outcomes:

By the end of the course the students will be able to:

CO1 Use different inbuilt tools and constructs of VB language to design a VB application.

CO2 Design, Code and Run different projects in VB by using different types of Dialog boxes. Use Procedures, Menus and ActiveX Controls to design real applications in VB.

CO3 Establish the data connection by using DAO, ADO and RDO components to manipulate and manage data.

CO4 Work in .NET environment by using .Net CLS, CTS and CLR.

CO5 Programming in VB.Net and ADO.Net by establishing data connection and using binding controls.

Maximum marks: 100 (**External: 80**, **Internal: 20**) **Time:** 3 hours

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (objective type/short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit- IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT – I

Introduction to Visual Basic: VB Integrated Development Environment, An overview of VB project types, Default controls in Tool Box. Programming with VB: Variables, Constants, Data types, Operators: Arithmetic, String, Relational & Logical Operators. Built-in functions, I/O in VB, Branching & Looping statements, Procedures: Functions & Subroutines, Arrays, Collections. Working with Forms: Single form, Multiple forms & MDI forms.

UNIT – II

Menus Management: Adding Menus and its manipulation. **Dialog Boxes**: Types of Dialog boxes, Working with Common Dialog Box.

Creating & Using ActiveX Controls: Introduction, Creating, Designing, Adding Controls & Testing an Active X Control. Creating Active X Document & Comparison between ActiveX DLL & EXE.

UNIT – III

VB and Databases: The Data Controls and Data-Bound Controls, Connection to database: Introduction to DAO, RDO & ADO, Implementation using DAO and ADO.

Web-Enabled Applications: Creating & using a Web Browser, Programming E-Mail (Internet Transfer Control).

Introduction to .NET Framework: Microsoft .Net Platform, Origin of .Net, .Net Strategy, Design Goals, .Net Architecture: .NET Framework Class Library, Common Language Runtime, CLR Execution, Common Type System (CTS), Common Language Specification (CLS), Console Environment, IL, JIT, Managed and Unmanaged code.

UNIT – IV

Visual Basic .NET Programming: Introduction to Visual Basic .NET IDE: Toolbars, Graphical designer, Code designer, Object explorer, Toolbox, Properties window. Working with Validation Controls: Required Field Validators, Comparison Validators, Range Validators & Custom Validators.

ADO.NET Programming: Creating a data connection, Creating & Populating the data set, displaying the data in data grid. Binding Controls: Simple & Complex Binding.

Text Books:

1. Visual Basic 6 Programming: Black Book, Steven Holzner, Dreamtech PRESS
2. Mastering Visual Baisc 6, Evangelos Petroutsos BPB
3. Programming in Visual Basic 6.0 By Julia Case Bradley & Anita C. Millspaugh Tata McGraw-Hill Edition

Reference Books:

1. Step by Step Microsoft Visual Basic 6.0 Professional By Michael Halvorson PHI
2. Visual basic 6 Complete BPB
3. Using Visual Basic 6 Special Edition By Brian Siler and Jeff Spotts PHI
4. Visual Basic .net Comprehensive Concepts and Techniques Shelly, cashman,Quasney Cengage learning,2012
5. Visual Basic .net by Steven Holzer, Dream Tech Press Latest Edition
6. Murach's Beginning Visual Basic .NET by Anne Prince Murach
7. Programming in Visual Basic .NET Julia Case Bradley,Anita C. Millspaugh MGH edition

PAPER CODE: 16MTC22C2
SUBJECT: ADVANCED JAVA PROGRAMMING

Course Outcomes:

After the completion of this course, a successful student will be able to do the following:

CO1 Use the characteristics of an object-oriented programming language JAVA in a program.

CO2 Apply JAVA features to program design and implementation.

CO3 Design and implementation programs of Java Script, Applets, Event Handling, AWT Programming, and Interface.

CO4 To do the implementation of Packages, Swing, and Servlet.

CO5 Design and implementation programs of JSP.

Maximum marks: 100 (**External: 80**, **Internal: 20**) **Time:** 3 hours

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (objective type/short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT-I

Introduction: OOPS Concept, Java Scripts: Objects in Java Script, Dynamic HTML with Java Script. XML: Document type Definition, XML Schemas, XML Syntax Rules. Review of Applets, Event Handling, AWT Programming, Interface.

UNIT II

Packages: Understanding Packages, Defining a Package, Packaging up your Classes, Adding Classes from a Package to your Program, Understanding CLASSPATH, Standard Packages.

Swing: JApplet, Handling Swing Controls: Icons, Labels, Buttons, Text Boxes, Combo Boxes, Tabbed Pains, Scroll Pains, Trees, Tables. Differences between AWT Controls & Swing Controls. Developing a Home page using Applet & Swing.

UNIT-III

Introduction to Servlets: Lifecycle of a Servlet, The Servlet API, The javax.Servlet Package, Reading Servlet parameters, Reading Initialization parameters; The javax.servlet HTTP package, Handling HTTP Request & Responses.

Introduction to JSP: Problems with Servlets, The Anatomy of a JSP Page, JSP Processing, JSP Application Design with MVC and Setting Up JSP Environment, Installing the Java Software Development Kit, Tomcat Server & Testing Tomcat.

UNIT-IV

JSP Application Development: Generating Dynamic Content, Using Scripting Elements, Implicit JSP Objects, Conditional Processing: Displaying Values Using an Expression to set an Attribute, Declaring Variables, Methods, Error Handling and Debugging, Sharing Data Between JSP pages, Requests, Users Passing Control and Date between Pages, Sharing Session and

Application Data, Memory Usage Considerations, Database Access, Introduction to struts framework, RMI, CGI programming.

Reference Books:

1. Dietel and Nieto: Internet and World Wide Web – How to program?, PHI/Pearson Education Asia.
2. Patrick Naughton and Herbert Schildt: The Complete Reference Java, Latest Edition, Tata McGraw-Hill.
3. Hans Bergstan: Java Server Pages.
4. Bill Siggelkow, S P D O'Reilly: Jakarta Struts, Cookbook.
5. Murach: Murach's beginning JAVA JDK 5, SPD.
6. Wang-Thomson: An Introduction to Web Design and Programming.
7. Knuckles: Web Applications Technologies Concepts- John Wiley.
8. Sebesta: Programming world wide web, Pearson.
9. Building Web Applications-NIIT,PHI.
10. Bai/Ekedaw-Thomas: Web Warrior Guide to Web Programmming.
11. Jon Duckett: Beginning Web Programming, WROX.
12. Pekowsky, Java Server Pages, Pearson.
13. Any other book(s) covering the contents of the paper in more depth.

