# SCHEME OF EXAMINATION FOR M.TECH. (COMPUTER SCIENCE & ENGINEERING) w.e.f. Academic Session 2014-15

| Paper Code | Nomenclature of Paper | Exam Time (hrs.) | External Marks | | Internal Marks | | Total Marks |
|---|---|---|---|---|---|---|---|
| | | | Max | Pass | Max | Pass | |
| FIRST SEMESTER | | | | | | | |
| MT-CSE-14-11 | ADVANCES IN ALGORITHMS | 3 | 100 | 40 | 50 | 20 | 150 |
| MT-CSE-14-12 | ADVANCED WEB TECHNOLOGIES | 3 | 100 | 40 | 50 | 20 | 150 |
| MT-CSE-14-13 | DATA WAREHOUSING & DATA MINING | 3 | 100 | 40 | 50 | 20 | 150 |
| MT-CSE-14-14 | ADVANCED COMPUTER ARCHITECTURE | 3 | 100 | 40 | 50 | 20 | 150 |
| MT-CSE-14-15 | S/W LAB - I BASED ON MT-CSE-14-11 | 3 | 100 | 40 | | | 100 |
| MT-CSE-14-16 | S/W LAB - II BASED ON MT-CSE-14-12 | 3 | 100 | 40 | | | 100 |
| MT-CSE-14-17 | SEMINAR | | | | 50 | 20 | 50 |
| | TOTAL | | 600 | | 250 | | 850 |
| SECOND SEMESTER | | | | | | | |
| MT-CSE-14-21 | OBJECT ORIENTED ANALYSIS & DESIGN USING UML | 3 | 100 | 40 | 50 | 20 | 150 |
| MT-CSE-14-22 | DIGITAL IMAGE PROCESSING | 3 | 100 | 40 | 50 | 20 | 150 |
| MT-CSE-14-23 | ELECTIVE - I | 3 | 100 | 40 | 50 | 20 | 150 |
| MT-CSE-14-24 | ELECTIVE - II | 3 | 100 | 40 | 50 | 20 | 150 |
| MT-CSE-14-25 | S/W LAB - III BASED ON MT-CSE-14-21 | 3 | 100 | 40 | | | 100 |
| MT-CSE-14-26 | S/W LAB - IV BASED ON MT-CSE-14-22 | 3 | 100 | 40 | | | 100 |
| MT-CSE-14-27 | SEMINAR | | | | 50 | 20 | 50 |
| | TOTAL | | 600 | | 250 | | 850 |

| ELECTIVE PAPERS | |
|---|---|
| MT-CSE-14-23(i) SOFTWARE QUALITY MODELS & TESTING | MT-CSE-14-24(i) DISTRIBUTED SYSTEMS |
| MT-CSE-14-23(ii) HIGH PERFORMANCE NETWORKS | MT-CSE-14-24(ii) BIOMETRICS SYSTEM SECURITY |
| MT-CSE-14-23(iii) ADVANCES IN DATABASES | MT-CSE-14-24(iii) SECURITY IN COMPUTING |

## Seminar

Each student shall individually prepare and submit a seminar report within stipulated time. A panel consisting of two teachers (internal) should evaluate the seminar report and the presentation. Marks should be distributed considering report writing, presentation, technical content, depth of knowledge, brevity and references and their participation in seminar. The time allotted for presentation is 30 minutes.

## MT-CSE-14-11 ADVANCES IN ALGORITHMS

**Maximum marks:** 150 (**External:** 100, **Internal:** 50) **Time:** 3 hours

**Note:** Examiner will be required to set NINE questions in all. Question Number 1 will consist of objective type/short-answer type questions covering the entire syllabus. In addition to question no. 1, the examiner is required to set eight more questions selecting two from each unit. 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. All questions will carry equal marks.

### UNIT - I

Algorithms: Role of algorithm in computing, Asymptotic Notations, Standard notations and common functions.

Recurrence: The maximum-subarray problem, Strassen's algorithm for matrix multiplication, substitution and recursion-tree method for solving recurrences, master method for solving recurrences, Proof of the master theorem, Probabilistic Analysis and Randomized Algorithms.

### UNIT - II

Sorting: Bubble sort, Heap, Building and maintaining heap, Heapsort, Quicksort, Lower bounds for sorting, Counting sort, radix sort, bucket sort.

