SCHEME OF EXAMINATIONS					
MASTER OF COMPUTER APPLICATIONS					
(THROUGH DIRECTORATE OF DISTANCE EDUCATION, KURUKSHETRA UNIVERSITY, KURUKSHETRA)					
W. E. F. ACADEMIC SESSION 2021-22 IN PHASED MANNER					
Paper No.	**Nomenclature of Paper**	**External Marks**	**Internal Marks**	**Total Marks**	**Duration of Exam**
MCA FIRST YEAR					
MCA-DE-21-11	Programming in Java	80	20	100	3 Hours
MCA-DE-21-12	Object-Oriented Analysis and Design using UML and C++	80	20	100	3 Hours
MCA-DE-21-13	Artificial Intelligence	80	20	100	3 Hours
MCA-DE-21-14	Advances in Data Bases	80	20	100	3 Hours
MCA-DE-21-15	Elective-I	80	20	100	3 Hours
MCA-DE-21-16	S/W Lab – I Based on MCA-DE-21-11	100	-	100	3 Hours
MCA-DE-21-17	S/W Lab – II Based on MCA-DE-21-12	100	-	100	3 Hours
Elective – I					
MCA-DE-21-15 (i)	Software Engineering				
MCA-DE-21-15 (ii)	Computer Graphics				
MCA-DE-21-15 (iii)	Security in Computing				
MCA-DE-21-15 (iv)	Design and Analysis of Algorithms				
MCA-DE-21-15 (v)	Cloud Computing & IoT				
MCA-DE-21-15 (vi)	Cyber Security				
MCA SECOND YEAR					
MCA-DE-21-21	Programming with Python	80	20	100	3 Hours
MCA-DE-21-22	Web Technologies	80	20	100	3 Hours
MCA-DE-21-23	Data Communication and Networking Technologies	80	20	100	3 Hours
MCA-DE-21-24	Linux and Shell Programming	80	20	100	3 Hours
MCA-DE-21-25	Elective-I	80	20	100	3 Hours
MCA-DE-21-26	S/W Lab – III Based on MCA-DE-21-21	100	-	100	3 Hours
MCA-DE-21-27	S/W Lab – IV Based on MCA-DE-21-24	100	-	100	3 Hours
Elective – I					
MCA-DE-21-25 (i)	Principles of Programming Languages				
MCA-DE-21-25 (ii)	Advanced Computer Architecture				
MCA-DE-21-25 (iii)	Theory of Computation				
MCA-DE-21-25 (iv)	Mobile Application Development				
MCA-DE-21-25 (v)	Machine Learning				
MCA-DE-21-25 (vi)	Data Warehousing and Mining				

MCA-DE-21-11 PROGRAMMING IN JAVA

Max. 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 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. All questions will carry equal marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, students will have to attempt four more questions selecting one question from each Unit.

UNIT – I

Introduction to Java: Importance and features of Java, Java virtual machine, Bytecode, 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 by TMH, 2011.

Reference books:

1. E Balaguruswamy, **“**Programming with java”, Tata McGraw-Hill.
2. Horstmann, “Computing Concepts with Java 2 Essentials”, John Wiley.

MCA-DE-21-12 OBJECT ORIENTED ANALYSIS & DESIGN USING UML AND C++

Max. 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 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. All questions will carry equal marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, students will have to attempt four more questions selecting one question from each Unit.

Unit I

Introduction to UML: History of UML, Principles of Modeling, Overviews of UML Views, Things – Structural, Behavioral, Grouping and Annotational Things, Relationships in UML, Adornments, Stereotypes, Tagged Values, Constraints, Overviews of UML Diagrams,

Class Modelling using UML: Object, Class, Link, Association, generalization & Inheritance, Association Ends, N-ary associations, Aggregation vs Composition, Abstract Classes, Metadata, Reification, Constraints, Derived Data, Drawing Class Diagrams.

Unit II

State Modeling with UML: Events, States, Transitions, Conditions, Action, Activity, State Diagrams, Nested States, Signal Generalization, Concurrency, Relationships between Class and State Models.

Interaction Modeling: Use Case Models – Actors, Use Cases, Include & Extend Relationships, Use Case Diagrams; Sequence Models – Scenarios, Sequence Diagrams; Activity Models – Activities, Branches, Concurrent Activities, Swim Lanes, Activity Diagrams.

System Design: Estimating System Performance, Making a Reuse Plan, Breaking a System into Subsystems, Identify Concurrency , Allocate Subsystems to Hardware, Managing Data Stores, Handling Global Resources, Choosing a Software Control Strategy, Handling Boundary Conditions, Setting Trade-Off Priorities, Selecting an Architectural Style.

Unit III

Introduction to C++: Class and Objects, Inline functions , Static data members and members functions , Dynamic memory allocation and de-allocation, constructors and destructors, unformatted and formatted I/O operations.

Compile-time Polymorphism in C++: unary and binary; arithmetic and relational operators; Friend Function and its need, Friend Class, Function overloading, overloading operators through friend function.

Unit IV

Inheritance in C++: Derivation Rules, Single Inheritance, Multiple Inheritance, Hierarchical Inheritance, Multilevel Inheritance, Roles of constructors and destructors in inheritance.

Run-time Polymorphism in C++: Virtual functions and their needs, Pure virtual function, virtual derivation and its need, abstract class.

Generic programming & Exception Handling in C++: Template function, Template class, Exception handling features of C++.

Text Books:

1. M. Blaha , J. Rumbaugh , Object-Oriented Modeling and Design with UML , pearson Education-2007
2. Herbert Schildt, C++, the complete Reference, Tata McGraw-Hill

Reference Books:

1. Bjarne Stroustrup , The C++ Programming Language , pearson
2. Satzinger, Jackson, Burd, Object-Oriented Analysis & Design with the Unified Process, Thomson-2007
3. Lippman , C++ Primer , 3/e, Pearson Education
4. Balaguruswami, E., Object Oriented Programming In C++ , Tata McGraw-Hill

MCA-DE-21-13 ARTIFICIAL INTELLIGENCE

Max. 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 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. All questions will carry equal marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, students will have to attempt four more questions selecting one question from each Unit.

UNIT – I

Introduction: Background and history, Overview of AI applications areas.
Predicate calculus: Syntax and semantic for propositional logic and First Order Predicate Logic (FOPL), Clausal form, inference rules, resolution and unification. Knowledge representation: Network representation-Associative network & conceptual graphs, Structured representation- Frames & Scripts.

UNIT – II

Search strategies: Strategies for state space search, data driven and goal driven search; Search algorithms- uninformed search (depth first, breadth first, depth first with iterative deepening) and informed search (Hill climbing, best first, A* algorithm, mini-max etc.), computational complexity, Properties of search algorithms-Admissibility, Monotonicity, Optimality, Dominance, etc.

UNIT – III

Production system: Types of production system-commutative and non-commutative production systems, Decomposable and non-decomposable production systems, Control of search in production system.
Expert systems: Architecture, development, managing uncertainty in expert systems - Bayesian probability theory, Stanford certainty factor algebra, Nonmonotonic logic and reasoning with beliefs, Fuzzy logic, Dempster / Shaffer and other approaches to uncertainty.

UNIT – IV

Knowledge acquisition: Types of learning, learning automata, genetic algorithms, intelligent editors, learning by induction.
AI Programming Language: PROLOG: Introduction, Clauses: Facts, goals and rules. PROLOG unification mechanism, arithmetic operator, list manipulations, Fail and Cut predicates.

Text Books:

1. George F. Luger, Artificial Intelligence, 5th edition, Pearson Education, 2008.
2. Dan W. Patterson, Introduction to Artificial Intelligence and Expert system PHI.

Reference Books:

1. Ben Coppin, Artificial Intelligence Illuminated, Narosa Publishing House – 2005.
2. Nils J. Nilsson Principles of Artificial Intelligence Narosa publishing house.

