PUNJABI UNIVERSITY, PATIALA

SYLLABI
OUTLINES OF TESTS,
AND COURSES OF READINGS

FOR

MASTER OF COMPUTER APPLICATIONS (MCA)
(SEMESTER SYSTEM)

SECOND YEAR (Semester III & IV)

Session 2018-19

CHOICE-BASED CREDIT SYSTEM

(As per RUSA Guidelines)

PUNJABI UNIVERSITY,
PATIALA 147002

M.C.A. (MASTER OF COMPUTER APPLICATIONS)
SECOND YEAR - THIRD SEMESTER EXAMINATIONS
Session 2018-19

Paper Code	Title of Paper	L	T	P	C	Internal Marks		External Marks	
						Max	Pass	Max	Pass
MCA-211	Design and Analysis of Algorithms	4	0	0	4	50	20	50	20
MCA-212	Software Engineering	4	0	0	4	50	20	50	20
MCA-213	Decision Support Systems	4	0	0	4	50	20	50	20
MCA-214	Programming in Java	4	0	0	4	50	20	50	20
MCA-215	Programming Lab – III (Java Lab and Minor Project)	0	0	6	3	60	24	40	16
MCA-216	*Elective	4	0	0	4	50	20	50	20
	Total	20	0	6	23	310		290	

***List of Electives**: Any one of the following papers:

PAPER CODE	TITLE OF PAPER
MCA-216 E1	Organisation Behaviour and Development
MCA-216 E2	System Software
MCA-216 E3	Computer Based Optimization Techniques
MCA-216 E4	Data Mining and Data Warehousing
MCA-216 E5	ERP Systems and Processes

*** Note:** The electives will be offered to the students depending upon the availability of the teachers. The decision of the Head of the Department in this respect will be final.

CONTINUOUS ASSESSMENT (THEORY PAPERS)

1.	Two tests will be conducted during the semester. Both the tests will be counted for assessment.	:	60% of the total marks allotted for continuous assessment.
2.	Assignment/Quizzes	:	20% of the total marks allotted for continuous assessment.
3.	Attendance	:	10% of the total marks allotted for continuous assessment.
4.	Class Participation and behaviour	:	10% of the total marks allotted for continuous assessment.

CONTINUOUS ASSESSMENT (PRACTICAL LAB)

1.	Two tests will be conducted during the semester. Both the tests will be counted for assessment.	:	60% of the total marks allotted for continuous assessment.
2.	Lab Assignments	:	30% of the total marks allotted for continuous assessment.
3.	Attendance	:	10% of the total marks allotted for continuous assessment.

M.C.A. (MASTER OF COMPUTER APPLICATIONS)
SECOND YEAR - FOURTH SEMESTER EXAMINATIONS
Session 2018-19

Paper Code	Title of Paper	L	T	P	C	Internal Marks		External Marks	
						Max	Pass	Max	Pass
MCA-221	Operating Systems	4	0	0	4	50	20	50	20
MCA-222	Data Communication and Computer Networks	4	0	0	4	50	20	50	20
MCA-223	Web Programming using ASP.NET	4	0	0	4	50	20	50	20
MCA-224	Business Intelligence	4	0	0	4	50	20	50	20
MCA-225	Programming Lab – IV (ASP.NET and Minor Project)	0	0	6	3	60	24	40	16
MCA-226	*Elective	4	0	0	4	50	20	50	20
	Total	20	0	6	23	310		290	

***List of Electives:** Any one of the following papers:

PAPER CODE	TITLE OF PAPER
MCA-226 E1	Object Oriented Modelling and Design using UML
MCA-226 E2	Embedded Systems
MCA-226 E3	Compiler Design
MCA-226 E4	Software Testing and Quality Assurance
MCA-226 E5	Graph Theory

*** Note:** The electives will be offered to the students depending upon the availability of the teachers. The decision of the Head of the Department in this respect will be final.

CONTINUOUS ASSESSMENT (THEORY PAPERS)

1.	Two tests will be conducted during the semester. Both the tests will be counted for assessment.	:	60% of the total marks allotted for continuous assessment.
2.	Assignment/Quizzes	:	20% of the total marks allotted for continuous assessment.
3.	Attendance	:	10% of the total marks allotted for continuous assessment.
4.	Class Participation and behaviour	:	10% of the total marks allotted for continuous assessment.

CONTINUOUS ASSESSMENT (PRACTICAL LAB)

1.	Two tests will be conducted during the semester. Both the tests will be counted for assessment.	:	60% of the total marks allotted for continuous assessment.
2.	Lab Assignments	:	30% of the total marks allotted for continuous assessment.
3.	Attendance	:	10% of the total marks allotted for continuous assessment.

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MCA-211: Design and Analysis of Algorithms

Maximum Marks: 50 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

A) Instructions for paper-setter

The question paper will consist of three sections A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and each question will carry 7.5 marks. Section C will consist of 10 short answer type questions of 2 marks each covering the entire syllabus uniformly and will carry 20 marks in all.

B) Instructions for candidates

1. Candidates are required to attempt five questions in all, selecting two questions each from section A and B and compulsory question of section C.
2. Use of non-programmable scientific calculator is allowed.

SECTION A

Introduction to algorithm analysis: Introduction to algorithms, Algorithm Specifications, performance analysis, case study on analysis of algorithms.
Recursion and Induction: recursive procedures, induction proofs, proving correctness, recurrence equations, recursion.
Randomized Algorithms: Basic of Probability Theory, Description of Randomized algorithms, Identifying the repeated Elements, Partiality Testing, Advantages and Disadvantages of using randomized algorithms.
Algorithmic Techniques: Introduction to Brute Force, Greedy, Divide and Conquer and Dynamic Programming techniques.
Linear Search Algorithm, Performance analysis of linear search algorithm, Binary Search Algorithm, Performance analysis of Binary Search Algorithm
Divide and conquer technique of problem solving: Quick sort, Merge Sort and Selection Sort Algorithms and their Performance Analysis.