Advanced Data Structures: Splay Trees, Top-down splay trees, Red-black Trees, Deterministic skip lists, AA-Trees, Trie, Treaps, K-d Trees.

### UNIT - III

Advanced Design and Analysis: Dynamic Programming: matrix-chain multiplication, Longest common subsequence, optimal binary search tree, Greedy algorithms: Huffman codes.

Graph Algorithms: Storage of graphs, traversing a graph, Topological sort, Minimum Spanning Trees, Shortest path problems: Single source and All-pairs shortest path, Maximum Flow networks, matching in bipartite graphs.

### UNIT - IV

Miscellaneous Topics: Knapsack Problem and Memory functions, Approximate String Matching, Chinese remainder theorem, Integer factorization, naïve-string matching, Rabin-karp string matching, String matching with finite automata, Knuth-moris-pratt algorithm, finding convex hull, Polynomial time, verification and reducibility, NP-completeness and proofs.

**Text Books:**


1. Cormen, Thomos, Leiserson, "Introduction to Algorithms", Prentice Hall of India Learning.
2. Horowitz, Ellis and Sahni, Sartaj, "Fundamentals of Computer Algorithms", University Science Press.


**Reference Books:**


1. Anany Levitin, "Introduction to Design and Analysis of Algorithms", Pearson Education.
2. Cooper A., "Computability Theory", Chapman and Hall/ CRC Press.
3. Robert Sedgewick, "Algorithms", Pearson Education India.
4. Steven Skiena, "The Algorithm Design Manual", Springer India.
5. Reiter, Johnson, "Limits of Computation", Chapman and Hall/ CRC Press.

## MT-CSE-14-12 ADVANCED WEB TECHNOLOGIES

**Maximum marks: 150 (External: 100, Internal: 50)** **Time: 3 hours**

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of objective type/short-answer type questions covering the entire syllabus. In addition to question no. 1, the examiner is required to set eight more questions selecting two from each unit. 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. All questions will carry equal marks.

### UNIT - I

Introduction: Web Browsers, Caching, Downloading and Rendering, Persistent Connections, DNS caching and prefetching, CSS Expressions and performance, Buffering, Weblog

Optimization and Security: Parallel Downloading, Controlling caches, Content compression, Control size with minification, Optimizing images, Load balancers, Tuning MYSQL, Using query caching, Optimizing query execution and optimization, Marketing of Website: traffic generation, Newsletters; Security: SQL: query log, SQL injections.

### UNIT - II

Search engines: Searching techniques used by search engines, keywords, advertisements, Search engine optimization for individual web pages: header entries, tags, selection of URL, alt tags, Search engine optimization for entire website: Hyperlinks and link structure, page rank of Google, click rate, residence time of website, frames, scripts, content management system, cookies, robots, Pitfalls in Optimization: optimization and testing, keyword density, doorway pages, duplicate contents, quick change of topics, broken links, poor readability, rigid layouts, navigation styles; tools for optimization: etracking, Google analytics, checklists.

### UNIT - III

Introduction to JavaScript: Introduction, Obtaining user inputs, memory concepts, Operators, Control Structures, Looping constructs, break, continue statements, Programmer defined functions, Scoping rules, Recursion and iteration, Array declaration and allocation, passing arrays to function, Objects: String, Date, Boolean, Window, document; using cookies, Handling Events Using JavaScript.

### UNIT - IV

Introduction to PHP: Installing and Configuring MySQL and PHP, Basic Security Guidelines, Variables, Data Types, Operators and Expressions, Constants, Flow Control Functions; Switching Flow, Loops, Code Blocks and Browser Output, Objects, Strings Processing, Form processing, Connecting to database, using cookies, dynamic contents.

**Text Books:**


1. Peter Smith, “Professional Website performance”, Wiley India Pvt. Ltd.
2. Maro Fischer, “ Website Boosting: Search Engine, Optimization, Usability, Website Marketing”, Firewall Media, New Delhi.
3. Deitel H.M., Deitel P.J., “Internet & World wide Web: How to program”, Pearson Education.


**Reference Books:**


1. Kogent Learning, “Web Technologies: HTML, JavaScript, PHP, Java, JSP, XML, AJAX - Black Book”, Wiley India Pvt. Ltd.
2. Boronczyk, Naramore, “Beginning PHP, Apache, MySQL Web Development”, Wiley India Pvt. Ltd.

