THIRD YEAR: INFORMATION TECHNOLOGY

SCHEME OF INSTRUCTION AND EXAMINATION

(RC 2016-17)

SEMESTER –V

Subject Code	Name of the Subject	Scheme of Instruction Hrs/Week			Scheme of Examination						
		L	T	P#	Th Duration (Hrs)	Marks					
						Th	S	TW	P	O	Total
IT 5.1	Introduction to Data Communication	3	1	--	3	100	25	--	--	--	**125**
IT 5.2	Java Programming	3	1	2	3	100	25	--	25	--	**150**
IT 5.3	Statistical Models for Information Science	3	--	--	3	100	25	--	--	--	**125**
IT 5.4	Intelligent Agents	3	1	2	3	100	25	25	--	--	**150**
IT 5.5	Operating Systems	3	1	2	3	100	25	--	--	25	**150**
IT 5.6	Database Management Systems	3	1	2	3	100	25	--	25	--	**150**
TOTAL		**18**	**05**	**08**	**--**	**600**	**150**	**25**	**50**	**25**	**850**

A candidate is considered to have successfully fulfilled the requirement of a semester, provided he/ she submits to the department a certified journal reporting the experiments conducted during the semester.

THIRD YEAR: INFORMATION TECHNOLOGY

SCHEME OF INSTRUCTION AND EXAMINATION

(RC 2016-17)

SEMESTER –VI

Subject Code	Name of the Subject	Scheme of Instruction Hrs/Week			Scheme of Examination						
		L	T	P#	Th Duration (Hrs)	Marks					
						Th	S	TW	P	O	Total
IT 6.1	Data Mining	3	1	2	3	100	25	--	--	--	**125**
IT 6.2	Theory of Computation	3	1	--	3	100	25	25	--	--	**150**
IT 6.3	Computer Networks	3	1	2	3	100	25	--	--	25	**150**
IT 6.4	Computer Graphics	3	1	2	3	100	25	--	25	--	**150**
IT 6.5	Web Technology	3	1	2	3	100	25	--	25	--	**150**
IT 6.6	Software Testing and Quality Assurance	3	1	--	3	100	25	--	--	--	**125**
TOTAL		**18**	**06**	**08**	**--**	**600**	**150**	**25**	**50**	**25**	**850**

A candidate is considered to have successfully fulfilled the requirement of a semester, provided he/ she submits to the department a certified journal reporting the experiments conducted during the semester.

APPENDIX

IT 5.1 INTRODUCTION TO DATA COMMUNICATION

Subject Code	Name of the Subject	Scheme of Instruction Hrs/Week			Scheme of Examination						
		L	T	P	Th Duration (Hrs)	Marks					
						Th	S	TW	P	O	Total
IT 5.1	Introduction to Data Communication	3	1	-	3 hrs	100	25	-	-	-	**125**

Course Objectives:

1. To learn and understand fundamentals of data communications.
2. To understand the conceptual and analytical differences between analog and digitalcommunication.
3. To understand a conceptual foundation for the study of data communications using theopen system interconnection (OSI) layered architecture model.

Course Outcomes:

The student after undergoing this course will be able to:

1. Understand the basic concepts of data communication components used at various transmission speeds.
2. Explain the different network topologies and their advantages and disadvantages.
3. Explain how to build a network model and why.
4. Understand how data could be encoded to digital bits.
5. Identify different types of Transmission Mediums.
6. Apply and differentiate between different error detection and correction methods.

UNIT - 1 (10 Hours)

Introduction to Data Communication, Components of data communication, Networks, Protocols and Standards. Network Models: Layered Task, The OSI Reference Model, TCP/IP protocol Suite, Addressing. Basic Concepts of Data Communication: Line Configuration - Point-to-Point, Multipoint. Topology: Mesh, Star, Tree, Bus and Ring and Hybrid Technologies. Transmission Modes: Simplex, half Duplex and Full-Duplex. Categories of Networks – LAN, MAN and WAN, Inter networks. Transmission Media:
Guided Media – Twisted–pair cable, Coaxial cable and Optical fibre. Unguided Media – Wireless Communication, Terrestrial microwave, satellite communication and cellular telephony.Transmission Impairments: Shannon's Theorem, Comparison of different Media, Distortion, attenuation and noise.

UNIT - 2 (14 Hours)

Data Encoding: Analog Data, Digital Data, Analog Signal and Digital Signals. Spread Spectrum: Direct Sequence and Frequency Hopping, CDMA. Data Communication Interface: The Physical Layer: Asynchronous and Synchronous Transmission, Interfacing – V.24/EIA 232-F, ISDN Physical Interface.