MCA-DE-21-14 ADVANCES IN DATABASES

Max. 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 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. All questions will carry equal marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, students will have to attempt four more questions selecting one question from each Unit.

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, Superclasses, 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.

MCA-DE-21-15 (i) SOFTWARE ENGINEERING

Max. 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 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. All questions will carry equal marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, students will have to attempt four more questions selecting one question from each Unit.

Unit-I

Introduction: Software Crisis-problem & causes, Software Processes, Development models: Waterfall, Prototype, Evolutionary & Spiral models, Quality Standards like ISO 9001, SEI-CMM.
Requirement Analysis: Structured Analysis, Behavioural & non-behavioural requirements, Software requirement specification: components & characteristics, Function point metric.

Unit-II

Software Project Planning: Cost estimation, static, Single & multivariate models, COCOMO model, Putnam Resource Allocation Model, Risk management, project scheduling, personnel planning, team structure, Software configuration management, quality assurance, project monitoring.

Unit-III

Software Design: Fundamentals, problem partitioning & abstraction, design methodology, Function Oriented Design, Cohesion, Coupling & their classification, User Interface Design, Detailed design, Information flow metric, Cyclomatic complexity.
Coding: Style, structured programming, Metrics: LOC, Knot count, live variable, Halstead's measures.

Unit-IV

Testing: Static & dynamic testing, Functional testing: Boundary Value Analysis, Equivalence class testing, Decision table testing, Cause effect graphing; Structural testing: Control-flow & data-flow based testing, loop testing, mutation testing; performance testing; testing strategies: unit & integration testing, System testing, Alpha & Beta testing, debugging.
Maintenance: Types & characteristics of maintenance, Reverse Engineering & Re-engineering.

Text Books:

1. Pressman R. S., “Software Engineering – A Practitioner’s Approach”, Tata McGraw Hill.
2. Jalote P., “An Integrated approach to Software Engineering”, Narosa.

Reference Books:

1. Sommerville, “Software Engineering”, Pearson Education.
2. Fairley R., “Software Engineering Concepts”, Tata McGraw Hill.
3. James Peter, W Pedrycz, “Software Engineering”, John Wiley & Sons.

MCA-DE-21-15 (ii) COMPUTER GRAPHICS

Max. 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 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. All questions will carry equal marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, students will have to attempt four more questions selecting one question from each Unit.

UNIT – I

Introduction to Computer Graphics and its applications; Components and Working of Interactive Graphics; Display Processors; Look-up table; Popular Graphics Software; Coordinate Systems;

Graphics Devices: Raster scan and Random Scan systems, Resolution, Aspect Ratio, Refresh CRT, Color CRT monitors, Plasma Panel and LCD monitors, Interlacing; Grey shades; Interactive Input Devices: Pointing Devices, Image and Video Input Devices; Hard Copy Devices: Printers, Plotters;

UNIT – II

Drawing Geometry: Points and Lines; Output Primitives: Symmetrical and Simple DDA line drawing algorithms, Bresenham's line drawing; loading frame buffer; symmetrical DDA for drawing circle; DDA approach for drawing a Circular Arc; Polynomial method for Circle drawing; Circle drawing using Polar coordinates, Bresenham's circle drawing; generation of ellipse;

Line Styles; Generation of Bar Charts, Pie-Charts; Parametric representation of Cubic Curves; Bezier curves; Anti-Aliasing;

UNIT – III

2-D Transformations: Geometric Transformations, Coordinate Transformations, Translation, Rotation, Scaling; Matrix representations and Homogeneous Coordinates; Composite transformations; general pivot point rotation; general fixed point scaling; Shearing; Reflection about X- Axis and Y- Axis; Reflection through an Arbitrary Line; General Concatenation Properties;

2-D Viewing: WIndow, Viewport; Window-to-Viewport coordinate transformation, Zooming, Panning; Clipping operations: Point and Line clipping, Cohen-Sutherland line clipping, Mid-point Subdivision line clipping, Liang-Barsky line clipping, Sutherland-Hodgman polygon clipping;