Note: Latest and additional good books may be suggested and added from time to time

PAPER CODE: 16MTC22DA1
SUBJECT: BIG DATA ANALYTICS

Course Outcomes:

By the end of the course the students will be able to:

CO1 Learn the concept of Big Data, its Components and its Architecture.
CO2 Apply different approaches for performing Big Data Analytics.
CO3 Perform Business Intelligence in IT applications.
CO4 Identify the differences between Business Intelligence and Business Analytics
CO5 Implement Big Data on Real Time Data Stream more effectively, Concept of Statistical Analysis using R Software.

Maximum marks: 100 (External: 80, Internal: 20) **Time:** 3 hours

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (objective type/short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit- IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT – I

Introduction to Data Analytics: Data and Relations, Data Visualization, Correlation, Regression, Forecasting, Classification and Clustering.

Big data Technology: Fundamentals of Big Data, Types, Big Data Technology Components, Big Data Architecture, Big Data Warehouse, Functional vs Procedural Programming Models for big data.

UNIT-II

Big Data Analytics: Introduction to Big Data Analytics, Framework for Big Data Analysis, Approaches for big data analysis, ETL in Big Data. Understanding Text Analytics and Big Data, Predictive Analysis on Big Data, Role of Data Analyst. Introduction to Hadoop Ecosystem: HDFS, Map reduce programming.

UNIT-III

Business Intelligence: Introduction to Business Intelligence, Business View of IT Applications, Digital Data, Introduction to Online Analytical Processing & OLAP vs OLTP. Business **Intelligence Concepts:** BI roles and responsibilities, BI framework and components, BI Project life cycle, Business Intelligence vs Business Analytics.

UNIT-IV

Implementation of Big Data: Big data implementation: Big data workflow. Variant data types: Operational databases, Graph databases in big data environment, Real Time Data Stream and Complex Event Processing. Introduction to Statistical Analysis with R Software. Big Data

Computation and its limitations. Applications of Big data: Business Scenario, Big data on Cloud and Security and Governance of Big data.

Reference Books:

1. Minelli M., Chambers M., Dhiraj A., Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for today's Businesses, Wiley CIO, 2013.
2. Viktor Mayer-Schonberger, Kenneth Cukier, Big Data: A Revolution that will transform how we live, work and think.
3. Big Data Black Book by DT Editorial Services, dreamtech publications 2015.
4. Seema Acharya & Subhashini Chellappan, Big data and Analytics, Wiley publishers

PAPER CODE: 16MTC22DA2 (EL-1)
SUBJECT: SOFTWARE QUALITY MANAGEMENT

Course Outcomes:

By the end of the course the students will be able to:

- CO1 Knowledge of Software Quality, Quality Attributes, Software Quality Control and Software Quality Assurance.
- CO2 Use and implementation of Reviews, Walkthrough, Inspection and Configuration Audits, Configuration Management.
- CO3 Knowledge of Defect Analysis and risk management techniques.
- CO4 Knowledge of Corrective Actions and Software Quality Program Planning.
- CO5 Knowledge of Quality management standards and Six Sigma concepts.

Maximum marks: 100 (**External: 80**, **Internal: 20**) **Time:** 3 hours

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (objective type/short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit- IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT – I

Concepts and Overview: Defining Software Quality, Quality Attributes, Error, fault, failure. Software Quality Control.

Software Quality Assurance: The Philosophy of Assurance, Evolution of SQA, Major SQA activities, Major SQA issues, The Relationship of Assurance to the Software Life-Cycle, SQA Techniques, Zero defect Software.

UNIT – II

Tailoring the Software Quality Assurance Program: Reviews, Walkthrough, Inspection and Configuration Audits. Evaluation: Software Requirements, Preliminary design, detailed design, Coding and Unit Test, Integration and Testing, System Testing, types of Evaluations. **Configuration Management:** Maintaining Product Integrity, Components, Configuration items, Change Management, Version Control, Configuration accounting.

UNIT – III

Defect Analysis: Analysis concepts, Identification of Defect, Classification of Defect, Analysis of Defect, Defect Reporting, Defect repair, Implementation of Correction, Regression Testing; Trend Analysis: Error Quality, Error Frequency, Program Unit Complexity, Compilation Frequency. **Risk management:** Risk Management Cycle, Risk Identification: Common tools and Techniques for risk Quantification, Risk Monitoring, Risk mitigation in Context of Global Project Team.

UNIT – IV

Corrective Action: Identifying the Requirement for Corrective Action, Determining the Action to be Taken, Implementing the corrective Action, Periodic Review of Actions Taken, Traceability, Records, Software Quality Program Planning; Social Factors: Accuracy, Authority, Benefit, Communication, Consistency, and Retaliation.
Quality Standards: CMM, ISO 9000 series, Six Sigma concepts.

Text Books:

1. John W. Horch, Practical Guide to Software Quality Management, Artech house publisher.
2. Robert Dunn, Software Quality Concepts and Plans, Prentice-Hall.
3. Alan Gillies, Software Quality, Theory and Management, Chapman and Hall.

Reference Books:

1. Tom Gilb, Principles of Software Engineering Management, Addison-Wesley.
2. Michael Dyer, The Clean room approach to Quality Software Engineering, Wiley & Sons.
3. Daniel Freedman, Gerald Weinberg, Handbook of Walkthroughs, Inspections and Technical Reviews, Dorset House Publishing.
4. Tom Gilb, Dorothy Graham, Software Inspection, Addison-Wesley.
5. Watts Humphrey, Managing the Software Process, Addison-Wesley.
6. Watts Humphrey, A Discipline for Software Engineering, Addison-Wesley.
7. Arthur Lowell, Improving Software Quality An Insiders' guide to TQM, John Wiley Sons.

PAPER CODE: 16MTC22DA3
SUBJECT: SOFT COMPUTING

Course Outcomes:

CO1 Ability to analyze the applications which can use fuzzy logic.

CO2 Ability to design Fuzzy Inference Systems and Fuzzy Controller.

CO3 Ability to understand the difference between learning and programming and explore practical applications of Neural Networks (NN).

CO4 Ability to appreciate the importance of optimizations and its use in computer engineering fields and other domains.

CO5 Students would understand the efficiency of a hybrid system and how Neural Network and fuzzy logic can be hybridized to form a Neuro-fuzzy network and its various applications.

Maximum marks: 100 (**External: 80**, **Internal: 20**) **Time:** 3 hours

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (objective type/short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT – I

Basic concepts of Neuro-Computing: Artificial Neural Network (ANN) and their biological roots and motivations, Mathematical Models of Neurons, ANN architecture, Learning rules, Learning Paradigms: Supervised, Unsupervised and reinforcement Learning, ANN training Algorithms-perceptions, Training rules, Delta, Back Propagation Algorithm, Multilayer Perceptron Model, Applications of Artificial Neural Networks, Competitive learning networks, Kohonen self organizing networks, Hebbian learning; Hopfield Networks, Associative Memories, The boltzman machine; Applications.

UNIT – II

Introduction to Fuzzy Logic: Classical and Fuzzy Sets: Overview of Classical Sets, Membership Function, Fuzzy rule generation. Operations on Fuzzy Sets: Compliment, Intersections, Unions, Combinations of Operations, Aggregation Operations. Fuzzy Arithmetic: Fuzzy Numbers, Linguistic Variables, Arithmetic Operations on Intervals & Numbers, Lattice of Fuzzy Numbers, Fuzzy Equations. Fuzzy Logic: Classical Logic.

UNIT – III

Genetic algorithms(GA), Evolution strategies(ES), Evolutionary programming(EP), Genetic Programming(GP), Selecting, crossover, mutation, schema analysis, analysis of selection algorithms; convergence; Markov & other stochastic models. Introduction to Genetic Algorithms: Robustness of traditional optimization and search methods, The Goals of optimization, Difference between GA and traditional methods, A simple genetic algorithm, Important Similarities, Similarity Templates (Schemata), Encodings.

UNIT – IV

Random Optimization, Simulated Annealing, Tabu Search, Ant Colony Optimization, Particle Swarm Optimization, Memetic Algorithms.

Text Books:

1. S. N. Sivanandam & S. N. Deepa, Principles of Soft Computing, Wiley – India.

Reference Books:

1. Jang, Sun, Mizutani, Neuro-Fuzzy and Soft computing, Pearson.
2. Haykin, Neural networks: a comprehensive foundation, Pearson.
3. Mitchell M., An Introduction to Genetic Algorithms, Prentice-Hall.
4. Goldberg D. E., Genetic Algorithms in Search, Optimization, and Machine Learning, Addison-Wesley.
5. Klir G.J. & Yuan B., Fuzzy Sets & Fuzzy Logic, PHI.

PAPER CODE: 16MTC22DB1 (EL-2)
SUBJECT: ADVANCE OPTIMIZATION AND SIMULATION OPERATIONAL

Course Outcomes:

By the end of the course the students will be able to:

CO1 Understand the linear programming problem.
CO2 Use various methods like Simplex or Dual method.
CO3 Identify the transparency of product and transportation cost.
CO4 Determine the practical solution.
CO5 Identify the resources and work schedule.

Maximum marks: 100 (**External: 80**, **Internal: 20**) **Time:** 3 hours

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (objective type/short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit- IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT – I

Linear Programming: Formulation, Graphical solution, standard and matrix form of linear programming problems, Simplex method and its Algorithm, Two-phase Simplex method.

Duality: General Rules for converting any Primal into its Dual, Dual Simplex method. Assignment models: Mathematical formulation of Assignment Problem, Hungarian algorithm for Assignment problems, Unbalanced Assignment problems.

UNIT – II

Integer Programming: Importance, Need and importance of Integer Programming, Gomory's All Integer Programming Problem technique and its algorithm.

CPM/PERT: Applications of CPM/PERT techniques, Network Diagram representation and rules for drawing Network Diagram, Time Estimation and Critical Path in Network Analysis.

UNIT – III

Modeling & Simulation Concepts: System Concepts**,** Introduction to Model, Type of Models, Modeling & Simulation, Continuous vs. Discrete System Simulation, Numerical Integration vs. Continuous Simulation, Analog vs. Digital Simulation, Simulation vs. Monte- Carlo Simulation, Nature of Computer Modeling and Simulation, When to Use Simulation?, Limitations of Simulation, Validation**,** and Simulation Languages.

Random Numbers: Pseudo-random generators, Testing of Pseudo-random number generators, Generation of non-uniformly distributed random numbers.

UNIT – IV

Simulation Experiments: Run length of Static and Dynamic Stochastic Simulation Experiments, Minimizing variability in simulators without increasing Number of simulation Runs.

Design of Application Simulators: Multi-server Queuing System, PERT, Optimizing Inventory Policy and Cost in Business environment.

Text Books:

1. Sharma, S.D., Operations Research, Kedar Nath and Ram Nath, Meerut.
2. Nar Singh Deo, "System Simulation with Digital computer", PHI, New Delhi.

Reference Books:

1. Taha, H.A., Operation Research – An Introduction, McMillan Publishing Co, New York.
2. Gupta P.K., Hira and D.S., Operation Research, Sultan Chand & Sons, New Delhi.
3. Kanti Swarup, Gupta P.K. & Man Mohan, Operation Research, Sultan Chand & sons, New Delhi.
4. Rao S.S., Optimization Theory and Applications, Wiley Eastern Ltd. New Delhi.
5. Gordon G., "System Simulation", PHI, New Delhi.
6. Payne James A. , " Introduction to Simulation : Programming Techniques and Methods of Analysis,McGraw Hill International Editions, Computer Science services, New York.
7. Jerry Banks, John S Carson II, Barry L Nelson and David M Nicol, Discrete Event Simulation, Pearson Education Asia, New Delhi.
8. Francis Neelamkavil, "Computer Modeling and Simulation", John Wiley & Sons, New York.

PAPER CODE: 16MTC22DB2 (EL-2)

SUBJECT: CLOUD INFRASTRUCTURE AND SERVICES

Course Outcomes:

By the end of the course the students will be able to:

CO1 Understand the meaning of Cloud Computing and its architecture.
CO2 Differentiate Cloud computing from Cluster and Grid Computing.
CO3 Perform Cloud-based Big Data/Real Time Analytics.
CO4 Implement Service Management by generating bills & accounts in Cloud Computing, Authentication Concepts in Cloud Computing
CO5 Identify Cloud Security Challenges and its solutions

Maximum marks: 100 (**External: 80**, **Internal: 20**) **Time:** 3 hours

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (objective type/short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit- IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT I

Cloud Computing Fundamentals: Cloud Computing definition: private, public and hybrid cloud; Evolution of Cloud Computing; Characteristics of Cloud. Cloud Computing Benefits and Limitations. Cloud Architecture. Cloud computing vs. Cluster computing vs. Grid computing; **Applications:** Technologies and Process required when deploying Web services; Deploying a Web service from inside and Outside of a Cloud.