MT-CSE-14-13 DATA WAREHOUSING & DATA MINING

Maximum marks: 150 (External: 100, Internal: 50) Time: 3 hours

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of objective type/short-answer type questions covering the entire syllabus. In addition to question no. 1, the examiner is required to set eight more questions selecting two from each unit. 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. All questions will carry equal marks.

## UNIT - I

Data Warehousing: Need for Data Warehousing, Paradigm Shift, Operational and Informational Data Stores, Data Warehouse Characteristics, Architecture for a Data Warehouse Data Warehouse Sourcing, Acquisition, Cleanup and Transformation tools, Metadata, Access Tools, Data Marts. OLAP Tools: Need for OLAP, Multidimensional Versus Multi relational OLAP, Categorization of OLAP tools, OLAP operations, Identifying Facts and Dimensions, Designing Fact Tables, Designing Dimension Tables

Building a Data Warehouse: Data Warehouse Schemas. Steps for the Design and Construction of Data Warehouses. Business consideration, Design consideration, Technical consideration, Integrated Solutions.

## UNIT - II

Data Mining: Introduction: Motivation, Knowledge Discovery Process, Kind of Data, Data Mining Functionalities, Interesting Patterns, Classification of Data Mining Systems, Major issues.

Data Preparation: Preprocess, Data Cleaning, Data Integration and Transformation, Data Reduction. Data Mining Primitives, Languages, and System Architectures. Concept Description and Data Generalization by Attribute-Oriented Induction.

## UNIT - III

Mining Frequent patterns, Associations and Correlations: Market Basket Analysis, Frequent Itemsets, Closed Itemsets and Association Rules, Frequent Itemset Mining Methods, Pattern Evaluation Methods.

Decision Tree: Basics, Building a Decision Tree, Classifying by using Decision Trees, Building Multiple Decision Trees, Obtaining Prules from Decision Trees.

## UNIT - IV

Clustering: Clustering in Grouping, Agglomerative Hierarchical Clustering, K-means Clustering.

Multilayer Neural Nets: Neurodes, Modelling an AND Gate, Or Gate and XOR Gate. Commonly used Neunet Architecture.

Nearest Neighbour Classification: Performance of Nearest Neighbour classifier, Modification of Nearest Neighbour Classifier.

### Text Books:


1. A. Berson, S.J. Smith, “Data Warehousing, Data Mining & OLAP”, Tata McGraw-Hill.
2. J Han, M. Kamber and J. Pei, “Data Mining Concepts and Techniques”, Elsevier India.


### Reference Books:


1. Rajjan Singhal, “Pattern Recognition Techniques and Applications”, Oxford University Press.
2. Zhao Y., Cen Y., “Data mining Applications with R”, Elsevier India.

## MT-CSE-14-14 ADVANCED COMPUTER ARCHITECTURE

**Maximum marks: 150 (External: 100, Internal: 50)** **Time: 3 hours**

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of objective type/short-answer type questions covering the entire syllabus. In addition to question no. 1, the examiner is required to set eight more questions selecting two from each unit. 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. All questions will carry equal marks.

### UNIT-I

Instruction Level Parallelism (ILP): Data dependences and hazards - data dependences, control dependences; Basic Compiler Techniques for Exposing ILP - basic pipeline scheduling and loop unrolling, reducing branch costs with advanced branch prediction, overcoming data hazardous with dynamic scheduling, Tomasulo's approach, hardware based speculation; Exploiting ILP using Multiple issue and Static Scheduling - VLIW & Superscalar processors, Advanced techniques for Instruction Delivery and Speculation; Limitations of ILP.

### UNIT-II

Data Level Parallelism in Vector, SIMD & GPU Architectures: Vector Architecture - working of vector processors, vector execution time, multiple lanes, vector registers, memory banks, stride, gather-scatter; SIMD Instruction Set Extensions for Multimedia; Graphics Processing Units, Vector architecture vs GPUs, Multimedia SIMD v/s GPUs; detecting and enhancing Loop-Level Parallelism - finding dependences, eliminating dependent computations

Thread-Level Parallel Parallelism: Multiprocessor Architecture - centralized shared-memory architectures, cache coherence problem, schemes enforcing coherence, snooping coherence protocol; Extensions to basic coherence protocol; Distributed Shared-Memory and Directory-Based Coherence

### UNIT-III

Warehouse-Scale Computers (WSC) to Exploit Request-Level and Data-Level Parallelism: Programming models and workloads for WSC, architecture of warehouse-scale computers, physical infrastructure and costs of WSC; Cloud Computing.