SECTION B

Greedy algorithms: General Method, Case Study based on Greedy Algorithm (Knapsack Problem), Minimum-cost Spanning Trees: Prim's algorithm, Kruskal's minimal spanning trees, Single source shortest paths, transitive closure and APSP problem.
Dynamic Programming: General Method, Multistage graphs, All Pair Shortest Paths, Optimal Binary Search Trees, String Editing.
Intractable Problems: Nondeterministic Algorithms, NP Hard and NP complete Problems, NP Hard Graph Problem (Travelling Salesman problem), NP Hard Scheduling Problems (Job Shop Scheduling)

Text Book:

1. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, Fundamentals of Computer Algorithms, Universities Press.

Reference Books:

1. Coreman, Leiserson & Rivest : Introduction to Algorithm, PHI Publication.
2. Aho et. al. : Design & Analysis of Computer Algorithm, Pearson Education.
3. Infosys, Campus Connect, Analysis of Algorithms, Vol-3
4. Knuth : The art of programming (Vol I to III), Pearson Education.
5. Weiss M.A. : Data Structures and Algorithm Analysis in C, Pearson Education.
6. Heilemau G. L. : Data Structures, Algorithm and Object Oriented Programming, T.M. H. Publications
7. Goodman S.E. and Hedeniemi : Introduction to the Design and Analysis and Algorithms, TMH Publications.
8. Sara Baose, Gelder A.V. : Computer Introduction to Design and Analysis Algorithms, Pearson Educations, Inc.

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MCA-212: Software Engineering

Maximum Marks: 50 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

A) Instructions for paper-setter

The question paper will consist of three sections A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and each question will carry 7.5 marks. Section C will consist of 10 short answer type questions of 2 marks each covering the entire syllabus uniformly and will carry 20 marks in all.

B) Instructions for candidates

1. Candidates are required to attempt five questions in all, selecting two questions each from section A and B and compulsory question of section C.
2. Use of non-programmable scientific calculator is allowed.

SECTION A

Introduction to Software Engineering: Problem Domain, Challenges, Software Engineering Approach ; Software Development process: Process Characteristics, Process Models : Waterfall, Prototype, Spiral, Iterative Enhancement; Project Management Process, The Inspection process, Software Configuration Management Process, Requirements Change management

Software Metrics: Software Measurement and Metrics, Designing Software Metrics, Classification of Software Metrics, Issues in Software metrics, Risk Management

Software Process Planning, Effort Estimation, Cost estimation models, Project Scheduling and Staffing,

Software Requirements Analysis and Specification: Requirements Anticipation, Requirements Investigation, Requirements Specifications, Analysis Approaches, Characteristics and Components of SRS, Fundamental problems in defining requirements, requirements validation.

Decision Analysis Tools: Decision Tree, Decision Table, Structured English.

Entity Relationship Diagram: Identify entity and relationship, Data Dictionary

SECTION B

Software Design: Design Principles, Module level concepts, Design Notation and Specification, Structured Design Methodology, Verification, Metrics, OO Analysis and OO Design

User-Interface Design: Introduction to User-Interface Design, Elements, Design Principles, Design Tips and Techniques, Good v/s Bad Interface.

Coding: Programming practice, Verification: code reading, reviews, static analysis, symbolic execution.

Software Maintenance: Types of Maintenance, Maintenance Cost, Introduction to legacy systems, Role of documentation in maintenance and types of documentation

Software Testing: Objectives, Principles, Test case design, White-Box testing and Black-Box testing techniques.

Reverse Engineering: Basics of Software Re-engineering, Re-engineering Process Model.

Text Book:

1. Pankaj Jalote, An Integrated Approach to Software Engineering, Narosa Publications.

Reference Books:

1. E. Fairley, "Software Engineering Concepts", McGraw-Hill.
2. Rohit Khurana, " Software Engineering : Principles and Practices", Vikas Publishing House.
3. Ian Sommerville, " Software Engineering ", Pearson Education
4. Roger. S. Pressman, "Software Engineering - A Practitioner's Approach", McGraw Hill,
5. Designing User Interface, James E Powell, Galgotia Publications.

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MCA-213: Decision Support Systems

Maximum Marks: 50 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

A) Instructions for paper-setter

The question paper will consist of three sections A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and each question will carry 7.5 marks. Section C will consist of 10 short answer type questions of 2 marks each covering the entire syllabus uniformly and will carry 20 marks in all.

B) Instructions for candidates

1. Candidates are required to attempt five questions in all, selecting two questions each from section A and B and compulsory question of section C.
2. Use of non-programmable scientific calculator is allowed.

SECTION A

Concept of Decision - making, Decision - Making Process, Simon's Model, Programmed and Non-Programmed decisions, Decision models: Payoff matrix, Decision-Making under Assumed Certainty, Decision-Making under Risk and Decision-Making under Uncertainty, Criterion for choosing alternatives and their computations.
Introduction to Decision Support Systems, Characteristics and Objectives, Benefits of DSS, DSS Vs. EDP/MIS, Specific DSS, DSS Generator, DSS tools and their relationships, Role of DSS and its applications.

SECTION B

Components of DSS - Data Subsystem, Model Subsystem, User - Interface, DBMS in DSS, Report generator, Types of Models and Modelling in DSS.
DSS Software Tools: Standard Packages, specialized tools and Generators-DBMS, Information retrieval packages, statistical data analysis packages, forecasting packages, Programming Languages for DSS.
Group Decision Support Systems: Group versus Individual activities, Characteristics of groups and their needs, Types of groups, Types of Group support systems, Electronic Meeting Systems, Work flow systems.
Expert Systems: Basic idea, components of Expert Systems, Expert Systems and DSS integration.

Text Books:

1. Efrem G. Mallach, Decision Support and Data Warehouse Systems, Tata McGraw-Hill.
2. Efraim Turban, Jay E. Aronson, Decision Support Systems and Intelligent Systems, Pearson Education.

Reference Books:

1. Michael W-Davis, "Applied Decision Support", Prentice Hall.
2. R. Jaya Shankar, "Decision Support Systems", Tata McGraw Hill.
3. Sprague and Watson, "Decision Support Systems: Theory & Practice", PHI.
4. J.L. Bennett, "Building Decision Support System", Addison-Wesley Publications.

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MCA-214: Programming In Java

Maximum Marks: 50 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

A) Instructions for paper-setter

The question paper will consist of three sections A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and each question will carry 7.5 marks. Section C will consist of 10 short answer type questions of 2 marks each covering the entire syllabus uniformly and will carry 20 marks in all.

