DIRECTORATE OF DISTANCE EDUCATION

KURUKSHETRA UNIVERSITY KURUKSHETRA

(Established by the State Legislature Act XII of 1956)

Academic Session: 2018-19

Scheme of Examination MCA (Distance Mode)-3rd Year

Paper Code	Nomenclature	Max. Marks			Pass Marks
		External	Internal	Total	
CS-DE-31	DATA COMMUNICATION AND NETWORKING TECHNOLOGIES	80	20	100	35
CS-DE-32	WEB TECHNOLOGIES	80	20	100	35
CS-DE-33	ADVANCED COMPUTER ARCHITECTURE	80	20	100	35
CS-DE-34	ADVANCES IN DATABASES	80	20	100	35
CS-DE-35	ELECTIVE-I	80	20	100	35
CS-DE-36	SOFTWARE LAB – I BASED ON CS-DE-32	80	20	100	35
CS-DE-37	SOFTWARE LAB – II BASED ON CS-DE-34	80	20	100	35
	Total Marks	**560**	**140**	**700**	

ELECTIVE-I

(I) PRINCIPLES OF PROGRAMMING LANGUAGE.
(II) DESIGN AND ANALYSIS OF ALGORITHMS.
(III) LINUX AND SHELL PROGRAMMING.
(IV) PROGRAMMING IN JAVA
(V) THEORY OF COMPUTATION

CS-DE-31 DATA COMMUNICATIONS 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

1. Michael A. Gallo, William M. Hancock, Computer Communications and Networking Technologies – CENGAGE learning.
2. Behrouz A Forouzan, Introduction to Data communications and Networking 5E- Mc-Graw Hill.

Reference Books:

1. William Stallings, Data and Computer Communications, 5th Edition – PHI.
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:
Internet basics; WWW and DNS, Web Server, Proxy Server, Web Crawler, Web Browsers; functions and working principle of web browsers, conceptual architecture of common web browsers: Google Chrome, Internet Explorer. Internet services: HTTPS, FTP, Telnet, SMTP, POP, MIME ,IMAP, Web site attacks; Introduction to HTML; History of HTML and SGML; HTML Command Tags, Creating Links, Creating Tables, Form and Frames.

UNIT – II

Web page designing:
Designing web pages with HTML, DHTML and its events; Working with website templates. Use of Cascading Style Sheet in web pages: Adding CSS, Selectors, Pseudo Classes and Elements, Extensible Markup Language (XML): Introduction, Prolog; displaying XML contents; Using DTDs in XML document; XML with CSS and XSL, XML Parser.

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:

1. Uttam K. Roy, "Web Technologies", OXFORD, University Press.

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
3. Dafydd Stuttard, "The Web Application Hacker's Handbook", Wiley India Pvt. Ltd.

CS-DE-33 ADVANCED COMPUTER ARCHITECTURE

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:

1. Sima, Fountain, Kacsuk, Advanced Computer Architecture, Pearson Education.
2. D. A. Patterson and J. L. Hennessey, Computer Architecture – A Quantitative Approach, Elsevier India.

Reference Books:

1. Kai Hwang, Advanced Computer Architecture, McGraw Hill.
2. Nicholas Carter, Computer Architecture, McGraw Hill.
3. Harry F. Jordan, Gita Alaghband, Fundamentals of Parallel Processing, Pearson Education.

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

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.

CS-DE-35(i) PRINCIPLES OF PROGRAMMING LANGUAGES

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

Preliminaries: History, Impact of Programming Paradigms, Role of Programming Languages, Good Language, Effects of Programming Environment, Translators and virtual architectures, Binding and Binding time, Language Syntax, Analysis of Program, Synthesis of Object program, Formal translation models: BNF Grammars, General parsing, Language translation, Recursive descent parsing.

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.
2. Sebesta W. Robert, "Concepts of Programming Languages", Pearson Education.

Reference Books:

1. Appleby Doris & VandeKopple J. Julius, "Programming languages-Paradigm and practice", McGraw Hill.
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

Introduction: Algorithms, Role of algorithms in computing, Complexity of algorithms, Analyzing algorithms, designing algorithms, asymptotic notations.
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.

Dynamic Programming (DP): Elements of DP, Matrix chain multiplication, Longest common subsequence, optimal binary search trees.