UNIT II

Cloud Computing Service models: Introduction to Cloud Services: SaaS, IaaS, PaaS; Storage as a Service, Communication as a Service; Cloud-based big data/real time analytics, Understanding SOA; Improving Performance through Load Balancing.

Virtualization Basics: Objectives, Benefits of Virtualization, Emulation, Virtualization for Enterprise, VMware, Server Virtualization, Data Storage Virtualization.

UNIT III

Cloud Vendors and Service Management: Amazon cloud: AWS Overview, Installation of AWS, Google app Engine, Azure cloud and Salesforce.

Service Management in Cloud Computing: Service Level Agreements(SLAs), Billing & Accounting, Comparing, Scaling Hardware: Traditional vs. Cloud, Economics of scaling: Benefitting enormously , Managing Data: Looking at Data, Scalability & Cloud Services, Database & Data Stores in Cloud , Large Scale Data Processing.

UNIT IV

Security Concepts: Cloud security challenges, Cloud security approaches: Encryption, tokenization/obfuscation, Cloud security alliance standards, Cloud security models and related patterns, Cloud security in mainstream vendor solutions, Mainstream Cloud security offerings: Security assessment, Secure Cloud architecture design, Authentication in cloud computing, Client access in cloud, Cloud contracting Model, Commercial and business considerations.

Reference Books:

1. Cloud Computing : A Practical Approach by Anthony T. Velte Toby J. Velte, Robert Elsenpeter, The McGraw-Hill.
2. Cloud Computing: SaaS, PaaS, IaaS, Virtualization and more. by Dr. Kris Jamsa.
3. Tim Mather, SubraKumaraswamy, ShahedLatif, Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, O'ReillyMedia Inc.
4. Cloud Computing Bible, Barrie Sosinsky, Wiley-India.
5. Jason Venner,Pro Hadoop,Apress.
6. Cloud Computing: Principles and Paradigms, Editors: Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Wiley.
7. Cloud Computing: Principles, Systems and Applications, Editors: Nikos Antonopoulos, Lee Gillam, Springer.
8. Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Ronald L. Krutz, Russell Dean Vines, Wiley-India.

PAPER CODE : 16MTC22DB3
PAPER: SECURITY IN COMPUTING

Course Outcomes:

By the end of the course the students will be able to:

CO1 Apply security measures to commonly used computer resources
CO2 Identify the possible threats and apply protection mechanisms
CO3 Classify sensitive data and its relevance
CO4 Identify malicious and non-malicious codes
CO5 Determine ethical and legal issues of computer security

Maximum marks: 100 (**External: 80**, **Internal: 20**) **Time:** 3 hours

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (objective type/short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit- IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be

compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT – I

Computer Security: Security meaning, Goals, Vulnerabilities, Threats, Attacks, Controls, Computer Criminals, Methods of Defense.

Cryptography: Terminology and Background, Substitution Ciphers, Transpositions, Cryptanalysis, Data Encryption Standard, DES & AES Algorithms and comparison, Public Key Encryption – RSA.

Program Security: Secure Programs, Non-malicious Program Errors, Viruses and Other Malicious Code, Targeted Malicious Code, Controls against Program Threats.

UNIT – II

Protection in General-Purpose Operating Systems: Protected Objects, Security Methods of Operating Systems, Memory and Address Protection, Control of Access to General Objects, File Protection Mechanisms, User Authentication.

Designing Trusted Operating Systems: Trusted System, Security Policies – Military and Commercial; Models of Security – Multilevel security (Lattice Model of Access, Bell-La Padula Confidentiality Model, Biba Integrity Model), Trusted System Design principles, Security features of Trusted Operating System.

UNIT – III

Database and Data Mining Security: Overview, Security Requirements, Reliability and Integrity, Sensitive Data, Multilevel Databases -Security Issues.

Data Mining - Privacy and Sensitivity, Data Correctness and Integrity, Availability of Data.

UNIT – IV

Security in Networks: Overview of Network Concepts, Threats in Networks, Network Security Controls, Firewalls – design and types, Intrusion Detection Systems – types, goals, strengths and limitations, Secure E-Mail – requirements and solutions.

Legal and Ethical Issues in Computer Security: Copyrights, Patents, Trade Secrets, Information and the Law, Computer Crime, Cyber laws and Ethical issues.

Text Book:

1. Charles P. Pfleeger, Shari L. Pfleeger and Deven N. Shah: Security in Computing, Latest Edition, Pearson Prentice Hall.

Reference Books:

1. William Stallings, Network Security Essentials, Applications and Standards, 3rd edition, Pearson Education.

2. William Stallings, Cryptography and Network Security Principles and practice. 4/e, Prentice Hall.
3. Michael. E. Whitman and Herbert J. Mattord, Principles of Information Security, Course Technology.

PAPER CODE: 16MTC22CL1
SUBJECT: S/W LAB – I (BASED ON 16MTC22C1)

Course Outcomes:
By the end of the course the students will be able to:

CO1 Design, implement and creating web applications and window applications using C#.
CO2 Develop, implement, and demonstrate Component Services, Threading, Remoting, Windows services.
CO3 Develop applications by implementing security concepts in the .NET framework.
CO4 Learn about feature, controls and code to connect database with front end using ODBC, OLEDB, and SQL using ADO.NET,
CO5 Able to develop web based applications using Web facilities of Visual Basic Programming Language.

PAPER CODE: 16MTC22CL2
SUBJECT: S/W LAB – I (BASED ON 16MTC22C2)

Course Outcomes:
By the end of the course the students will be able to implement the various concepts in JAVA like that:

CO1 Develop a window using an Applet. Generate Form using HTML & JAVA SCRIPT, implement Event and AWT components, JSP to implement the Scripting Elements, JSP to implement any five Implicit Objects.
CO2 Implement Event and AWT components.
   a. Button
   b. Checkbox
   c. CANVAS
   d. SCROLLBAR
CO3 Implement Swing components.
   a. Button
   b. Table
   c. Tree
   d. Checkbox Pane
   e. Tabbed Pane

f. Scroll Pane

CO4 Implement all the phases of life cycle of Servlet, DHTML and CSS with java script, program in Java using JSP which accept two integer numbers from user and display the result, POST and GET Method in swing, JavaScript program to check number entered is an Armstrong number or not, create a Login Form and validate it.

CO5 What is role of server side different from client side in a typical Website? Clear using an example.

Semester-III

PAPER CODE: 17MTC23C1
SUBJECT: MOBILE COMPUTING

Course Outcomes:

By the end of the course the students will be able to:

CO1 Describe the basic concepts and principles in mobile computing.

CO2 Understand the concept of Wireless LANs, PAN, Mobile Networks, and Sensor Networks. Explain the structure and components for Mobile IP and Mobility Management.

CO3 Understand positioning techniques and location-based services and applications and describe the important issues and concerns on security and privacy.

CO4 Apply the fundamental design paradigms and technologies to mobile computing applications.

CO5 Appraise the quality and performance of mobile applications, MANET and assess and implement security principles in mobile applications.

Maximum marks: 100 (**External: 80**, **Internal: 20**) **Time:** 3 hours

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (objective type/short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit- IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT I

Mobile Computing Concepts: Mobile computing and Its Applications, Mobile computing features: Low power, Limited resource, Fault Tolerant, Persistence; Cellular network: Components; architecture, Call setup, Frequency reuse and Co – Channel cell, Cell design, Interference,

Channel Assignment, Handoff, Adjacent channel Interference, Transmission problems And Solutions.

UNIT II

Pervasive Computing: Basics and Vision, Principles of Pervasive Computing, Categories of Pervasive Devices, 3G and 4G cellular Network, Migration to 3G networks: IMT 2000and UMTS Architecture. Use Equipment, GSM: System Architecture; Mobile Services and Features, Protocols, Handover, GSM channels, localization and calling, User Validation, GPRS; Bluetooth architecture: layers, security in Bluetooth.

UNIT III

Wireless LAN: Architecture, protocol layers; Ad-Hoc networks: Definition, application, Challenges, Traffic Profile, Ad- hoc routing protocols: Proactive, Reactive and Hybrid. Secure Routing Protocols; Mobility and location management; Sensor Networks: Introduction, applications, Design issues, Requirements.

UNIT IV

TCP/IP Architecture: The Internet Protocols: IPv4 and IPv6, UDP and TCP; Security Aspects: Threats, vulnerabilities, Attacks, Integrity, Confidentiality, Policy and relevant Definitions. Mobile IP: Architecture, Packet delivery, Care of address management.

Network simulator: Installing, Creating and Managing Nodes, configuring nodes, analyzing the statistics: PDR, Delay, Throughput; Introduction to NAM files.

Text Books:

1. Jochen Schiller, “Mobile Communications”, Second Edition, Pearson Education.
2. Raj Kamal, “Mobile Computing”, Oxford Higher Education.

Reference Books:

1. Sipra DasBit, Biplab K. Sikdar, “Mobile Computing”, PHI.
2. William C.Y.Lee, “Mobile Cellular Telecommunications”, Second Edition, (Tata McGraw-Hill).
3. Theodore S. Rapparort, “Wireless Communications- Principles and Practice”, Second Edition, Pearson Education.
4. Stomenovic and Cacute, “Handbook of Wireless Networks and Mobile Computing”, Wiley
5. W. Stallings, “Wireless Communications and Networks”, Pearson Education
6. Uwe Hansmann, Lothar Merk, Martin S. Nicklons, Thomas Stober, “Principles of Mobile Computing”, Springer, New York
7. Hazysztof Wesolowshi, “Mobile Communication Systems”, John Wiley and Sons

PAPER CODE: 17MTC23C2

SUBJECT: OBJECT ORIENTED ANALYSIS AND DESIGN USING UML

Object Outcomes:

By the end of the course the students will be able to:

CO1 Understand Object Oriented concepts, terms and principles.

CO2 Understand the basic concepts to identify state & behavior of real world objects.

CO3 Able to learn various object oriented methodologies and choose the appropriate one for solving the problem with the help of various case studies.

CO4 Understand the concepts of analysis and design to develop a document for the project.

CO5 Able to implement analysis and design phase in developing a software project.

Maximum marks: 100 (**External: 80**, **Internal: 20**) **Time:** 3 hours

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (objective type/short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit- IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT – I

Overview of Object-Oriented Methodologies: Concepts - abstraction, encapsulation, object, class, methods, message passing, inheritance, polymorphism, genericity, overriding, abstract class & methods, concurrency, persistence of objects. Methodologies - Object Modeling Technique (OMT) – object model, dynamic model, functional model.

Modeling with UML: Modeling Concepts – Systems, Models & Views; Event Classes, Events & Messages; Object-Oriented Modeling; Falsification & Prototyping; UML Diagrams – Use case diagram, class diagram, interaction diagram, State chart diagram, Activity diagram.

UNIT – II

Requirements Elicitation: Functional and non Functional requirements; Greenfield, reengineering and interface engineering; Activities – Identifying actors, scenarios and use cases; relationships among actors and use cases; identifying initial analysis objects and non-functional requirements.

Analysis: Analysis Object Models and Dynamic Models; entity, boundary and control objects; generalization and specialization; Activities - identifying entity, boundary and control objects; mapping use cases to objects with sequence diagrams; modeling interaction among objects; identifying associations, aggregates and attributes; modeling state dependent behavior of individual objects; modeling inheritance relationships between objects.

UNIT – III

System Design: Concepts – Subsystems & Classes; Coupling & Cohesion; Layers & Partition; Architectural Styles; Activities – identifying design goals and subsystems.

Addressing Design Goals: UML Deployment Diagram; Activities: Mapping subsystems to processors; identifying and storing persistent data, providing access control, designing the global control flow; identifying boundary conditions; reviewing system design.

UNIT – IV

Reusing Pattern Solutions: Reuse Concepts – Application and Solution Objects, Specification and Implementation Inheritance, Delegation, Liskov Substitution principle; Design Patterns – Elements of a design pattern, Reuse Activities - Selecting Design Patterns and Components – Heuristics for selecting Design Patterns; Identifying and Adjusting Application Frameworks.