B) Instructions for candidates

1. Candidates are required to attempt five questions in all, selecting two questions each from section A and B and compulsory question of section C.
2. Use of non-programmable scientific calculator is allowed.

SECTION A

History and Evolution of Java, Data Types, Variables and Arrays, Operators, Control Statements, Introducing Classes, A Closer Look at Methods and Classes.
Inheritance: Basics, Using super, Creating Multilevel Hierarchy, Method Overriding, Dynamic Method Dispatch, Using Abstract Classes, Using final with inheritance, The object Class. Packages and Interfaces: Defining a package, Finding packages and CLASSPATH, Access Protection, Importing Packages, Defining an Interface, Implementing Interface, Nested Interface, Applying Interface, Variables in Interfaces, Exception Interface: Fundamentals, Exception Types, Uncaught Exceptions, Using try and catch, Multiple catch clauses, Nested try Statements, throw, throws, finally, Java's inbuilt Exceptions, Creating own Exception Subclasses, Chained Exceptions, Using Exceptions, Multithreaded Programme: The java Thread Model, The Main Thread, Creating a thread, Creating Multiple Threads, Using is Alive() and join (), Thread Priorities, Synchronization, Inter thread Communication, Suspending, Resuming, and Stopping Threads, Using Multithreading.

SECTION B

I/O Basics: Streams, Byte Streams, Character Streams, The Predefined Streams, Reading Console Input, Writing Console Output, The Print Writer Class, Reading and writing files, Applet Fundamentals, The Transient and volatile Modifiers, Using Instance of, Static Import, Invoking Overloaded constructors Through this().
Introduction to Swing, Event handling
String Handling, Primitive Type Wrappers, Java and Database: JDBC Basics, SQL Package in Java, Working with database, Creation of JDBC Statements, Networking in Java: Basics

Text Book:

1. Patrick Naughton, Herbert Schildt, Java 2: The Complete Reference, McGraw Hill.

Reference Books:

1. Ken Arnold, James Gosling, David Holmes "Java Programming Language", Pearson Publications.
2. URL: http: //java.sun.com/docs/books/tutorial/jdbc/basics/index.html
3. Shah, “Core Java for Beginners”, Shroff- X team.

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MCA-215: Programming Lab-III (Java Lab and Minor Project)

Maximum Marks: 100* **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Practical units to be conducted: 55-65**

This laboratory course will mainly comprise of exercises on what is learnt under the paper MCA-214: Programming in Java.

For the minor projects in a team of maximum size two will be allowed and the team will submit joint project report. The student team members must highlight their role and/or contributions in the joint project report.

*The splitting of marks is as under

- Maximum Marks for Continuous Assessment : 60
- Maximum Marks for University Examination : 40

CONTINUOUS ASSESSMENT (PRACTICAL LAB)

1.	Two tests will be conducted during the semester. Both the tests will be counted for assessment.	:	60% of the total marks allotted for continuous assessment.
2.	Lab Assignments	:	30% of the total marks allotted for continuous assessment.
3.	Attendance	:	10% of the total marks allotted for continuous assessment.

For University Examination the evaluator will distribute the marks for the minor project work according to the following guidelines:

Demonstration of Project	50% of the marks allotted for University Examination
Presentation and Viva Voce	25% of the marks allotted for University Examination
Project Report Document	15% of the marks allotted for University Examination
Source Code	10% of the marks allotted for University Examination.

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MCA-216 E1: Organization Behaviour and Development

Maximum Marks: 50 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

A) Instructions for paper-setter

The question paper will consist of three sections A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and each question will carry 7.5 marks. Section C will consist of 10 short answer type questions of 2 marks each covering the entire syllabus uniformly and will carry 20 marks in all.

B) Instructions for candidates

1. Candidates are required to attempt five questions in all, selecting two questions each from section A and B and compulsory question of section C.
2. Use of non-programmable scientific calculator is allowed.

SECTION A

Defining OB, Fundamentals of OB, Foundations for the study of OB: The Hawthorne studies and its implications, Human relation movement, organisational culture, the basic theories of behaviour prediction of human behaviour at work. Understanding Indian social and cultural environment. Influence on industrial behaviour. Challenges & Opportunities for OB. Developing an OB Model, Personality, and its determinants, Personality traits attributes, influencing OB. Personality development Understanding attitudes, values and formation of organisational culture, job satisfaction.

Perception, its nature and importance, perception vs sensation, perceptual organisation and selectivity, social perception.

Learning: theories of Learning, learning principles, Reinforcement-kinds and administration.

SECTION B

Motivation, its meaning, type of motives, theories of Motivation (Maslow, Herzberg, McGreger & McClelland's) job designing and goal setting.

Interpersonal Behaviour: Understanding conflicts and its dimensions. Goal congruence and group Behaviour and dynamics.

Power and politics: meaning and relationship. Source and types of power, implications and acquisition of power, Leadership and its theories.

O.D defined and its importance, underlying assumptions and values, characteristics and foundations of OD, operational components of OD, conditions for success of OD, Interventions-its overview, kinds and applications.

Text Book:

1. Stephen P. Robbins, T.A. Judge, Seema Sanghi, Organizational Behaviour, Pearson Education.

Reference Books:

1. J.W. Newston & Keith Davis, OB, TMH.
2. Fred Luthaus, Organiations Behaviour, McGraw Hill.
3. R.W. Griffn & Moohead . Organisational Behaviour, Jaico Books.

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MCA-216 E2: System Software

Maximum Marks: 50 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

A) Instructions for paper-setter

The question paper will consist of three sections A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and each question will carry 7.5 marks. Section C will consist of 10 short answer type questions of 2 marks each covering the entire syllabus uniformly and will carry 20 marks in all.

B) Instructions for candidates

1. Candidates are required to attempt five questions in all, selecting two questions each from section A and B and compulsory question of section C.
2. Use of non-programmable scientific calculator is allowed.

SECTION A

Introduction to systems software: Definition, features of system programming, system programming vs. application programming, type of system programmes.
Machine Architecture: Organization of simple computer, Instruction types, addressing modes.
Machine Language: Features of machine language, Machine instruction format of 8086/88 family.
Assembly Language: Features, various types of statements, data types of 8086/88
Assembler: general design procedure of an assembler, two-pass assembler, single pass assembler.
Macro processor: macro instructions, features of macro facility, implementation, one pass macro pre-processor, two pass macro pre-processor, macro assemblers.

SECTION B

Compilers: Overview of compilation process, lexical analysis, syntax analysis, semantic analysis, intermediate code generation, code optimisation techniques, Error Processing.
Loaders and Linkers: Various Loading and Linking Schemes, Design of Assemble and Go loading scheme, Absolute Loader, Re-Locatable loaders, dynamic loading and linking concepts.
Introduction to device drivers, functions and structure of text editor.
Operating System: Introduction, various types of operating system - batch processing, Multiprogramming, Multitasking, time sharing, parallel, distributed and PC operating system.
Resource Manager's View of Operating System: Components of Operating System, User's View of Operating System: Operating System Services, Operating System Structure – Simple structure, Layered Approach, Micro kernel approach.

Text Book:

1. John. J. Donovan, Systems programming, Tata McGraw-Hill.

Reference Books:

1. A.V. Aho, Ravi Sethi, J.D. Ullman, Compilers: Principles, Techniques and Tools, Addison-Wesley Publishing Co.
2. D.M. Dhamdhere, "Systems Programming and Operating System", Tata McGraw Hill.
3. Infosys Campus Connect Foundation Program Volume 1 – 3, Education & Research Department, Infosys Technologies Ltd , Bangalore.

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MCA-216 E3: Computer Based Optimization Techniques

Maximum Marks: 50 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

A) Instructions for paper-setter

The question paper will consist of three sections A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and each question will carry 7.5 marks. Section C will consist of 10 short answer type questions of 2 marks each covering the entire syllabus uniformly and will carry 20 marks in all.

B) Instructions for candidates

1. Candidates are required to attempt five questions in all, selecting two questions each from section A and B and compulsory question of section C.
2. Use of non-programmable scientific calculator is allowed.

SECTION A

OR models, solving the OR Model, Introduction to Linear Programming, two-variable LP model, Graphical LP Solution, Graphical sensitivity Analysis, Simplex Method, Big M Method, Two Phase Method, Special cases in Simplex Method Application.
Duality and Sensitivity Analysis: Definition of the Dual problem, Primal dual relationship,, Additional Simplex Algorithm for LP, Post optimal or Sensitivity Analysis.
Transportation Model, Transportation Algorithm, Assignment Model.

SECTION B

Networks Models: Definition, Minimum spanning trees algorithms, Shortest Route Problem, Maximum flow Model, Minimum Cost Capacitors flow problem, PERT & CPM.
Non-Linear Programming: Unconstrained Algorithms, Direct search Method, Gradient Method, Constrained Algorithm, Separable programming, Quadratic Programming, Geometric Programming

Text Book:

1. H.A. Taha, Operations Research: An Introduction, Pearson Education.

Reference Books:

1. Kanti Swarup, "Operations Research"
2. N.G. Nari, "Operations Research"
3. Heera and Gupta, "Operations Research"
4. S.D. Sharma, "Operations Research"
5. Goel and Mittal, "Operational Research"
6. V.K. Kapoor, "Problems and Solutions in Operations Research"

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MCA-216 E4: Data Mining and Data Warehousing

Maximum Marks: 50 **Maximum Times: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

A) Instructions for paper-setter

The question paper will consist of three sections A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and each question will carry 7.5 marks. Section C will consist of 10 short answer type questions of 2 marks each covering the entire syllabus uniformly and will carry 20 marks in all.

B) Instructions for candidates

1. Candidates are required to attempt five questions in all, selecting two questions each from section A and B and compulsory question of section C.
2. Use of non-programmable scientific calculator is allowed.

SECTION A

Data Warehousing and Business Analysis: Data warehousing Components –Building a Data warehouse – Mapping the Data Warehouse to a Multiprocessor Architecture – DBMS Schemas for Decision Support – Data Extraction, Clean up, and Transformation Tools –Metadata – reporting – Query tools and Applications – Online Analytical Processing (OLAP) – OLAP and Multidimensional Data Analysis.
Data Mining: Data Mining Functionalities – Data Pre-processing – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization and Concept Hierarchy Generation. Association Rule Mining: Efficient and Scalable Frequent Item set Mining Methods – Mining Various Kinds of Association Rules – Association Mining to Correlation Analysis – Constraint-Based Association Mining.

SECTION B

Classification and Prediction: Issues Regarding Classification and Prediction – Classification by Decision Tree Introduction – Bayesian Classification – Rule Based Classification – Classification by Back propagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods – Prediction – Accuracy and Error Measures – Evaluating the Accuracy of a Classifier or Predictor – Ensemble Methods – Model Section.
Cluster Analysis: Types of Data in Cluster Analysis – A Categorization of Major Clustering Methods – Partitioning Methods – Hierarchical methods – Density-Based Methods – Grid-Based Methods – Model-Based Clustering Methods – Clustering High Dimensional Data – Constraint-Based Cluster Analysis – Outlier Analysis.

Text Book:

1. Jiawei Han, Micheline Kamber and Jian Pei, Data Mining: Concepts and Techniques, Morgan Kaufmann.

Reference Books:

1. Alex Berson and Stephen J. Smith, Data Warehousing, Data Mining & OLAP, Tata McGraw – Hill Edition.
2. K.P. Soman, ShyamDiwakar and V. Ajay, Insight into Data mining: Theory and Practice, Prentice Hall of India.
3. G. K. Gupta, Introduction to Data Mining with Case Studies, Prentice Hall of India.
4. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, Introduction to Data Mining, Pearson Education.

L T P C
4 0 0 4

MCA-216 E5: ERP Systems and Processes

Maximum Marks: 50 **Maximum Times: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

A) Instructions for paper-setter

The question paper will consist of three sections A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and each question will carry 7.5 marks. Section C will consist of 10 short answer type questions of 2 marks each covering the entire syllabus uniformly and will carry 20 marks in all.

B) Instructions for candidates

1. Candidates are required to attempt five questions in all, selecting two questions each from section A and B and compulsory question of section C.
2. Use of non-programmable scientific calculator is allowed.