UNIT - 3 (14 Hours)

Data Link Layer: Flow Control – Stop and Wait Flow Control, Sliding Window , Error Detection: Types of errors, Detection Methods, Parity Check, Cyclic Redundancy Check using modulo-2, Polynomials (CRC-16, CRC-32), Error Control – Stop and Wait ARQ, Go-Back-N ARQ and Selective-Reject ARQ. Data Link Protocols: Asynchronous Protocols , Synchronous Protocols, Character Oriented Protocols – BSC , Bit-Oriented Protocols- HDLC, Configuration, Types of frames and Modes of Communication, operation. Packet Switching, Message Switching and circuit switching

UNIT - 4 (10 Hours)

Local Area Networks: Topologies (Bus, Ring, Star, Tree) and transmission media. LAN Protocol Architecture : LLC(Logical Link Control), Medium Access Control (MAC).
Introduction to Networking and Internetworking devices: Repeaters, Routers, Gateways, Bridges: Functions, Protocol Architecture and Spanning Tree Approach.Wireless WAN's: Cellular Telephony, satellite Networks. High Speed LANs: Emergence, Ethernet, Token Ring, Fiber channel.

Recommended Readings:

1. B.A. Forouzan; Data Communication and Networking; Tata McGraw Hill, 4/e
2. Andrew S. Tanenbaum ; Computer Networks; Pearson Education
3. William Stallings; Data and Computer Communication; 7/e.
4. J.S Katre; Computer Network Technology; Tech-Max Publications; 2010.
5. Fred Halsall ; Data Communications, Computer Networks and Open Systems; Addison Wesley; 3/e.
6. D.P.Nagpal; Data Communication and Networking; S. Chand;1/e

IT 5.2 Java Programming

Subject Code	Name of the Subject	Scheme of Instruction Hrs/Week			Scheme of Examination						
		L	T	P	Th Duration (Hrs)	Marks					
						Th	S	TW	P	O	Total
IT5.2	Java Programming	3	1	2	3	100	25	--	25	--	**150**

Course Objectives:

The subject aims to provide the student with:

1. An ability to plan, design, execute and document sophisticated object oriented programs to handle different computing problems using "Java".
2. An understanding of how things work in the web world.
3. An understanding of the client-side implementation of web applications.
4. An ability to understand the generic principles of object oriented programming using "Java".
5. An understanding the use of Event driven Graphics programming in "Java".
6. Understands how data is accessed from the file.

Course Outcomes:

The student after undergoing this course will be able to:

1. Design algorithms using principles of object oriented programming
2. Demonstrate the use-cases, pseudo code, and an incremental coding plan for a given Problem specification.
3. Explain the operations of common data structures and algorithms.
4. Design a "Java" program to solve a given problem specification.
5. Illustrate stream I/O, Graphics programming and exception handling.
6. Design robust web based applications satisfying user requirements.

UNIT – 1 (12 Hours)

Java Evolution, Java History , Java Features: Overview of Java Language, Constants, Variables and Data Types, Operators and Expressions, Decision making, branching and looping. Classes, Objects and Methods, Arrays, String and Vectors.

UNIT –2 (12 Hours)

Interfaces, Packages, Collections, Multithreading, Managing errors and Exception.

UNIT –3 (12 Hours)

Graphics Programming,Java AWT, Event Handling, Swings, JDBC .

UNIT –4 (12 Hours)

Networking, Java Beans , Java Enterprise Applications: Java Servlets, Java Server Pages, Introduction to struts Framework, Security in java.

Recommended Readings:

1. E. Balagurusamy; Programming with Java A Primer; Tata McGrawHill Companies 5th edition.
2. H. M. Deitel and P. J. Deitel;Advanced Java 2 Platform HOW TO PROGRAM;Prentice Hall 9th edition.
3. Hervert Schildt; The complete reference JAVA2; TMH
4. John P. Flynt ;Java Programming; Thomson 2nd.
5. Ken Arnold ;Java Programming Language; Pearson.
6. Cay Horstmann; Big Java; 2nd edition; Wiley India Edition.
7. Sachin Malhotra, Saurabh Chaudhary; Programing in Java; Oxford University Press, 2010.

List of Experiments:

(At least 8 experiments should be conducted from the list of experiments.)

1. Programs using constructor and destructor.
2. Creation of classes and use of different types of functions.
3. Count the number of objects created for a class using static member function.
4. Write programs on interfaces.
5. Write programs on packages.
6. Write program using java collections.
7. Write programs using function overloading.
8. Programs using inheritance.
9. Programs using IO streams.
10. Programs using files.
11. Write a program using exception handling mechanism.
12. Programs using AWT.
13. Programs on swing.
14. Programs using JDBC.
15. Program to design scientific calculator using event-driven programming paradigm of Java.
16. Develop multi-threaded echo server and a corresponding GUI client in Java.
17. Write program to make use of Java beans.

IT 5.3. Statistical Models for Information Science

Subject Code	Name of the Subject	Scheme of Instruction Hrs/Week			Scheme of Examination						
					Th	Marks					
		L	T	P	Duration (Hrs)	Th	S	TW	P	O	Total
IT 5.3	Statistical Models for Information Science	3	-	-	3	100	25	--	--	---	**125**

Course Objective:

1. To understand about data and its statistics
2. To study behavior of information in terms of its dispersion, skewness etc.
3. Identify the rules of sampling and its effect.
4. To know Hypothesis and its usage
5. To understand various test and regression analysis.

Course Outcomes:

The student after undergoing this course will be able to:

1. Analyze Sampling System
2. Evaluate Hypothesis Testing for various Conditions
3. Analyze Chi- