<table>
<thead>
<tr>
<th>Paper Code</th>
<th>Nomenclature</th>
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<tr>
<td>CS-DE-31</td>
<td>DATA COMMUNICATION AND NETWORKING TECHNOLOGIES</td>
<td>80</td>
<td>20</td>
<td>100</td>
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<tr>
<td>CS-DE-32</td>
<td>WEB TECHNOLOGIES</td>
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<td>20</td>
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<td>ADVANCED COMPUTER ARCHITECTURE</td>
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<td>20</td>
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<tr>
<td>CS-DE-34</td>
<td>ADVANCES IN DATABASES</td>
<td>80</td>
<td>20</td>
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<tr>
<td>CS-DE-35</td>
<td>ELECTIVE-I</td>
<td>80</td>
<td>20</td>
<td>100</td>
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<tr>
<td>CS-DE-36</td>
<td>SOFTWARE LAB – I BASED ON CS-DE-32</td>
<td>80</td>
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<td>CS-DE-37</td>
<td>SOFTWARE LAB – II BASED ON CS-DE-34</td>
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<td><strong>Total Marks</strong></td>
<td><strong>560</strong></td>
<td><strong>140</strong></td>
<td><strong>700</strong></td>
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**ELECTIVE-I**

(I) PRINCIPLES OF PROGRAMMING LANGUAGES  
(II) DESIGN AND ANALYSIS OF ALGORITHMS  
(III) LINUX AND SHELL PROGRAMMING  
(IV) PROGRAMMING IN JAVA  
(V) THEORY OF COMPUTATION
CS-DE-31 DATA COMMUNICATION AND NETWORKING TECHNOLOGIES

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 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 Communication Components and Data Representation; Computer Networks and its types, Network Software: Protocols, Services, network architecture, design issues, OSI Reference model, TCP/IP Reference model, Comparison of OSI and TCP/IP Models; TCP, UDP, IP; IPv4 and IPv6; Networking models: decentralized, centralized, distributed, client/server, peer-to-peer, web-based, file sharing model;
Introduction to example Networks: the Internet, ISDN, Frame Relay and ATM;

UNIT – II
Digital and Analog data and signals, Asynchronous and Synchronous transmission; bit rate, baud, bandwidth, Transmission impairment; Channel Capacity; Manchester and Differential Manchester encoding; Pulse Code Modulation and Delta Modulation; Amplitude, Frequency and Phase Shift Keying;
Switching: Circuit Switching and Packet Switching; Multiplexing: FDM, TDM, WDM; Spread Spectrum; local loop; Modems and ADSL; Internet over Cable; ADSL Versus Cable;

UNIT – III
Data Link Layer Design issues; Framing, Error Detection and Correction; Flow Control: Sliding Window Protocols; Medium Access Control: Aloha, CSMA protocols, Collision free protocols; Wireless LAN Protocol: MACA; Introduction to IEEE LAN standards; Ethernet, Switched Ethernet, Fast Ethernet, Gigabit Ethernet, VLAN, Introduction to Wireless LANs: IEEE 802.11; Bluetooth; Introduction to WiMax and Cellular Networks;

UNIT – IV
Network Layer Design issues, Virtual Circuit and Datagram Subnet, Routing Algorithms: Shortest path Routing, Flooding, Distance Vector Routing, Link State Routing, Multi Cast Routing; Internet Structure; Introduction to RIP, OSPF and BGP protocols; Congestion Control Algorithms: General Principals, Traffic Shaping, Leaky bucket, token bucket, choke packets, Load Shedding,
Internet Security issues: Threats and Attacks; Security Services; Firewalls; Encryption; Authentication; Digital Signature; Message Digest; Virtual Private Networks;

Text Books

Reference Books:
2. Andrew s. Tanenbaum, Computer Networks - PHI.
CS-DE-32 WEB TECHNOLOGIES

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 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:

UNIT – II

Web page designing:

UNIT – III

Client and Server Side Programming:
Introduction to CGI, JavaScript: JavaScript overview; constants, variables, operators, expressions & statements; user-defined & built-in functions; Arrays; client-side form validation; using properties and methods of built-in objects, DOM. Java Server pages (JSP), JSP application design, tomcat server, JSP objects, declaring variables and methods, debugging, sharing data between JSP pages, Session Tracking.

UNIT – IV

Web Security:
Web Security; Firewalls- definition and uses, network layer firewalls and application layer firewalls; Injection attacks, Local privacy attacks, browser attacks, Security from Hacker and Crackers.

Text Books:
2. Xavier, C, Web Technology and Design, New Age International

Reference Books:
1. Ivan Bayross, HTML, DHTML, Java Script, Perl & CGI”, BPB Publication.
2. Jackson, Web Technologies, Pearson Education
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 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
Computational Model: Basic computational models, evolution and interpretation of computer architecture, concept of computer architecture as a multilevel hierarchical framework. Classification of parallel architectures, Relationships between programming languages and parallel architectures
Parallel Processing:: Types and levels of parallelism, Instruction Level Parallel (ILP) processors, dependencies between instructions, principle and general structure of pipelines, performance measures of pipeline, pipelined processing of integer, Boolean, load and store instructions, VLIW architecture, Code Scheduling for ILP-Processors - Basic block scheduling, loop scheduling, global scheduling.

UNIT – II
Superscalar Processors: Emergence of superscalar processors, Tasks of superscalar processing – parallel decoding, superscalar instruction issue, shelving, register renaming, parallel execution, preserving sequential consistency of instruction execution and exception processing, comparison of VLIW & superscalar processors
Branch Handling: Branch problem, Approaches to branch handling – delayed branching, branch detection and prediction schemes, branch penalties and schemes to reduce them, multiway branches, guarded execution.

UNIT – III
MIMD Architectures: Concepts of distributed and shared memory MIMD architectures, UMA, NUMA, CC-NUMA & COMA models, problems of scalable computers.
Direct Interconnection Networks: Linear array, ring, chordal rings, star, tree, 2D mesh, barrel shifter, hypercubes.

UNIT – IV
Dynamic interconnection networks: single shared buses, comparison of bandwidths of locked, pended & split transaction buses, arbiter logics, crossbar, multistage networks – omega, butterfly
Cache coherence problem, hardware based protocols – snoopy cache protocol, directory schemes, hierarchical cache coherence protocols, software based protocols.

Text Books:

Reference Books:
CS-DE-34  ADVANCES IN DATABASES

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 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

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

Text Books:

Reference Books:
1. Date C.J., An Introduction to Database Systems, Pearson Education.
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 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

UNIT – II
Formal languages and automata: The Chomsky hierarchy of formal languages, regular grammars, Regular expressions, Finite State Automata, Context-free grammars, Pushdown automata, Ambiguous grammars. Language Semantics: Attribute grammars, Denotational semantics, Program verification and validation, Data objects, variables, constants, data types, declaration, type checking, type casting, type promotion, Enumerators, Composite data types.

UNIT – III
Object Orientated concepts: Structured data types, Abstract data types, Information hiding, Subprogram concepts, Good program design, Type definitions, Type equivalence, Inheritance, Derived classes, Abstract classes, Polymorphism, Inheritance and software reuse. Sequence control: Implicit and explicit sequence control, Sequence control within arithmetic expressions, sequence control between statements, sequencing with non-arithmetic expressions, Subprogram Sequence control.

UNIT – IV
Miscellaneous topics: Parameter passing techniques, Static & Dynamic Scoping, Storage of variables, Static storage, Heap Storage management, Distributed Processing, Exceptions and Exception handlers, Coroutines, Scheduled subprograms, Parallel programming, Processor design, Hardware and Software architectures, Network Programming, Evolution of scripting languages, Applets, XML.

Text Books:
1. Pratt T.W., Zelkowitz M.V., Gopal T.V., Programming Languages Design and Implementation, Pearson Education.