SECTION A

Introduction of ERP: Concept of Enterprise, ERP Overview, Integrated information system, The role of Enterprise, Business Modelling, Myths about ERP, Basic ERP Concepts, Intangible benefits of ERP, Justifying ERP investment, Risks of ERP, Benefits of ERP

ERP and related Technology: Business Intelligence, Data ware housing, Data mining, OLAP, Business Process Reengineering, SCM, CRM, ERP Security.

Modules of ERP: Basic modules of ERP Package, Human Resources Management, Financial Management, Inventory Management, Quality Management, Sales and Distribution

SECTION B

ERP for Industries: ERP for manufacturing Industry: ERP for petroleum, GAS companies, ERP for Automobile Industry, ERP for Pharmacy, ERP for FMCG, ERP for Mining industry; ERP for Service Industry: ERP for retail, ERP for healthcare, ERP for Educational Institution, ERP for Telecom, ERP for banks, ERP for Insurance companies.

ERP Implementation: ERP Lifecycle implementation, Implementation Methodologies, ERP package selection, Reasons for failure and reasons for success of ERP implementation.

Text Books:

1. Alexis Leon, ERP Demystified, Tata McGraw-Hill.
2. Rajesh Ray, Enterprise Resource Planning - Text and Cases, Tata McGraw-Hill.

Reference Books:

1. David L. Olson, Managerial Issues of Enterprise Resource Planning Systems, Tata McGraw Hill.
2. Ellen Monk and Bret Wagner, Concepts in Enterprise Resource Planning, Cengage Learning.
3. Ashim Raj Singla, Enterprise Resource Planning, Cengage Learning.

L T P C
4 0 0 4

MCA-221: Operating Systems

Maximum Marks: 50 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

A) Instructions for paper-setter

The question paper will consist of three sections A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and each question will carry 7.5 marks. Section C will consist of 10 short answer type questions of 2 marks each covering the entire syllabus uniformly and will carry 20 marks in all.

B) Instructions for candidates

1. Candidates are required to attempt five questions in all, selecting two questions each from section A and B and compulsory question of section C.
2. Use of non-programmable scientific calculator is allowed.

SECTION A

Introduction: Operating System as Resource Manager, types of operating system - batch processing, Multiprogramming, Multitasking, time sharing, parallel, distributed and PC operating system. Operating system structure, System services, system calls, system design and implementation.
Process management: Process Concept, process scheduling, operations on process, co-operating process, inter process communication. CPU scheduling Criteria, scheduling algorithms and algorithm evaluation.
Process synchronisation: critical section problem, semaphores, critical regions, monitors.
Deadlock: necessary conditions, deadlock prevention, deadlock avoidance, deadlock detection and recovery.
File System: file concept, access methods, directory structure, directory implementation, allocation methods, examples of MS-DOS and i-node structure of Unix file system.
Disk scheduling: FCFS, SSTF, LOOK, C-LOOK,SCAN, C-SCAN algorithms.

SECTION B

Memory Management: Local vs. physical addresses space, swapping, contiguous allocation, paging, segmentation, and segmentation with paging.
Virtual memory: demand paging, page replacement algorithms, thrashing.
Security: security problem, user authentication, program threats, system threats, securing systems and facilities, intrusion detection, cryptography, security-classifications.
Introduction to distributed systems: topology, network types, communication, design strategies.
Distributed file system: naming and transparency, remote file access.
Distributed co-ordination: event ordering, mutual exclusion, atomicity, concurrency control, deadlock handling.

Text Book:

1. Abraham Silberschatz, Peter B. Galvin, Gerg Gegne, Operating System Concepts, Wiley.

Reference Books:

1. Hansen, Per Brinch, "Operating System Principles", Prentice-Hall.
2. N. Haberman, "Introduction to Operating System Design", Galgotia Publication.
3. Hansen, Per Brich, "The Architecture of Concurrent Programs", PHI.
4. Shaw, "Logical Design of Operating System", PHI.
5. Infosys Campus Connect Foundation Program Volume:1 – 3, Education & Research Department, Infosys Technologies Ltd , Bangalore.

L T P C
4 0 0 4

MCA-222 : Data Communication and Computer Networks

Maximum Marks: 50 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

A) Instructions for paper-setter

The question paper will consist of three sections A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and each question will carry 7.5 marks. Section C will consist of 10 short answer type questions of 2 marks each covering the entire syllabus uniformly and will carry 20 marks in all.

B) Instructions for candidates

1. Candidates are required to attempt five questions in all, selecting two questions each from section A and B and compulsory question of section C.
2. Use of non-programmable scientific calculator is allowed.

SECTION A

Computer Networks: Uses Of Computer Networks, Network Software, Network Hardware, Network elements (LAN, WAN, host, workstation, server), Physical topologies (bus, star, ring, mesh, backbone), Reference Models-OSI – protocols on different layers, TCP/IP, Comparison, Network

Introduction to Data Communications: Concepts & Terminology, Analog and Digital Signals, Data Transmission : Data Signals & Transmission, Transmission Impairments, Analog and Digital Modulation, Asynchronous & Synchronous Transmissions, Electromagnetic spectrum, Multiplexing, Transmission Media (twisted pair, coaxial cable, fibre optics), Unguided media: (Radio waves, microwave, Infrared, Bluetooth, Wi-Fi, Wi-Max).

The Medium Access sub layer: The Channel Allocation Problem, Multiple Access Protocols (The Ethernet MAC sub layer Protocol, The Binary Exponential Back off Algorithm, Ethernet Performance, Switched Ethernet, Fast Ethernet, Gigabit Ethernet, IEEE 802.2: Logical Link Control)

Network Layer Design Issues, Routing Algorithms, Congestion Control Algorithms, Quality Of Service (Requirements, Techniques For Achieving Good Quality Of Services), Internetworking, IPv4, ICMP, IPv6, and ICMPv6.

SECTION B

The Transport Service (Services Provided To The Upper Layers And Transport Service Primitives), Elements Of Transport Protocols, The Internet Transport Protocols: UDP(Introduction To UDP, Remote Procedure Call), TCP(Introduction To TCP, The TCP Service Model, The TCP Protocol, The TCP Segment Header, TCP Connection Establishment, TCP Connection Release, Modelling TCP Connection Management, TCP Transmission Policy And TCP Congestion Control)

The Application Layer: Domain Name System, Domain Name Space, DNS in the Internet, Electronic Mail, WWW (Architectural overview), HTTP, introduction to SNMP, Multimedia (introduction to audio, voice over IP, introduction to video, video on demand), Introduction to cryptography, substitution ciphers, transposition ciphers, one-time pads, two fundamental cryptographic principles, digital signatures(symmetric-key signatures, public key-signatures, message digests and the birthday attack), management of Public Keys (certificates).