Specifying Interfaces: Concepts - Class Implementer, Class Extender & Class User; Types, Signature & Visibility; Invariants, Preconditions & Post conditions; Object Constraint Language (OCL); OCL Collections; OCL Qualifiers; Identifying missing attributes and operations; Specifying type signatures, visibility, preconditions, post conditions & invariants; Inheriting contracts, Implimentation using Rational Rose

Text Books:

1. Bernd Bruegge, Allen H. Dutoit, Object Oriented Software Engineering using UML, Pearson Education

2. M. Blaha, J. Rumbaugh, Object-Oriented Modeling and Design with UML, Pearson Education

Reference Books:

1. Grady Booch, James Rumbaugh, Ivar Jacobson, The Unified Modeling Language User Guide, Pearson education 2. Satzinger, Jackson, Burd, Object-Oriented Analysis & Design with the Unified Process, Thomson

3. Grady Booch, Object Oriented Analysis & Design, Addison Wesley

4. Timothy C. Lethbridge, Robert Laganiere, Object Oriented Software Engineering, (Tata McGraw-Hill)

PAPER CODE: 17MTC23DA1
SUBJECT: THEORY OF COMPUTATION

Course Outcomes

After completing this course, students will be able to:

CO1 Analyze and design finite automata, formal languages, and grammars.
CO2 Explain the basic concepts of deterministic and non-deterministic finite automata, regular language, context-free language, Turing machines
CO3 Find ambiguous grammars, able to construct derivative trees
CO4 Describe the formal relationships among machines, languages and grammars
CO5 Distinguish different computing languages and classify their respective types.

Maximum marks: 100 (**External: 80**, **Internal: 20**) **Time:** 3 hours

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (objective type/short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit- IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT-I

Finite Automata and Regular Expressions: Basic Mathematical Notation, Finite State Systems, Basic Definitions- Non- Deterministic finite automata (NDFA), Deterministic finite automata (DFA), Equivalence of DFA and NDFA, Regular Expressions, Equivalence of finite automata and Regular Expressions, Conversion of NFA to DFA by Arden's Method, Pumping Lemma for Regular Sets, Applications of the pumping lemma.

UNIT-II

Grammars: Definition, Context free and Context sensitive grammar, Ambiguity regular grammar, Reduced forms, Removal of useless Symbols and unit production, Chomsky Normal Form (CNF), Greibach Normal Form (grammars, GNF).

UNIT-III

Pushdown Automata: Definitions, Deterministic Pushdown Automata, Equivalence of Pushdown Automata and CFL.

Turing Machines: Deterministic and Non-Deterministic Turing Machines, Design of T.M, Halting problem of T.M., PCP Problem.

UNIT-IV

Chomsky Hierarchies: Chomsky hierarchies of grammars, unrestricted grammars, Context sensitive languages, Relation between languages of classes.

Computability: Basic concepts, Primitive Recursive Functions.

Reference books:

1. Introduction to Automata theory, language & computations- Hopcroaft & O.D. Ullman, R. Mothwani
2. Theory of Computer Science (Automata, Languages and computation): K.L.P. Mishra & N. Chandrasekaran, PHI.
3. Introduction to languages and the Theory of Computation by John C. Martin, T.M.H
4. Fundamentals of the Theory of Computation- Principles and Practice by Ramond Greenlaw and H. James Hoover,Harcourt India Pvt. Ltd..
5. Elements of Theory of Computation by H.R. Lewis & C.H. Papaditriou, PHI.

PAPER CODE-17MTC23DA2
SUBJECT: SOFTWARE TESTING

Course Outcomes:

By the end of the course the students will be able to:

CO1 Apply software testing knowledge and engineering methods to design and conduct a software test process for a software testing project.

CO2 Identify and select appropriate testing technique to test a software.

CO3 identify various software testing problems and solve these problems by various software testing methods.

CO4 Understand the contemporary issues in software testing, such as buddy, agile, extreme, ad-hoc software testing problems etc.

CO5 To use software testing methods and modern software testing tools for their testing projects and employ correct testing terminology throughout the testing process.

Maximum marks: 100 (**External: 80**, **Internal: 20**) **Time:** 3 hours

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (objective type/short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit- IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT – I

Software testing principles: Types of Debugging and testing, fundamentals of test process, Need for testing, Psychology of testing, Testing economics, Software Verification & Validation, types of testing, Weyuker's adequacy axioms.

UNIT – II

Testing strategies: White box testing techniques: Control Flow based testing - Statement coverage, Branch Coverage, Path Coverage; Data flow based testing, Mutation testing, Automated code coverage analysis, Black box testing techniques: Boundary value analysis, Robustness testing, Equivalence partitioning, Cause-effect graphing, Syntax testing - Finite state testing; Levels of testing - Unit, Integration and System Testing; Acceptance testing: α, β, and γ testing.

UNIT – III

Testing object oriented software: Challenges, Differences from testing non-Object Oriented Software, Class testing strategies, Class Modality, State-based Testing, Message Sequence Specification. Testability and related issues: Design for Testability - Observability & Controllability - Built-in Test – Design by Contract - Precondition, Post condition and Invariant - Impact on inheritance - Applying in the real world Regression Testing - Challenges – test optimization

UNIT – IV

Miscellaneous topics: Automated Tools for Testing - Static code analyzers, Test case generators, GUI Capture/Playback, Stress Testing, Testing Client-server applications, Testing compilers and language processors, Testing web-enabled applications, Ad hoc testing: Buddy testing, pair testing, Exploratory testing, Agile and extreme testing,

Text Books:

1. Glenford J.Myers, "The Art of Software Testing", 2/e, John Wiley & Sons,
2. Mathur P Aditya, Foundations of Software Testing, Pearson Education, 2008
3. D. Srinivasan & R. Gopalaswamy, Software Testing – Principles & Practices, Pearson Education

Reference Books:

1. Robert V.Binder, "Testing Object-Oriented Systems: Models Patterns and Tools", Addison Wesley.
2. Patton Ron, Software Testing, 2/e, Pearson education.
3. Limaye G. M., Software Testing – Principles, Techniques, and Tools, Tata McGraw Hill.
4. Boris Beizer, Black-Box Testing: "Techniques for Functional Testing of Software and Systems", John Wiley & Sons
5. P.C.Jorgensen, "Software Testing - A Craftman's Approach", CRC Press
6. William E.Perry, "Effective Methods for Software Testing (2nd Edition)", John Wiley & Sons
7. Boris Beizer, "Software Testing Techniques (2nd Edition)", Van Nostrand Reinhold.

PAPER CODE: 17MCS23DA3
SUBJECT: DIGITAL IMAGE PROCESSING

Course Outcomes:

By the end of the course the students will be able to:

CO1 Quantize and to perform sampling on given images.
CO2 Transform and filter the digital image for improving the image quality.
CO3 Generate Color images by applying different image characteristics.
CO4 Compress the digital images by applying different lossless and lossycompression techniques.
CO5 Identify different representations of digital images.

Maximum marks: 100 (External: 80, Internal: 20) **Time: 3 hours**

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (objective type/short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit- IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT – I

Introduction to Digital Image Processing and its origins; Example fields using digital image processing; Fundamental steps in digital image processing; Components of an Image Processing system; Image sampling and Quantization; Relationships between pixels; Mathematical tools used in image processing.