UNIT – IV

Graphical User Interface; Input of Graphical Data: Logical Classification of Input Devices; Interactive Picture Construction Techniques; Positioning Constraints; Grids; Gravity Field; Rubber-Band technique; Dragging;

Polygon Area Filling: Flood Fill ; Scan-line fill algorithm; Boundary Fill;

3-D Graphics: 3-D modeling of objects, 3D Geometric transformation; Parallel projection; Perspective projection; Hidden surface removal: Back Face removal, Z-buffer, Scan line, Depth-Sorting, Area subdivision, Ray-Tracing, BSP Tree;

Colours and Shading: Modelling light intensities, Gouraud shading, Phong shading; Introduction to animation; Tweening;

Text book:

1. Donald Hearn, M. Pauline Baker, Computer Graphics, PHI.

Reference books:

1. Apurva A.Desai, Computer Graphics, PHI.
2. D.P.Mukherjee, Debasish Jana, Computer Graphics: Algorithms and Implementations, PHI.
3. D.P. Mukherjee, Fundamentals of Computer Graphics and Multimedia, PHI.
4. Newmann & Sproull, Principles of Interactive Computer Graphics, McGraw Hill.
5. Foley etc., Computer Graphics Principles & Practice, Addison Wesley.
6. Rogers, Procedural Elements of Computer Graphics, McGraw Hill.
7. Anirban Mukhopadhyay, Arup Chattopadhyay, Introduction to Computer Graphics and Multimedia, Vikas.
8. Zhigang Xiang, Roy Plastock, Computer Graphics, Tata McGraw Hill.
9. Malay K. Pakhira, Computer Graphics, Multimedia and Animation, PHI.

MCA-DE-20-15 (iii) SECURITY IN COMPUTING

Max. 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 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. All questions will carry equal marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, students will have to attempt four more questions selecting one question from each Unit.

Unit – I

Computer Security Concepts, Threats, Attacks and Assets, Security Functional Requirements, Security Architecture and Scope of Computer Security, Computer Security Trends and Strategies. Cryptography: Terminology and Background, Substitution Ciphers, Transpositions, Cryptanalysis,
Program Security: Secure Program, Non-malicious Program Error, Viruses and other Malicious Code, Targeted Malicious Code, Control against Program Threats.

Unit – II

Database Security: Database Management System, Relational Databases, Database Access Control, Inference, Security Requirements, Reliability and Integrity, Sensitive Data, Database Encryption.
Network Security: Threats in Network, Network Security Controls, Firewall- Need for firewall, Characteristics, Types of firewall, Firewall Basing, Intrusion Detection System- Types, Goals of IDS, IDS strengths and Limitations.

Unit – III

Internet Security Protocols and Standards: Secure Socket Layer (SSL) and Transport Layer Security (TLS), IPv4 and IPv6 Security, Kerberos 672, X.509, Public Key Infrastructure.
Linux Security Model, File System Security, Linux Vulnerability, Linux System Hardening, Application Security. Window Security Architecture, Windows Vulnerability, Windows Security Defense, Browser Defenses.

Unit – IV

Physical Security Threats, Physical Security Prevention and Mitigation Measures, Recovery form Physical Security Breaches, Security Auditing Architecture, Security Audit Trail, Security Risk assessment, Security Controls or Safeguard, IT Security Plan, Implementation of Controls, Cybercrime and Computer Crime, Intellectual Property, Privacy, Ethical Issues.

Text Books:

1. Charles. P. Pfleeger & Shari Lawrence Pfleeger, Security in Computing, Pearson Education.

Reference Books:

1. William Stalling, Lawrie Brown, Computer Security Principles and Practice, Pearson Education.
2. Atul Kahate, Cryptography and Network Security, Tata McGraw-Hill Education

MCA-DE-21-15 (iv) DESIGN AND ANALYSIS OF ALGORITHMS

Max. 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 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. All questions will carry equal marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, students will have to attempt four more questions selecting one question from each Unit.