Cloud Computing Basics: Overview, Applications, Intranet and the Cloud, First Movers on the cloud, the need for Cloud Computing, Benefits of cloud Computing, Limitations of Cloud Computing

Text Book:

1. Andrew S. Tanenbaum, Computer Networks, Pearson Education.

Reference Books:

1. Data Communications & Networking by Forouzan, Tata McGraw Hills.
2. Cloud Computing a Practical approach, Anthony T Velte, Toby J Velte, Robert Elsenpeter, Tata McGraw-HILL,

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MCA-223: Web Programming using ASP.NET

Maximum Marks: 50 **Maximum Times: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

A) Instructions for paper-setter

The question paper will consist of three sections A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and each question will carry 7.5 marks. Section C will consist of 10 short answer type questions of 2 marks each covering the entire syllabus uniformly and will carry 20 marks in all.

B) Instructions for candidates

1. Candidates are required to attempt five questions in all, selecting two questions each from section A and B and compulsory question of section C.
2. Use of non-programmable scientific calculator is allowed.

SECTION A

Introduction to Microsoft ASP.NET, .Net Framework, An overview of .NET including the Common Language Interface, the Common Type System, the Common Language Runtime, and .NET Framework and class libraries. The ASP.NET execution model,
ASP.NET Web Application User Interface: Creating an ASP.NET Web application user interface, Implementing event handlers by using code-behind files, Create and use user controls, Server-side controls, events.
Managing State: The Various Means to Manage State, Request object, Application object, Cache object, Session object, Server-side state management, using session for server-side and client-side state management.
XML Web Services: Need of XML Web services, Understanding the Web Service Model, Creating an ASP.NET Web Service, Creating & Consuming Web Services with Visual Studio .NET.
Creating a User Interface: Using Controls, Validating Data, Navigating Between Forms.
Implementing Master Pages and User Controls: Creating Master Pages, Adding User Controls to an ASP.NET Web Form.

SECTION B

Storing and Retrieving Data with ADO.NET: ADO.NET Overview, Connecting to Data, Executing SQL with Commands, Accessing Data with ADO.NET, Fast Data Access with Data Readers, Data Set Basics, Filling Data Sets with Data Adapters, Using Data Sets on Web Forms, Processing Transactions
Data Binding: Bind Data to the UI, Transform and Filter Data.
Security: Authenticating and Authorizing Users, Using Windows Authentication, Using Forms Authentication.
Ajax: Introduction to AJAX, AJAX Toolkit, Partial page update using AJAX, Extending an ASP.NET Web Forms Application by Using the Ajax Control Toolkit.
Reporting: Introduction to various reporting tools in .net.
Configuring, Deploying and Debugging Web Application: Configuration Files, Configuration Settings, Debugging Applications, Deploying an ASP.NET Web Application.

Text Book:

1. ASP.NET: The Complete Reference, Matthew MacDonald, McGraw-Hill/ Osborne.

References Books:

1. Jesse Liberty, Dan Hurwitz: Programming ASP.NET, OReilly.
2. Stephen Walther: ASP.NET 3.5 Unleashed, SAMS.
3. Infosys Campus Connect Foundation Program Volume:1 – 3, Education & Research Department, Infosys Technologies Ltd , Bangalore.
4. Liberty, Programming ASP.NET 3.5, Shroff/O'Reilly.

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MCA-224: Business Intelligence

Maximum Marks: 50 **Maximum Times: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

A) Instructions for paper-setter

The question paper will consist of three sections A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and each question will carry 7.5 marks. Section C will consist of 10 short answer type questions of 2 marks each covering the entire syllabus uniformly and will carry 20 marks in all.

B) Instructions for candidates

1. Candidates are required to attempt five questions in all, selecting two questions each from section A and B and compulsory question of section C.
2. Use of non-programmable scientific calculator is allowed.

SECTION A

Introduction to Business Intelligence, Digital data and its types – structured, semi-structured and unstructured, Introduction to Online Transaction Processing (OLTP), Online Analytical Processing (OLAP), Different OLAP architectures: MOLAP, ROLAP, HOLAP, Comparison of OLTP and OLAP. BI definitions and need, BI Component Framework, Business Applications of BI.

Data Warehouse: Definition, reasons and goals of a data warehouse. What constitutes a data warehouse. Introduction to Extraction-Transformation-Loading (ETL), Data integration, needs and advantages of using data integration, introduction to common data integration approaches, Introduction to Data Quality, Data Profiling concepts and applications.

SECTION B

Multi-Dimensional Data Modelling, Introduction to data and dimension modelling, Multi-dimensional data model, ER Modelling vs. Multi-dimensional modelling, Concepts of dimensions, facts, cubes, attribute, hierarchies, Typical Dimensional models - star and snowflake schema

Basics of Enterprise Reporting: Features of good reporting, Common report layout types, Report delivery formats, Report standardization and presentation practices, Brief introduction to Balanced scorecard, and Enterprise dashboards, Balanced scorecards vs. Enterprise dashboards.

Text Book:

1. R.N. Prasad, Seema Acharya, Fundamentals of Business Analytics, Wiley India Pvt. Ltd.

Reference Books:

1. Mike Biere, Business Intelligence for the Enterprise, Prentice Hall Professional.
2. David Taniar, Progressive methods in Data Warehousing and Business Intelligence: Concepts and competitive analytics, Idea Group Inc.

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MCA-225: Programming Lab - IV (ASP.NET and Minor Project)

Maximum Marks: 100* **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Practical units to be conducted: 55-65**

This laboratory course will mainly comprise of exercises on what is learnt under the paper MCA-223: Web Programming using ASP.NET.

For the minor projects in a team of maximum size two will be allowed and the team will submit joint project report. The student team members must highlight their role and/or contributions in the joint project report.

*The splitting of marks is as under

- Maximum Marks for Continuous Assessment : 60
- Maximum Marks for University Examination : 40

CONTINUOUS ASSESSMENT (PRACTICAL LAB)

1.	Two tests will be conducted during the semester. Both the tests will be counted for assessment.	:	60% of the total marks allotted for continuous assessment.
2.	Lab Assignments	:	30% of the total marks allotted for continuous assessment.
3.	Attendance	:	10% of the total marks allotted for continuous assessment.

For University Examination the evaluator will distribute the marks for the minor project work according to the following guidelines:

Demonstration of Project	50% of the marks allotted for University Examination
Presentation and Viva Voce	25% of the marks allotted for University Examination
Project Report Document	15% of the marks allotted for University Examination
Source Code	10% of the marks allotted for University Examination.

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MCA-226 E1: Object Oriented Modelling and Design using UML

Maximum Marks: 50 **Maximum Times: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

A) Instructions for paper-setter

The question paper will consist of three sections A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and each question will carry 7.5 marks. Section C will consist of 10 short answer type questions of 2 marks each covering the entire syllabus uniformly and will carry 20 marks in all.

B) Instructions for candidates

1. Candidates are required to attempt five questions in all, selecting two questions each from section A and B and compulsory question of section C.
2. Use of non-programmable scientific calculator is allowed.

SECTION A

Introduction to Object: Object Orientation, Development, Modelling, Object Modelling technique.
Object modelling: Objects and classes, Links and Association, Generalization and inheritance, Grouping constructs, Aggregation, Abstract Classes, Generalization as extension and restriction, Multiple inheritance, Meta data, Candidate keys, Constraints.
Dynamic modelling: Events and states, Nesting, Concurrency, Advanced Dynamic Modelling concepts
Functional modelling: Functional Models, Data flow diagrams, Specifying operations, Constraints, Relation of Functional model to Object and Dynamic Models.
Design Methodology, Analysis: Object modelling, dynamic modelling, Functional modelling, Adding operations, Iterating Analysis.
System design: Subsystems Concurrency, Allocation to processor and tasks, Management of data stores, Handling Global Resources, Handling boundary Conditions, Setting Trade-off priorities.
Object Design: Overview, Combining the three models, Designing Algorithms, Design Optimization, Implementation of Control, Adjustment of Inheritance, Design of Associations, Object Representation, Physical Packaging, Documenting design decisions

SECTION B

UML: Basics, Emergence of UML, Types of Diagrams.
Use Case: Actors, Use Case Diagram, Relationship between Use Cases.
Classes: Class Diagram, Classes, Objects, Attributes, Operations, Methods, Interfaces, Constraints, Generalization, Specialization, Association, Aggregation.
Behavioural Diagrams: Activity Diagram, Collaboration Diagram, Sequence Diagram, State chart Diagram.
Implementation Diagrams: Component Diagram, Deployment Diagram
Comparison of methodologies: Structured Analysis/Structured Design, Jackson Structured Development.
Implementation: Using Programming Language, Database System, outside Computer.
Programming Style: Object Oriented Style, Reusability, Extensibility, Robustness, Programming-in-the-large.

Text Books:

1. James R. Rumbaugh, Object Oriented Modeling and Design, Pearson Education.
2. Bernd Oestereich, Developing Software with UML, Pearson Education.

Reference Books:

1. Grady Booch, Object Oriented Analysis and Design with Applications, Addison-Wesley.
2. Pierre-Alain Muller, “Instant UML”, Shroff Publishers
3. Booch, Rumbaugh, Jacobson, “The Unified Modeling Language User Guide”, Addison Wesley
4. Booch, Rumbaugh, Jacobson, “The Unified Modeling Language Reference Manual”, Addison Wesley
5. Rebecca Wirfs-Brock, “Design Object Oriented Software”, PHI

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MCA-226: E2 Embedded Systems

Maximum Marks: 50 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

A) Instructions for paper-setter

The question paper will consist of three sections A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and each question will carry 7.5 marks. Section C will consist of 10 short answer type questions of 2 marks each covering the entire syllabus uniformly and will carry 20 marks in all.

B) Instructions for candidates

1. Candidates are required to attempt five questions in all, selecting two questions each from section A and B and compulsory question of section C.
2. Use of non-programmable scientific calculator is allowed.

SECTION A

Micro Controllers: Introduction and Embedded processors, overview of 8051 family. 8051 Assembly language programming: Introduction, Assembling and running 8051 program. The program Counter and ROM space in 8051, Data types and directives, 8051 flag bits and PSW register, register banks and stack.

Jump, loop and Call Instruction, Call instructions, time delay generation and calculation. I/O port programming: pin description of 8051, I/O programming: Bit manipulation: Addressing Modes: Immediate and register addressing, accessing memory using various addressing models.

SECTION B

Arithmetic Instructions and programs unsigned addition, Subtraction, multiplication and Division, signed number concepts and arithmetic operations, Logic Instructions and programs: Logic and compare instructions, rotate and sharp instructions BCD and ASCIII Application program.

Single Instructions and programming: Single bit instruction programming, Single-bit operations with CY, reading input pins vs. port batch. Timer/Counter in 8051: programming 8051 timers, Counter programming: 8051 interrupts, timer interrupts, external hardware interrupts, interrupt priority in 8051, 8051 interfacing to keyboard and with DAC.

Text Book:

1. M.A. Mazidi, J.G. Mazidi and R.D. Mckinlay, The 8051 Microcontroller and Embedded Systems, Pearson Education.

Reference Books:

1. Lyla B. Das, Embedded Systems: An Integrated Approach, Pearson Education.
2. Frank Vahid and Tony Givargis, Embedded System Design: A Unified Hardware / Software Introduction, Wiley Publications.

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MCA-226 E3: Compiler Design

Maximum Marks: 50 **Maximum Times: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

A) Instructions for paper-setter

The question paper will consist of three sections A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and each question will carry 7.5 marks. Section C will consist of 10 short answer type questions of 2 marks each covering the entire syllabus uniformly and will carry 20 marks in all.

B) Instructions for candidates

1. Candidates are required to attempt five questions in all, selecting two questions each from section A and B and compulsory question of section C.
2. Use of non-programmable scientific calculator is allowed.