Memory Hierarchy: Cache performance - average memory access time & processor performance, miss penalty and out-of-order execution processors, cache optimizations; Virtual Memory - fast address translation, selecting page size, protection of virtual memory

### UNIT-IV

MIMD Architectures: Architectural concepts of Distributed & Shared Memory MIMD architectures (UMA, NUMA, COMA, CC-NUMA); Interconnection Networks - direct interconnection networks (Linear Array, Ring, Star, 2D Mesh, Hyper cubes), switching techniques; dynamic interconnection networks (shared bus, crossbar, multistage networks); Specifications of top three super computers of Top500 list

**Text Books:**


1. Hennessy J.D., Patterson D.A., "Computer Architecture A Quantitative Approach", Elsevier India.
2. Sima D., Fountain T., Kasuk P., "Advanced Computer Architecture-A Design space Approach," Pearson Education.


**Reference Books:**


1. Hesham El-Rewini, Mostafa Abd-El-Barr, "Advanced Computer Architecture and Parallel Processing", Wiley India Pvt. Ltd.
2. Kai Hwang, "Advanced computer architecture - Parallelism, Scalability, Programmability", Tata McGraw Hill.
3. Rajaraman V. & Murthy C.S.R., "Parallel Computer: Architecture & Programming", PHI Learning.
4. David Culler, "Parallel Computer Architecture", Elsevier India.
5. Stallings W., "Computer Organization and Architecture", Pearson Education.

MT-CSE-14-21 OBJECT ORIENTED ANALYSIS & DESIGN USING UML

Maximum marks: 150 (External: 100, Internal: 50) Time: 3 hours

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of objective type/short-answer type questions covering the entire syllabus. In addition to question no. 1, the examiner is required to set eight more questions selecting two from each unit. 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. All questions will carry equal marks.

## UNIT - I

UML: History of UML, Goals of UML, nature & purpose of models, UML views & diagrams - static, design, use case, state machine, activity, interaction deployment, model management, profile; relationships in UML - association, dependency, generalization, realization; UML extensibility mechanisms - constraints, stereotypes, tagged values.

Unified Process (UP): UP structure, phases of UP

## UNIT - II

Requirements: Meta Model, Workflow, Functional and Non-functional Requirements; Requirement Attributes, Finding Requirements

Use Case Modeling: Finding Actors and Use Cases, Use Case Scenario - main flow, branching within a flow, repletion within a flow, modeling alternative flows; relationships among actors and use cases; use case diagrams

## UNIT - III

Analysis: Meta Model, Workflows, Finding Analysis Classes - using noun/verb analysis, CRC analysis, using RUP stereotypes – entity, boundary and control; Modeling Classes - Association (role name, multiplicity, navigability, association classes, qualified association) dependencies (usage, abstraction, permission), class generalization, generalization sets, power types; Analysis Package - nested packages, dependencies, transitivity, package generalization, architectural analysis, finding analysis packages; Concepts of Patterns & Frameworks

Use Case Realization - interaction diagram, sequence diagram; Activity Diagrams.

## UNIT - IV

Design: Meta Model, Workflow, design classes - well-formed design classes, inheritance, templates, nested classes, design relationships, aggregation and composition, refining analysis relationships; interfaces and components - provided and required interfaces, interface realization v/s interface, components, finding interfaces, designing with interfaces; interaction diagram in design, modelling concurrency, active classes, concurrency in sequence diagram, concurrency in communication diagram; state machine – state machine diagrams

Implementation: Meta model, workflow, deployment diagram

Text Books:


1. Jim Arlow, Ila Neustadt, "UML 2 and the Unified Process - Practical Object Oriented Analysis and Design", Pearson Education.
2. Bernd Bruegge, Allen H. Dutoit, "Object Oriented Software Engineering using UML", Pearson Education.


Reference Books:


1. Rumbaugh J., Jacobson I., Booch G., "The Unifed Modeling Language Reference Manual", Pearson Education.
2. Blaha M., Rumbaugh J., "Object-Oriented Modeling and Design with UML", Pearson Education.
3. Timothy C. Lethbridge, Robert Laganiere, "Object Oriented Software Engineering", Tata McGraw-Hill.
4. Booch G., Rumbaugh J., Jacobson I., "The Unified Modeling Language User Guide", Pearson education.
5. Satzinger, Jackson, Burd, "Object-Oriented Analysis & Design with the Unified Process", Course Technology Inc.