UNIT – II

Image Enhancement: Intensity transformations and spatial filtering; Histogram processing; Fundamentals of spatial filtering; Smoothing and sharpening spatial filters; Filtering in frequency **domain**: Fourier Series and Transform; Sampling; Fourier Transform of Sampled Functions; Discrete Fourier Transform; Frequency Domain Filtering Fundamentals; Image smoothing and sharpening using Frequency Domain Filters; Homomorphic Filtering.

UNIT – III

Image Restoration: Model of Image Degradation/Restoration process; Noise models; Linear, Inverse filtering; Mean Square Error Restoration; Least Square Restoration; Singular value Decomposition; Image Compression Fundamentals: Lossless and Lossy Compression;
Basic Compression Methods: Huffman Coding; Run-Length Coding; LZW Coding; Bit-Plane Coding; Predictive Coding; Transform Coding; Wavelet Coding.

UNIT – IV

Image Segmentation: Fundamentals; Point, Line, and Edge Detection; Thresholding; Region-Based Segmentation; Motion-Based Segmentation; Image Representation: Boundary Representation; Chain Codes; Polygonal Approximations; Signatures; Boundary Segments; Skeletons; Boundary Descriptors: Simple Descriptors; Shape Numbers; Fourier Descriptors; Regional Descriptors; Topological Descriptors; Texture.

Text Book:

1. Rafael C. Gonzalez, Richard E. Woods, Digital Image Processing, PHI.

Reference Books:

1. William K. Pratt, Digital Image Processing, John Wiley &Sons.
2. B.Chanda, D. Dutta Majumder, Digital Image Processing and Analysis, PHI.
3. A.K. Jain, Fundamental of Digital Image Processing, PHI.
4. Millman Sonka, Vaclav Hlavac, Image Processing Analysis and Machine vision, Thompson Learning

PAPER CODE: 17MTC23DB1
SUBJECT: DATA MINING AND KNOWLEDGE MANAGEMENT

Course Outcomes:

By the end of the course the student will be able to:

CO1 Evaluate and implement a wide range of newly adopted methodologies and technologies to facilitate the knowledge discovery.

CO2 Discover and measure interesting patterns from different kinds of databases.

CO3 Characterize and discriminate data summarization forms and determine data mining functionalities.

CO4 Evaluate and select appropriate data mining algorithm to apply, interpret and report the output appropriately.

CO5 Design and implement data mining applications using sample or realistic data sets.

Maximum marks: 100 (**External: 80**, **Internal: 20**) **Time:** 3 hours

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (objective type/short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit- IV. Examiner will set two questions from each Unit of the syllabus and each question will carry16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT I

Introduction to Big Data Analytics: Big Data Overview, State of the Practice in Analytics, the Data Scientist, Big Data Analytics in Industry Verticals, Data Analytics Lifecycle.

Data warehousing: Introduction, Operational data stores, ETL, Data warehouses-design guidelines for data warehouse implementation, Data warehouse metadata. OLAP: Introduction, Characteristics, Multidimensional view and data cube, Data cube operations.

UNIT II

Data mining: Introduction to Knowledge Discovery from Data (KDD). Data preprocessing: data integration and transformation, data reduction, Discretization and Concept Hierarchy Generation, Data mining primitives, Types of Data Mining, Architecture of data mining. Data Generalization & Summarization based characterization, Analytical characterization, Mining Class Comparisons.

UNIT III

Association Rules: Mining Association Rules in large databases: Association rule mining, single dimensional association rules from Transactional DBS, Multi level association rules from transaction DBS, multidimensional association rules from relational DBS and DWS.

Classification: Introduction, decision tree, tree induction algorithm-split algorithm based on information gain, split algorithm based on Gini index; naïve Baye's method; estimating predictive accuracy of classification method.

UNIT IV

Cluster Analysis: Introduction, partitioning methods, hierarchical methods, density based methods, Cluster software; Efficient Clustering of Very Large Document Collections: A case study: Spatial Data Mining.

Web Data mining: Web Terminology and Characteristics, Locality and Hierarchy in the web, Web Content Mining, Web Usage Mining, Web Structure Mining, Web mining Software.

Recommended Books:

1. Han J., Kamber M. and Pei J., Data mining concepts and techniques, Morgan Kaufmann Publishers.
2. Pudi V., Krishana P.R., Data Mining, Oxford University press.
3. Adriaans P., Zantinge D., Data mining, Pearson education press .
4. Pooniah P., Data Warehousing Fundamentals, Wiley Interscience Publication.
5. W.H.Inmon: Building Data Ware House, John Wiley & Sons.
6. S . Anahory and D.Murray: Data warehousing, Pearson Education, ASIA.
7. Michall Corey, M.Abbey, I Azramson & Ben Taub: Oracle 8i Building Data Ware Housing, TMH.
8. I.H. Whiffen: Data Mining, Practical Machine Cearing tools & techniques with Java (Morgan Kanffmen)
9. Sima Yazdanri & Shirky S. Wong: Data Ware Housing with oracle.
10. A.K. Pujari: Data Mining Techniques, University Press.
11. IBM An Introduction to Building the Data Warehouse, PHI Publication.
12. Pieter Adriaans Dolf Zantinge: Data Mining, Addition Wesley.

13. David Hand, Heikki Mannila, and Padhraic Smyth: Principles of Data Mining, PHI Publication.
14. Anahory S., Murray D. :Data Warehousing in the Real World, Addison Wesley.

Any other book(s) covering the contents of the paper.

PAPER CODE: 17MTC23DB2
SUBJECT: NATURAL LANGUAGE PROCESSING

Course Outcomes:

By the end of the course the students will be able to:

CO1 Get the idea about origin and fundamentals of NLP with Morphology concepts.
CO2 Learn the need of machine translation and understand the process of it..
CO3 Understand about lexical analysis, Word net theory, speech recognition and their concepts.
CO4 Understand the use of NLP in Sentiment analysis and information retrieval.
CO5 Learn the Implementation of NLP using various tools and techniques and implementation of key algorithms using NLP.

Maximum marks: 100 (**External: 80**, **Internal: 20**) **Time:** 3 hours

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (objective type/short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit- IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT I

Introduction: Origin of Natural Language Processing (NLP), Challenges of NLP, NLP Applications, Processing Indian Languages. Words and Word Forms Morphology fundamentals; Morphological Diversity of Indian Languages; Morphology Paradigms; Finite State Machine Based Morphology; Automatic Morphology Learning; Shallow Parsing; Named Entities; Maximum Entropy Models; Random Fields, Scope Ambiguity and Attachment Ambiguity resolution.