SECTION A

Introduction to Compiling: Compilers v/s Interpreters, Phases of a Compiler, Cross-compiler, Compiler-Construction tools. One Pass-Compiler, Syntax definition, Parsing: Predictive Paring, Design of a Predictive Parser, Symbol tables.
Lexical Analysis: Rote of Lexical Analyser, Specification and Recognition of Tokens, finite Automata, From Regular expression to a NFA.
Syntax Directed Translation: Syntax Directed definitions, Syntax directed translation scheme: Quadruples, Triples, Indirect triples, Constructing syntax trees, Bottom-up evaluation of S-attributed definitions, L: attributed definitions.

SECTION B

Syntax Analysis: Rate of parsing, CFG, Top-down parsing, Bottom up, Parse tree, Operator Precedence Parsing, LR parsers, Using ambiguous grammar. Run time Environment - Storage organisation, storage allocation strategies.
Code Generation: Issue in design of code generator, Basic Block and flow graphs, Next-use Information, DAG representation of basic blocks.
Code Optimization: Peep optimization, Principle source of optimization, Optimization of basic blocks, Introduction of Global DFA.

Text Book:

1. A.V. Aho, Ravi Sethi, J.D. Ullman, Compilers: Principles, Techniques and Tools, Addison-Wesley Publishing Co.

Reference Books:

1. Compiler Design In C By Allen.I. Holub, Pearson Publications
2. Elements of Compiler Design by M. Joseph, Laxmi Publications
3. Randy Allen, Ken Kennedy, “Optimizing Compilers for Modern Architectures: A Dependence-based Approach”, Morgan Kaufmann Publishers.
4. Steven S. Muchnick, “Advanced Compiler Design and Implementation, Morgan Kaufmann Publishers – Elsevier Science, India.
5. Keith D Cooper and Linda Torczon, “Engineering a Compiler”, Morgan Kaufmann Publishers Elsevier Science.
6. Charles N. Fischer, Richard. J. LeBlanc, “Crafting a Compiler with C”, Pearson Education.

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MCA-226 E4: Software Testing and Quality Assurance

Maximum Marks: 50 **Maximum Times: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

A) Instructions for paper-setter

The question paper will consist of three sections A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and each question will carry 7.5 marks. Section C will consist of 10 short answer type questions of 2 marks each covering the entire syllabus uniformly and will carry 20 marks in all.

B) Instructions for candidates

1. Candidates are required to attempt five questions in all, selecting two questions each from section A and B and compulsory question of section C.
2. Use of non-programmable scientific calculator is allowed.

SECTION A

Testing Principles ,Need of testing, Basic concepts – errors, faults, defects, failures, test bed, unit testing, integration testing system, system testing, regression testing, alpha, beta and acceptance testing , functional testing, performance testing, recovery testing, white box testing, black box testing, verification and validation.
Test Management, Testing Life Cycle – Roles and activities, Test Planning – forming a test team, develop test plan review Test Cases design strategies black box approach: random testing, equivalence class partitioning and boundary value analysis. white box approach: test adequacy criteria, coverage and control flow graphs, paths, loop testing, mutation testing.
Test execution: build test data, life cycle of defect, defect tracking, defect detection stages, defect detection stages, defect types, defect severity, defect analysis and prevention.
Software Metrics Scope of software metrics, Classifying software measures, Measurement basics – representational theory, scales, meaningfulness, What to measure – GOM technique, Control flow structure, product quality metrics – MTTF, defect density, customer problems, customer satisfaction, function point, Metrics for software maintenance, In-process quality metrics.

SECTION B

Quality Assurance : Quality concepts – quality, quality control, quality assurance, cost of quality Software quality assurance – SQA activities, software reviews, inspections, audits, Software reviews, inspections, audits, Software reliability Quality Attributes: correctness, reliability, usability, integrity, portability, maintainability, interoperability. Software reliability models
Quality Standards: Basic concept of – ISO 9000 & 9001, CMM, six sigma.
Development of CMM, Following KPAs : requirements management (RM), software project tracking and oversight (SPTO), software configuration management (SCM), organization process definition (OPD), software product engineering (SPE), peer reviews (PR), quantitative process management (QPM), defect prevention (DP), process change management

Text Books:

1. Ilen Burnstein, Practical Software Testing, Springer Publication.
2. William E. Perry, Effective Methods for Software Testing, Wiley Publication.

References Books:

1. Stephen H. Kan “Metrics and Models in Software Quality Engineering” Pearson Education.
2. Pressman, “Software Engineering “, TATA McGraw Hill.
3. Pankaj Jalote “CMM Practice” Pearson Education.

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MCA-226 E5: Graph Theory

Maximum Marks: 50 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

A) Instructions for paper-setter

The question paper will consist of three sections A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and each question will carry 7.5 marks. Section C will consist of 10 short answer type questions of 2 marks each covering the entire syllabus uniformly and will carry 20 marks in all.

B) Instructions for candidates

1. Candidates are required to attempt five questions in all, selecting two questions each from section A and B and compulsory question of section C.
2. Use of non-programmable scientific calculator is allowed.

SECTION A

Graphs: Introduction, Applications, finite and infinite graphs, incidence and degree, Isomorphism, Sub graphs, Walks, paths and circuits, connected Graphs, Disconnected graphs and components. Euler graphics, details of Euler graphs, travelling salesman problem.
Trees : Introduction, properties, pendent vertices in a tree, distance and centres in a tree, rooted and binary trees, spanning trees, fundamentals, circuits, spanning trees in weighed graph, Cut Sets : Introduction, fundamental circuits and cut sets, connectivity and separability, network flows.

SECTION B

Planar graphs: Introduction, Kuratowrski's two graphs, detection of planarity, geometric dual, combinational dual. Matrix Representations: Incidence matrix, adjacency matrix.
Chromatic number, Chromatic, polynomial, the four colour problem, Directed graphs : Introduction, types diagraphs and binary relation, directed paths and connectedness, Euler diagraphs, trees with directed edges : Enumeration of graphs : types, Counting labelled trees.

Text Book:

1. Narsingh Deo, Graph Theory with Applications to Engineering and Computer Science, PHI.

Reference Books:

1. West D. B.: Introduction to graph theory, Pearson Education Asia.
2. Wilson R. J.: Introduction to graph theory, Pearson Education, Asia.