Reference Books:
2. Sethi Ravi, Programming languages, Pearson Education
3. Scott M., Programming Language Pragmatics, Elsevier India.
CS-DE-35(II)  DESIGN AND ANALYSIS OF ALGORITHMS

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 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
Divide and Conquer: Complexity of iterative programs and recursive programs, solving recurrence equations: back substitution method, recursion tree method, masters theorem.
Analysis of heap sort and quick sort; Counting sort, Radix sort, Bucket sort, Lower bounds for sorting.

UNIT – II
Hash Tables, Hash functions, Collision handling in hashing, analyzing various operations on Binary search tree.
Introduction to Red-black trees.

UNIT – III
Greedy Techniques (GT): Elements of GT, Activity selection problem, Huffman codes, Knapsack Problem.

UNIT – IV
Strings: Storage of strings, naive string-matching algorithm, Rabin-Karp string matching algorithm.

Text Books:
1. Cormen, Leiserson, Rivest, Introduction to Algorithms, PHI India.

Reference Books:
Maximum marks: 100 (External: 80, Internal: 20)

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 Unix/Linux: Evolution of Unix/Linux, Unix/Linux distributions, Linux/Unix operating system, Linux/Unix architecture, Features of Linux/Unix, Interfacing with Unix/Linux system.
Commands in Unix/Linux: General-Purpose commands, File oriented commands, directory oriented commands, Communication-oriented commands, process oriented commands and other commonly used commands.

UNIT – II
Regular expressions & Filters in Linux: Regular expressions and their use, Simple filters viz. more, wc, diff, sort, uniq, grep, sed, etc.
Linux/Unix file system: Linux/Unix files, inodes and structure and file system, file system components, standard file system, file system types, file system mounting and unmounting.

UNIT – III
Processes in Linux: starting and stopping processes, initialization Processes, mechanism of process creation, job control - at, batch, cron, time, Signal handling.
System Calls: creat, open, close, read, write, isseek, link, unlink, stat, fstat, umask, chmod, exec, fork, wait, system.

UNIT – IV
Basic system administration in Linux/Unix.
Shell Programming: vi editor, shell variables, I/O in shell, control structures, loops, subprograms, command line programming, creating shell scripts.

Text Books:

Reference Books:
1. Yashwant Kanetkar, Unix & Shell programming – BPB.
Maximum marks: 100 (External: 80, Internal: 20)  

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 Java: Importance and features of Java, Java virtual machine, Byte code, JDK, Keywords, constants, variables and Data Types, Operators and Expressions, Decision Making, Branching and Looping, jump statements: break, continue, return. Introducing classes, objects and methods: defining a class, adding variables and methods, creating objects, constructors, class inheritance. Arrays and String: Creating an array, one and two dimensional arrays, string array and methods.

UNIT – II
Packages and interfaces, Exception Handling: Fundamentals exception types, uncaught exceptions, throw exception, built in exception, creating your own exceptions, Multithreaded Programming: Fundamentals, Java thread model: synchronization, messaging, thread classes, Runnable interface, inter thread Communication, suspending, resuming and stopping threads.

UNIT – III
I/O Streams: String and String Buffer classes, Wrapper classes: Basics types, using super, Multilevel hierarchy abstract and final classes. Input/Output Programming: Basics, Streams, Byte and Character Stream, predefined streams, Reading and writing from console and files.

UNIT – IV

Text Book:

Reference books:
THEORY OF COMPUTATION

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

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Unit – I
Computability and Non-computability and examples of non-computable problems, Russell's paradox, Finite State System, Extended Transition Function, Designing of DFA and NDFA, Finite Automata with E-Transitions, Equivalence of DFA and NFA with proof, Regular Expression, Laws of Regular Expressions, Kleene’s Theorem 1 and 2, Properties and Limitations of FSM, FSM with Output: Moore and Mealy Machines, Arden’s Theorem with proof, Closure Properties of Regular Sets, Application of Pumping Lemma, Myhill-Nerode Theorem, Minimization of FA.

Unit – II

Unit – III

Unit – IV

Text Books

Reference Books:
1. Hopcroft,J.E.&Ullman,J.D. Formal languages and their relation to Automata, Pearson Education.