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, master's 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.

MCA-DE-21-15 (v) CLOUD COMPUTING & IoT

Max. 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 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. All questions will carry equal marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, students will have to attempt four more questions selecting one question from each Unit.

UNIT–I

Cloud Computing: Definition, roots of cloud computing, characteristics, cloud architecture, deployment models, service models.

Virtualization: benefits& drawbacks of virtualization, server virtualization, virtualization of – operating system, platform, CPU, network, application, memory and I/O devices etc.

UNIT–II

Cloud Computing Service Platforms – compute services, storage services, database services, application services, queuing services, e-mail services, notification services, media services, content delivery services, analytics services, deployment & management services, identity & access management services and their case studies.

Security in cloud computing: issues, threats, data security and information security

UNIT–III

Internet of Thing (IoT): overview, conceptual framework, architecture, major components, common applications

Design principles for connected devices: Modified OSI Model for IoT/M2M systems, ETSI M2M Domains and High-level capabilities, wireless communication technologies - NFC, RFID, Bluetooth BR/EDR and Bluetooth low energy, ZigBee, WiFi, RF transceiver and RF modules. Data enrichment, data consolidation & device management at gateway.

UNIT–IV

Design principles for web connectivity: web communication protocols for connected devices: constrained application protocol, CoAP Client web connectivity, client authentication, lightweight M2M communication protocol. Message communication protocols for connected devices - CoAP-SMS, CoAP-MQ, MQTT, XMPP.

IoT privacy, security and vulnerabilities and their solutions.

Text Books:

1. ArshdeepBahga, Vijay Madisetti, Cloud Computing – A Hands-on Approach, University Press.
2. RajkumarBuyya, James Broberg, AndrzejGoscinski, Cloud Computing – Principles and Paradigms, Wiley India Pvt. Ltd.
3. Raj Kamal, Internet of Things - Architecture and Design Principles, McGraw Hills

Reference Books:

1. Kai Hwang, Geoffrey C.Fox, and Jack J. Dongarra, Distributed and Cloud Computing, Elsevier India Private Limited
2. Saurabh Kumar, Cloud Computing, Wiley India Pvt. Ltd.
3. Shailendra Singh, Cloud Computing, Oxford
4. Coulouris, Dollimore and Kindber, Distributed System: Concept and Design, Addison Wesley
5. Michael Miller, Cloud Computing, Dorling Kindersley India
6. Anthony T. Velte, Toby J. Velte and Robert Elsenpeter, Cloud computing: A practical Approach, McGraw Hill
7. Dimitrios Serpnos, Marilyn Wolf, Internet of Things (IoT) Systems, Architecture, Algorithms, Methodologies, Springer
8. Vijay Madisetti and ArshdeepBahga, Internet of Things (A Hands-on Approach), VPT
9. Francis daCosta, Rethinking the Internet of Things: A Scalable Approach to Connecting Everything, Apress Publications

MCA-DE-21-15 (vi) CYBER SECURITY

Max. 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 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. All questions will carry equal marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, students will have to attempt four more questions selecting one question from each Unit.

Unit- I

Introduction to Cyber Security: Overview of Cyber Security, Internet Governance: Challenges and Constraints, Cyber Threats, Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, Need for a Comprehensive Cyber Security Policy, Need for a Nodal Authority, International convention on Cyberspace.

Unit – II

Introduction to Cybercrime and Laws: Origins of Cybercrime, Classifications of Cyber crimes, information Security, Cyber criminals, Criminals Plan for Attacks, Cybercafe, Botnets, Attack Vector, The Indian IT ACT 2000 and amendments.

Tools and Methods used in Cybercrime: Introduction, Proxy Server and Anonymizers, Password Cracking, Key loggers and Spyware, Virus and Warms, Trojan and backdoors, DOS and DDOS attack, SQL injection.