MT-CSE-14-22 DIGITAL IMAGE PROCESSING

Maximum marks: 150 (External: 100, Internal: 50) Time: 3 hours

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of objective type/short-answer type questions covering the entire syllabus. In addition to question no. 1, the examiner is required to set eight more questions selecting two from each unit. 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. All questions will carry equal marks.

## UNIT - I

Introduction to Digital Image Processing, Applications of digital image processing, Steps in digital image processing, Components of an Image Processing system, Image sampling and Quantization, Relationships between pixels.

Image Enhancement: Intensity transformations and spatial filtering, Point and Mask based techniques, Histogram processing, Fundamentals of spatial filtering, Smoothing and sharpening spatial filters.

## UNIT - II

Filtering in frequency domain: Fourier Series and Transform, Discrete Fourier Transform, Frequency Domain Filtering Fundamentals, Homomorphic Filtering.

Color Image Processing: Color Fundamentals, Color characteristics, Color models, RGB, CYK, CMYK, HIS, YIQ models, Pseudo color image processing, full color image processing, color transformations, Smoothening and sharpening of images.

## UNIT - III

Image Restoration: Model of Image Degradation/Restoration process, Noise models, Linear, Inverse filtering, Mean Square Error Restoration, Least Square Restoration.

Image Compression Fundamentals: Lossless and Lossy Compression, Basic Compression Methods: Huffman Coding, Run-Length Coding, LZW Coding, Arithmetic Coding, Bit-Plane Coding, Predictive Coding, Transform Coding, Wavelet Coding, Compression standards.

## UNIT - IV

Image Segmentation: Fundamentals, Point, Line and Edge Detection, Thresholding, Region-Based Segmentation.

Image Representation: Boundary Representation, Chain Codes, Polygonal Approximations, Signatures, Boundary Descriptors, Simple Descriptors, Shape Numbers, Regional Descriptors, Topological Descriptors, Texture.

### Text Book:


1. Gonzalez R.C., Woods R.E., “Digital Image Processing”, Pearson Education.
2. Vipula Singh, “Digital Image Processing with MATLAB and LABVIEW”, Elsevier India.


### Reference Books:


1. Ganzalez R.C., “Digital Image Processing with MATLAB”, Tata McGraw Hill.
2. Sonka Milan, “Image Processing Analysis and Machine vision”, Cengage Learning.
3. William K. Pratt, “Digital Image Processing”, Wiley India Pvt. Ltd.
4. Chanda B., Majumder D. Dutta, “Digital Image Processing and Analysis”, PHI Learning.
5. Jain A.K., “Fundamental of Digital Image Processing”, PHI Learning.
6. Jayaraman S., Esakkirajan S., Veerakumar T., “Digital Image Processing”, Tata McGraw Hill.
7. Annadurai, “Digital Image Processing”, Pearson Education.

## MT-CSE-14-23(i) SOFTWARE QUALITY MODELS & TESTING

**Maximum marks: 150 (External: 100, Internal: 50)** **Time: 3 hours**

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of objective type/short-answer type questions covering the entire syllabus. In addition to question no. 1, the examiner is required to set eight more questions selecting two from each unit. 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. All questions will carry equal marks.

### UNIT - I

Overview of SQM: Concepts of Software Quality, Quality Attributes, Software Quality Models: McCall, Boehm, ISO-9000, CMM.

Software testing principles: Need for testing, Psychology of testing, Testing economics, White box, Black box, Grey box testing, Software Development Life Cycle (SDLC) and Testing, Software Verification & Validation, 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, Equivalence partitioning, Cause-effect graphing, Robustness testing, Levels of testing - Unit, Integration and System Testing; Acceptance testing: $\alpha$, $\beta$, and $\gamma$ testing.

### UNIT - III

Configuration Management: Maintaining Product Integrity, Components, configuration items, Change Management, Version Control, Configuration accounting, Reviews, Walkthrough, Inspection, and Configuration Audits.

Testing object oriented software: Challenges, Differences from testing non-Object Oriented Software, Class testing strategies, Class Modality, State-based Testing, Message Sequence Specification.

### UNIT - IV

Testability and related issues: Design for Testability, Observability & Controllability, Design by Contract, Precondition, Post condition and Invariant, Regression Testing, Challenges, test optimization.

Miscellaneous topics: 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. Jorgensen P. C., "Software Testing - A Craftman's Approach", CRC Press.
2. Mathur P. Aditya, "Foundations of Software Testing", Pearson Education.


**Reference Books:**


1. Glenford J. Myers, "The Art of Software Testing", Wiley India Pvt Ltd.
2. Robert V. Binder, "Testing Object-Oriented Systems: Models Patterns and Tools", 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", Wiley India Pvt Ltd.
5. William E. Perry, "Effective Methods for Software Testing", Wiley India Pvt Ltd.

MT-CSE-14-23(ii) HIGH PERFORMANCE NETWORKS

**Maximum marks: 150 (External: 100, Internal: 50)** **Time: 3 hours**

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of objective type/short-answer type questions covering the entire syllabus. In addition to question no. 1, the examiner is required to set eight more questions selecting two from each unit. 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. All questions will carry equal marks.

## UNIT - I

History of Networking and Internet; Need for Speed and Quality of Service; Advanced TCP/IP and ATM Networks; Internet Services; Internet Architecture; Backbone Networks; High Performance Networks; TCP Services; TCP format and connection management; SCTP; Encapsulation in IP; UDP Services, Format and Encapsulation in IP; IP Services; Header format and addressing; Fragmentation and reassembly; classless and subnet address extensions; subnetting and supernetting; CIDR; IPv6;

## 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(QoS): 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: Frame Relay Networks; Asynchronous Transfer Mode (ATM); ATM protocol Architecture; ATM logical connections; ATM cells; ATM Service categories; ATM Adaptation Layer; ATM Switching and Signaling; Optical Networks: SONET networks; SONET architecture;

High-Speed LANs: Bridged and Switched Ethernet; Fast Ethernet; Gigabit Ethernet; Wireless LANs: IEEE 802.11, Bluetooth; Introduction to HIPERLAN; WIMAX; RFID, Sensor Networks; Vehicular Networks;

Cellular Telephony; Generations; Cellular Technologies in different generations; GSM, CDMA; Satellite Networks;

## UNIT - IV

Internet Routing: Interior and Exterior gateway Routing Protocols; RIP; OSPF; BGP; IDRP; Multicasting; IGMP; MOSPF; DVMRP, ; Routing in Ad Hoc Networks; AODV, DSR; Routing in ATM: Private Network-Network Interface; Mobile IP and Wireless Application Protocol;

Error and Control Messages: ICMP; Error reporting vs Error Correction; ICMP message format and Delivery; Types of messages;

Address Resolution: ARP, BOOTP; DHCP; Network Management and SNMP;

**Text Books:**


1. Stallings W., "High-Speed Networks and Internets, Performance and Quality of Service", Pearson Education.
2. B. Muthukumaran, "Introduction to High Performance Networks", Vijay Nicole Imprints.


**Reference Books:**


1. James F. Kurose, Keith W. Ross, "Computer Networking, A Top-Down Approach Featuring the Internet", Pearson Education.
2. Behrouz A. Forouzan, "Data Communications and Networking", McGraw Hill.
3. Mahbub Hassan, Raj Jain, "High Performance TCP/IP Networking, Concepts, Issues, and Solutions", Pearson Education.
4. William Stallings, "Wireless Communications & Networks", Pearson Education
5. Asoke K Talukder, Hasan Ahmed, Roopa R Yavagal, "Mobile Computing", TATA McGraw Hill.
6. Larry L. Peterson, Bruce S. Davie, "Computer Networks", Elsevier India.

MT-CSE-14-23(iii) ADVANCES IN DATABASES

**Maximum marks: 150 (External: 100, Internal: 50)** **Time: 3 hours**

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of objective type/short-answer type questions covering the entire syllabus. In addition to question no. 1, the examiner is required to set eight more questions selecting two from each unit. 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. All questions will carry equal marks.

## UNIT - I

Database System Concepts and Architecture: Three – Schema Architecture and Data Independence, ER Diagrams, Naming conventions and Design Issues. Relational Model Constraints and Relational Database Schemas, EER model: Subclasses, Super classes, Inheritance, Specialization and Generalization, Constraints and characteristics of specialization and Generalization.