UNIT – III

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

Graph Algorithms: Single source shortest path: Analysis of Dijkstra's Algorithm, Limitations of Dijkstra's Algorithm, Negative weight cycle, Bellman-Ford algorithm. All Pairs Shortest Path: Relation of Shortest path and matrix multiplication, Analysis of Floyd Warshall algorithm. Maximum Flow: Flow network, Ford-Fulkerson method.

UNIT – IV

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

Computational complexity: Notion of Polynomial time algorithms, Complexity classes: P, NP, NP-Hard and NP-Complete, Polynomial time verification, Reducibility, NP-Completeness, Examples of NP-Complete and NP-Hard problems: Traveling Salesman Problem, Knapsack, Bin Packing, Satisfiability, Vertex Cover, Clique, Independent Set. Introduction to approximation algorithms.

Text Books:

1. Cormen, Leiserson, Rivest, "Introduction to Algorithms", PHI India.
2. Neapolitan R., "Foundations of Algorithms", Jones and Bartlett Learning.

Reference Books:

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

CS-DE-35(III) LINUX AND SHELL PROGRAMMING

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 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, iseek, 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:

1. Sumitabha Das, Your Unix - The Ultimate Guide, Tata McGraw-Hill. 3/e
2. Mark G.Sobell, A Practical Guide to Linux Commands, Editors, and Shell Programming, Pearson, 3/e

Reference Books:

1. Yashwant Kanetkar, Unix & Shell programming – BPB.
2. Richard Petersen, The Complete Reference – Linux, McGraw-Hill.
3. M.G.Venkateshmurthy, Introduction to Unix & Shell Programming, Pearson Education.
4. Stephen Prata, Advanced UNIX-A programmer's Guide, SAMS.

CS-DE-35(IV) PROGRAMMING IN JAVA

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 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

Event Handling: Different Mechanism, the Delegation Event Model, Event Classes, Event Listener Interfaces, Adapter and Inner Classes, Working with windows, Graphics and Text, using AWT controls, Layout managers and menus, handling Image, animation, sound and video, Java Applet. Beans: Introduction to Java Beans and Swings.

Text Book:

1. Patrick Naughton and Herbertz Schildt,Java-2 The complete Reference Edition 8 by TMH, 2011.

Reference books:

1. E Balaguruswamy, **"**Programming with java", Tata McGraw-Hill.2007
2. Horstmann,John Wiley, "Computing Concepts with Java 2 Essentials",Edition 3

CS-DE-35(V) THEORY OF COMPUTATION

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

Computability and Non-computability and examples of non-computable problems, Russel'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

Grammar: Definition, Chomsky Classification of Grammars, Construction of Context Free Grammar, Derivation, Parse Trees, Ambiguity, Removal of Ambiguity, Simplification of Context Free Grammar, CNF and GNF, Closure properties of CFL, Pumping Lemma for CFL.

Pushdown Automaton: Introduction, Types of PDA, Designing of PDA's, Conversion from PDA to CFG and vice-versa, Applications, Parsing: Early's, Cook-Kasami-Young, Tomito's, top-down and bottom-up methods

Unit – III

Linear Bounded Automata (LBA), Turing machines, variants of TMs, Restricted TMs, TMs and Computers. Recursive and recursively- enumerable languages and Properties.

Decidability: Post's correspondence problem, Rice's theorem, decidability of membership, emptiness and equivalence problems of languages. Random Access Machines, Decidable languages, decidable problems, The halting problem, Diagonalization method, Undecidable problems for Regular expressions, Turing machines and other undecidable problems.

Unit – IV

Reducibility: The Set NP and Polynomial Verifiability, Polynomial-Time Reductions and NP-Completeness, The Cook-Levin Theorem, Some Other NP-Complete Problems, Reduction, mapping reducibility.
Computational Complexity: Primitive recursive functions, computable functions, examples, Recursion theorem. Tractable and Intractable problems, Theory of Optimization.

Text Books:

1. John C. Martin, "Introduction To Languages and Theory of Computation", McGraw Hill.
2. Peter Linz, An introduction to formal language & automata, Jones & Bartlete publications.

Reference Books:

1. Hopcroft,J.E.&Ullman,J.D. Formal languages and their relation to Automata, Pear son Education.
2. Lewis, H.R. & Papadimitrious, C.H. Elements of the theory of computation. PHI
3. Krithivasan K. & Rama R.,"Introduction to Formal Languages, Automata Theory and Computation", Pearson Education, 2009.
4. Michael Sipser, "Introduction to the Theory of Computation", Cengage Learning