Unit – III

Phishing and Identity Theft: Introduction to Phishing, Methods of Phishing, Phishing Techniques, Phishing Toolkits and Spy Phishing. Identity Theft: PII, Types of Identity Theft, Techniques of ID Theft. Digital Forensics Science, Need for Computer Cyber forensics and Digital Evidence, Digital Forensics Life Cycle.

Introduction to Intellectual Property Law – The Evolutionary Past - The IPR Tool Kit- Para -Legal Tasks in Intellectual Property Law – Ethical obligations in Para Legal Tasks in Intellectual Property Law –types of intellectual property rights.

Unit – IV

Network Defence tools: Firewalls and Packet Filters: Firewall Basics, Packet Filter Vs Firewall, Packet Characteristic to Filter, Stateless Vs Stateful Firewalls, Network Address Translation (NAT) and Port Forwarding, Virtual Private Networks, Linux Firewall, Windows Firewall, Snort Detection System, Introduction to block chain technology and its applications.

Text Books:

1. Mike Shema, Anti-Hacker Tool Kit (Indian Edition), Publication McGraw Hill.
2. Nina Godbole and SunitBelpure, Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Publication Wiley.

Reference Books:

1. Marjie T. Britz, Computer Forensics and Cyber Crime: An Introduction, Pearson Education
2. Chwan-Hwa (John) Wu,J. David Irwin, Introduction to Computer Networks and Cyber security, CRC Press
3. Bill Nelson, Amelia Phillips, Christopher Steuart, Guide to Computer Forensics and Investigations, Cengage Learning
4. Debirag E.Bouchoux, Intellectual Property, Cengage Learning.

MCA–DE-21-21 PROGRAMMING WITH PYTHON

Max. 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 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. All questions will carry equal marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, students will have to attempt four more questions selecting one question from each Unit.

UNIT – I

Python: Introduction, Installation, Data types: Numbers, Lists, Tuples, Sets, Dictionaries, Files; Operators, Input/Output Statements, Control Flow statements.

Lists, tuples, and dictionaries; basic list operators, replacing, inserting, removing an element; searching and sorting lists; dictionary literals, adding and removing keys, accessing and replacing values; traversing dictionaries.

UNIT – II

Text files: manipulating files and directories, os and sys modules, reading/writing text and numbers from/to a file; creating and reading a formatted file (csv or tab-separated).

String manipulations: subscript operator, indexing, slicing a string; strings and number system: converting strings to numbers and vice versa.

Design with functions: hiding redundancy, complexity; arguments and return values; formal vs actual arguments, named arguments. Program structure and design. Recursive functions.

UNIT – III

Graphics and Image Processing: “turtle” module; simple 2d drawing- colors, shapes; digital images, image file formats.

Classes and OOP: classes, objects, attributes and methods; defining classes; design with classes, data modeling; persistent storage of objects, inheritance, polymorphism, operator overloading (_eq_,_str_, etc); abstract classes; exception handling, try block

UNIT – IV

Graphical user interfaces; event-driven programming paradigm; tkinter module, creating simple GUI; buttons, labels, entry fields, dialogs; widget attributes - sizes, fonts, colors layouts, nested frames

Multithreading, Networks, and Client/Server Programming; interacting with remote HTML server, running HTML-based queries, downloading pages; CGI programming, programming a simple CGI form, Regular expressions.

Text Books:

1. Kenneth Lambert, “Fundamentals of Python: First Programs”, Course Technology, Cengage Learning, 2012
2. T. Budd, “Exploring Python”, Tata Mcgraw Hill, New Delhi.

Reference Books:

1. Zed A. Shaw, “Learn Python The Hard Way”, 3rd Edition, Pearson Education.
2. Mark Lutz, “Learning Python”, O’Reilly Publishers.

MCA-DE-21-22 WEB TECHNOLOGIES

Max. 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 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. All questions will carry equal marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, students will have to attempt four more questions selecting one question from each Unit.

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 web site 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.

MCA-DE-21-23 DATA COMMUNICATIONS AND NETWORKING TECHNOLOGIES

Max. 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 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. All questions will carry equal marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, students will have to attempt four more questions selecting one question from each Unit.

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 Networking5E- Mc-Graw Hill.

Reference Books:

1. William Stallings, Data and Computer Communications, 5th Edition – PHI.
2. Andrew S. Tanenbaum, Computer Networks – PHI.

MCA-DE-21-24 LINUX AND SHELL PROGRAMMING

Max. 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 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. All questions will carry equal marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, students will have to attempt four more questions selecting one question from each Unit.

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, files 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: create, 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.

MCA-DE-21-25 (i) PRINCIPLES OF PROGRAMMING LANGUAGES

Max. 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 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. All questions will carry equal marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, students will have to attempt four more questions selecting one question from each Unit.

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 & Vande Kopple J. Julius, “Programming languages- Paradigm and practice”, McGraw Hill.
2. Sethi Ravi, “Programming languages”, Pearson Education
3. Scott M., “Programming Language Pragmatics”, Elsevier India.

MCA-DE-21-25 (ii) ADVANCED COMPUTER ARCHITECTURE

Max. 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 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. All questions will carry equal marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, students will have to attempt four more questions selecting one question from each Unit.

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 super scalar 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, 2Dmesh, 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.

MCA-DE-21-25 (iii) THEORY OF COMPUTATION

Max. 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 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. All questions will carry equal marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, students will have to attempt four more questions selecting one question from each Unit.

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.

Push down 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.

MCA-DE-21-25 (iv) MOBILE APPLICATION DEVELOPMENT

Max. 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 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. All questions will carry equal marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, students will have to attempt four more questions selecting one question from each Unit.

UNIT – I

Introduction: Mobile Applications, Characteristics and Benefits, Application Models, Mobile devices Profiles. Basics of Android, Importance and scope, Android Architecture, Android Stack, Android Applications Structure, Android Emulator, Android SDK, Overview of Android Studio, Android and File Structure, Android Virtual Device Manager, DDMS, LogCat

Application Design: Memory Management, Design patterns for limited memory, Work flow for Application Development, Techniques for composing Applications, Dynamic Linking, Plug-ins and rules of thumb for using DLLs, Concurrency and Resource Management.

UNIT-II

Google Android: Activities, Intents, Tasks, Services; Callbacks and Override in application, Concurrency, Serialization, Application Signing, API keys for Google Maps.

Android Framework: Fragments and Multi-platform development, Creating Widgets: Layouts, Canvas Drawing, Shadows, Gradients; Applications with multiple screens; Handling database in Android: Android Database class, Using the Database API, Working with Data Storage: Shared preferences, Preferences activity, Files access, SQLite database

UNIT-III

Android Applications: Various life cycles for applications, Building a User Interface: Blank UI, Folding and Unfolding a scalable UI, Making Activity, Fragment, Multiple layouts; Content Provider, Location and Mapping: location based services, Mapping, Google Maps activity, Working with MapView and MapActivity; Playing and Recording of Audio and Video in application; Sensors and Near Field Communication; Native libraries and headers, Building client server applications.

UNIT-IV

Preparing for publishing, Signing and preparing the graphics, Publishing to the Android Market

Other Platforms: Apple iPhone Platform, Introduction to iPhone OS and iOS, UI tool kit interfaces, Event handling and Graphics services, Layer Animation. Overview of Cross-platform application development.

Text Books:

1. Zigurd Mednieks, Laird Dornin, G,Blake Meike and Masumi Nakamura “Programming Android”, O’Reilly Publications.
2. Wei-Meng Lee, “Beginning iPhone SDK Progrmming with Objective-C”, Wiley India Ltd.

Reference Books:

1. Pradeep Kothari, “Android Application Development: Black Book”, Wiley India Ltd.
2. James C.S. “Android Application development”, CENGAGE Learning.
3. Gargenta M., Nakamura M., “Learning Android”, O’Reilly Publications.

MCA-DE-21-25 (v) MACHINE LEARNING

Max. 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 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. All questions will carry equal marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, students will have to attempt four more questions selecting one question from each Unit.