UNIT II

Machine Translation: Need of MT, Problems of Machine Translation, MT Approaches, Direct Machine Translations, Rule Based Machine Translation, Knowledge Based MT System, Statistical Machine Translation, UNL Based Machine Translation, Translation involving Indian Languages.

UNIT III

Meaning: Lexical Knowledge Networks, WorldNet Theory; Indian Language; Word Nets and Multilingual Dictionaries; Semantic Roles; Word Sense Disambiguation; WSD and Multi

linguality; Metaphors. Speech Recognition: Signal processing and analysis method, Articulation and acoustics, Phonology and phonetic transcription, Word Boundary Detection; Argmax based computations; HMM and Speech Recognition.

UNIT IV

Other Applications: Sentiment Analysis; Text Entailment; Question Answering in Multilingual Setting; NLP in Information Retrieval, Cross Lingual IR. Laboratory Work: To implement Natural language concepts and Computational linguistics concepts using popular tools and technologies. To implement key algorithms used in Natural Language Processing.

Recommended Books:

1. Siddiqui and Tiwari U.S., Natural Language Processing and Information Retrieval, Oxford University Press
2. Allen J., Natural Language understanding, Benjamin/Cunnings, (1987).
3. 3.Jensen K., Heidorn G.E., Richardson S.D., Natural Language Processing: The PLNLP Approach, Springer (2013).
4. Roach P., Phonetics, Oxford University Press (2012)

PAPER CODE: 17MTC23DB3
SUBJECT: WEB ANALYTICS AND INTELLIGENCE

Course Outcomes:
By the end of the course the students will be able to:

CO1 Characterize the web data as visit or content type.
CO2 Understand to apply the conversion metrics offline as well as online web.
CO3 Collect the data of different kinds: web logs, web beacons and stream data.
CO4 Create packets and to perform the packet sniffing, identification of unique page.
CO5 Apply different metrics to count hits, views, bounce and to generate different kinds of reports.

Maximum marks: 100 (**External: 80**, **Internal: 20**) **Time:** 3 hours

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (objective type/short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit- IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT I

Introduction: Definition, Process, Key terms: Site references, Keywords and Key phrases; building block terms: Visit characterization terms, Content characterization terms, Conversion

metrics; Categories: Offsite web, On site web; Web analytics platform, Web analytics evolution, Need for web analytics, Advantages, Limitations.

Data Collection: Click stream Data: Web logs, Web Beacons, JavaScript tags, Packet Sniffing; Outcomes Data: E-commerce, Lead generation, Brand/Advocacy and Support; Research data: Mindset, Organizational structure, Timing; Competitive Data: Panel-Based measurement, ISP-based measurement, Search Engine data.

UNIT II

Qualitative Analysis: Heuristic evaluations: Conducting a heuristic evaluation, Benefits of heuristic evaluations; Site Visits: Conducting a site visit, Benefits of site visits; Surveys: Website surveys, Post-visit surveys, creating and running a survey, Benefits of surveys.

Web Analytic fundamentals: Capturing data: Web logs or JavaScript's tags, Separate data serving and data capture, Type and size of data, Innovation, Integration, Selecting optimal web analytic tool, Understanding click stream data quality, Identifying unique page definition, Using cookies, Link coding issues.

UNIT III

Web Metrics: Common metrics: Hits, Page views, Visits, Unique visitors, Unique page views, Bounce, Bounce rate, Page/visit, Average time on site, New visits; Optimization (e-commerce, non e-commerce sites): Improving bounce rates, Optimizing adwords campaigns; Real time report, Audience report, Traffic source report, Custom campaigns, Content report, Google analytics, Introduction to KPI, characteristics, Need for KPI, Perspective of KPI, Uses of KPI.

Relevant Technologies: Internet & TCP/IP, Client / Server Computing, HTTP (Hypertext Transfer Protocol), Server Log Files & Cookies, Web Bugs.

UNIT IV

Web Analytics 2.0:Web analytics 1.0, Limitations of web analytics 1.0, Introduction to analytic 2.0, Competitive intelligence analysis : CI data sources, Toolbar data, Panel data ,ISP data, Search engine data, Hybrid data, Website traffic analysis: Comparing long term traffic trends, Analyzing competitive site overlap and opportunities.

Google Analytics: Brief introduction and working, Adwords, Benchmarking, Categories of traffic: Organic traffic, Paid traffic; Google website optimizer, Implementation technology, Limitations, Performance concerns, Privacy issues.

Recommended Books:

1. Clifton B., Advanced Web Metrics with Google Analytics, Wiley Publishing, Inc.2nd ed.
2. Kaushik A., Web Analytics 2.0, The Art of Online Accountability and Science of Customer Centricity, Wiley Publishing, Inc. 1st ed.
3. Sterne J., Web Metrics: Proven methods for measuring web site success, John Wiley and Sons

Any other book(s) covering the contents of the paper.

PAPER CODE: 17MTC23CL1
SUBJECT: S/W LAB – I (BASED ON 17MTC23C1)

Course Outcomes:

By the end of the course the students will be able to :

CO1 To understand the installing process, Creating and Managing Nodes.

CO2 To elaborate on various syntax of network simulator with suitable example.

CO3 To understand the reactive type protocols with suitable example

CO4 Describe UDP and TCP protocol based on various attributes

CO5 To understand the proactive type protocols with suitable example

PAPER CODE: 17MTC23CL2
SUBJECT: S/W LAB – I (BASED ON 17MTC23C2)

Course Outcomes:

By the end of the course the students will be able to :

1. Understand the programming concept of Object Oriented analysis using UML.
2. Understand the basic concepts to identify state & behavior of real world objects.
3. Learn various object oriented methodologies and choose the appropriate one for solving the problem with the help of various case studies.
4. Understand the concepts of analysis and design to develop a document for the project.
5. Analysis and design phase in developing a software project.

SEMESTER-IV

PAPER CODE: 17MTC24C1
SUBJECT: DISSERTATION

Course Outcomes:

By the end of the course the students will be able to:

CO1 Knowledge of research areas and problem formulation.

CO2 Knowledge of literature survey.

CO3 Knowledge of research gaps on the basis of literature survey.

CO4 Knowledge of research and its outcomes.

CO5 Preparation and publication of research papers in journals and conferences, submission of dissertation.