## UNIT - II

Object Model: Overview of Object-Oriented concepts, Object identity, Object structure, Type constructors, Encapsulation of operations, Methods, and Persistence, Type hierarchies and Inheritance, Complex objects. Query Processing and Optimization: Using Heuristics in Query Optimization, Semantic Query Optimization, Database Tuning in Relational Systems.

## UNIT - III

Databases for Advance Applications: Architecture for parallel database; Distributed database concepts, Data fragmentation, Replication, and allocation techniques, Overview of Client-Server Architecture, Active Database Concept and Triggers, Temporal Databases Concepts, Spatial and Multimedia Databases, Deductive Databases, XML Schema, Documents and Databases

## UNIT - IV

Principles of Big Data: Ontologies and Semantics: Classifications, The Simplest of Ontologies, Ontologies, Classes with Multiple Parents, Choosing a Class Model. Data Integration and Software Interoperability Versioning and Compliance Issues, Stepwise Approach to Big Data Analysis, Failures and Legalities.

**Text Books:**


1. Elmasri and Navathe, “Fundamentals of Database Systems”, Pearson Education.
2. Jules J. Berman, “Principles of Big Data”, Elsevier India.


**Reference Books:**


1. Date C.J., “An Introduction to Database Systems”, Pearson Education.
2. Hector G.M., Ullman J.D., Widom J., “Database Systems: The Complete Book”, Pearson Education.
3. Silberschatz A., Korth H., Sudarshan S., “Database System Concepts”, Tata McGraw Hill.

MT-CSE-14-24(i) DISTRIBUTED SYSTEMS

**Maximum marks:** 150 (**External:** 100, **Internal:** 50) **Time:** 3 hours

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of objective type/short-answer type questions covering the entire syllabus. In addition to question no. 1, the examiner is required to set eight more questions selecting two from each unit. 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. All questions will carry equal marks.

## UNIT - I

Introduction: Goals, Distribution Transparency, Types of Distributed Systems, Architectural styles, System architecture: Centralized, Decentralized, Hybrid; Architecture versus Middleware.

Process: Process, Threads, Threads in distributed systems, virtualization, Clients, Servers, Server clusters, Code migration.

Communication and Naming: Types of communication, Remote procedure calls, message-oriented and stream oriented communication, multicast communication, names, identifiers, addresses, naming techniques, attribute based naming.

## UNIT - II

Synchronization: clock synchronization, Global positioning system, logical clocks, vector clocks, mutual exclusion, election algorithm.

Consistency and replication: Introduction to replication in distributed environment, data-centric and client -centric consistency models, replica management, consistency protocols.

## UNIT - III

Fault Tolerance: Faults and failures, failure masking, process resilience, design issues, reliable client server communication, reliable group communication, distributed commit, recovery.

Security: Security threats, policies and mechanisms, design issues, cryptography, secure channels, authentication, access control, firewall, denial of service, security management.

Distibuted object-based systems: architecture, of distributed objects, processes and object servers, communication of distributed objects, naming and synchronization, security.

## UNIT - IV

Distributed File systems: client server architecture, processes and communication, naming in NFS, File locking and sharing in Coda, File replication in distributed environment, Byzantine failres and other security aspects.

Distributed Web and Coordination Based Systems: Traditional web based systems, web server clusters, web proxy caching, replication and security in web based systems, traditional architecture of coordination models, content-based routing, static and dynamic replication.

**Text Books:**


1. Tanenbaum A.S., Steen M.V., "Distributed Systems: Principles and Paradigms", Prentice Hall of India.
2. Coulouris G., Dollimore J., Kindberg T., "Distributed Systems-Concepts and Design", Pearson Education.


**Reference Books:**


1. Attiya H., Welch J., "Distributed Computing: Fundamentals, Simulations and Advanced Topics", Wiley India Pvt. Ltd.

MT-CSE-14-24(ii) BIOMETRICS SYSTEM SECURITY

**Maximum marks: 150 (External: 100, Internal: 50)** **Time: 3 hours**

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of objective type/short-answer type questions covering the entire syllabus. In addition to question no. 1, the examiner is required to set eight more questions selecting two from each unit. 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. All questions will carry equal marks.

## UNIT - I

Introduction to Biometrics, Biometrics technology evolution, Biometric system, Biometric Functionalities; Verification and Identification, Biometric characteristics, Different Biometric traits; physiological and behavioral, Comparison of various biometrics, Biometric deformations, Biometric system errors; false match rate, false non-match rate, failure to capture and failure to enroll.

## UNIT - II

Unibiometric, Multibiometric, Unimodal and Multimodal biometrics, Fusion of different biometrics, Sources of biometric information for fusion, Levels of fusion; Sensor level fusion, Feature level fusion, Match score level fusion and Decision level fusion, score normalization, Fusion methodologies, Issues in designing a multibiometric system, Advantages and disadvantages of multibiometrics.

## Unit - III

Biometrics Security; Biometric system challenges, Attacks on biometric system, Biometric cryptography, Biometric steganography, Liveness detection in biometrics, Cancelable biometrics, Watermarking techniques; basic framework of watermarking, application of watermarking, attacks on watermarking, general watermarking process, watermarking algorithms.

## Unit - IV

Biometric sensors; Biometric sensor interoperability, Soft biometrics, Incorporating Ancillary information in biometric systems, Biometric scope and future; biometrics and IT infrastructure, smart card technology and biometrics, DNA biometrics, Biometric standards, API of AADHAAR Schemes. Applications of biometrics; Government sector, Commercial sector and Forensic sector, SFINGE tool.

### Text Books:


1. Davide Maltoni, Dario Maio, Anil K. Jain, & Salil Prabhakar, “Handbook of Fingerprint Recognition”, Springer India.
2. G.R. Sinha and Sandeep B. Patil, “Biometric: Concepts and Applications”, Wiley India Pvt. Ltd.
3. Arun A. Ross, K. Nandakumar, and Anil K. Jain, “Handbook of Multibiometrics, (International Series on Biometrics)”, Springer India.


### Reference Books:


1. Anil K.Jain, Patrick Flynn, Arun A. Ross, “Handbook of Biometrics”, Springer India.
2. John Chirillo and, Scott Blaul, “Implementing Biometric Security”, Wiley India Pvt. Ltd.
3. Julian Ashbourn, “Practical Biometrics: From Aspiration to Implementation”, Springer Professional Computing.

MT-CSE-14-24(iii) SECURITY IN COMPUTING

**Maximum marks: 150 (External: 100, Internal: 50)** **Time: 3 hours**

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of objective type/short-answer type questions covering the entire syllabus. In addition to question no. 1, the examiner is required to set eight more questions selecting two from each unit. 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. All questions will carry equal marks.

## UNIT - I

Computer Security Concept, Threats, Attacks and Assets, Security Functional Requirements, Security Architecture for Open System, Scope of Computer Security, Computer Security Trends and Strategy.

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

Malicious Software: Types of Malicious Software, Viruses, Virus countermeasures, Worms, Bots, Rootkits.

## UNIT - II

Protection in General-Purpose Operating Systems: Security Methods of Operating Systems, Memory and Address Protection.

Designing Trusted Operating Systems: Security Policies, Models of Security, Designing of Trusted Operating System.

Linux Security: Linux Security Model, Linux Vulnerabilities, Linux System Hardening, Application Security, Mandatory Access Control

## UNIT - III

Database Security: Relational Database, Database Access Control, Inference, Statistical Databases, Database Encryption.

Data Mining Security: Security Requirements, Reliability and Integrity, Sensitive data, Multilevel Databases, Proposal for Multilevel Security, Data Mining – Privacy and Sensitivity, Data Correctness and Integrity, Data Availability.

Trusted Computing: Concept of Trusted System, Trusted Computing and Trusted Platform Module, Common Criteria for Information Technology Security Evaluation.

## UNIT - IV

Security in Networks: Threats in networks, Network security controls, Firewall and Intrusion Prevention Systems: Need, Characteristics, Types of Firewalls, Firewall Basing, Intrusion Prevention Systems. Intrusion Detection Systems.

Internet Security Protocols and Standards: Secure Socket Layer (SSL) and Transport Layer Security (TLS), IP4 and IP6 Security, Secure Email.

Legal and Ethical Aspects: Cyber crime and Computer Crime, Intellectual Property, Copyrights, Patents, Trade Secrets, Privacy and Ethical Issues.

### Text Books:


1. Pfleeger C. & Pfleeger S.L., “Security in Computing”, Pearson Education.
2. Stalling W., Brown L., “Computer Security Principles and Practice”, Pearson Education.


### Reference Books:


1. Schneier B., “Applied Cryptography: Protocols, Algorithms and Source Code in C”, Wiley India Pvt. Ltd.