Unit – I

Machine Learning: Introduction to Machine Learning, Overview of Machine Learning, Key Terminology and task of ML, Applications of ML;
Supervised Learning: Classification, Decision Tree Representation- Appropriate problem for Decision Learning, Decision Tree Algorithm, Hyperspace Search in Decision Tree;

Unit – II

Naive Bayes- Bayes Theorem, Classifying with Bayes Decision Theory, Conditional Probability, Bayesian Belief Network;
Regression: Linear Regression- Predicting numerical value, Finding best fit line with linear regression, Regression Tree- Using CART for regression.

Unit – III

Logistic Regression - Classification with Logistic Regression and the Sigmoid Function;
Clustering: Learning from unclassified data –Introduction to clustering, K-Mean Clustering, Expectation-Maximization Algorithm(EM algorithm), Hierarchical Clustering, Supervised Learning after clustering.

Unit – IV

Dimensionality reduction- Dimensionality reduction techniques, Principal component analysis, Anomaly Detection, Recommender Systems;
SVM, Reinforcement Learning.

Text Books:

1. Tom M. Mitchell, Machine Learning, McGraw-Hill Education (India) Private Limited.
2. EthemAlpaydin, Introduction to Machine Learning (Adaptive Computation and Machine Learning), The MIT Press.

Reference Books:

1. Stephen Marsland, Machine Learning: An Algorithmic Perspective, CRC Press.
2. Peter Flach, Machine Learning: The Art and Science of Algorithms that Make Sense of Data, Cambridge University Press.
3. Peter Harrington, Machine Learning in Action, Manning
4. ShaiShalev-Shwartz and Shai Ben David, Understanding Machine Learning From Theory to Algorithms, Cambridge University Press

MCA-21-25 (vi) DATA WAREHOUSING AND MINING

Max. 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 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. All questions will carry equal marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, students will have to attempt four more questions selecting one question from each Unit.

UNIT – I

Data Warehouse: Basic concepts, The Data Warehouse - A Brief History, Characteristics, Difference between Operational Database Systems and Data Warehouse, Architecture for a Data Warehouse, Fact and Dimension Tables, Data Warehouse Schemas, Data Cube : A Multidimensional Data Model, Data Cube Computation Methods, Typical OLAP Operations, Data Warehouse Design and Usage, Data Warehouse Implementation, Data Generalization by Attribute Oriented Induction.

UNIT – II

Data Mining: Introduction: Motivation, Importance, Knowledge Discovery Process, Data Mining Functionalities, Interesting Patterns, Classification of Data Mining Systems, Major issues, Data Objects and Attribute Types. Data Preprocessing: Overview, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization. Data Mining Models: Directed Data Mining Models, Directed Data Mining Methodology. Data Visualization. Outliers, Types of Outliers and Challenges of Outlier Detection.

UNIT – III

Data Mining Classical Techniques: Statistics – Similarity Models, Steps for Designing Similarity Models, Table Lookup Model. Clustering- Requirement for Cluster Analysis, Clustering Methods- Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid-Based Methods, Evaluation of Clustering. Nearest Neighborhood- Memory Based Reasoning, Challenges of Memory Based Reasoning,

UNIT – IV

Data Mining Next Generation Techniques: Decision Tree- Decision Tree Induction, Attribute Selection Measures, Tree Pruning. Association Rule Mining- Market Basket Analysis, Frequent Itemset Mining using Apriori Algorithm, Improving the Efficiency of Apriori, Neural Network- Bayesian Belief Networks, Classification by Back propagation. Data Mining Applications, Data Mining Trends and Tools.

Reference Books:

1. J Hanes, M. Kamber, “Data Mining Concepts and Techniques”, Elsevier India.
2. G.S. Linoff, M.J.A. Berry, “Data Mining Techniques”, Wiley India Pvt. Ltd.
3. A. Berson, S.J. Smith, “Data Warehousing, Data Mining & OLAP”, Tata McGraw-Hill.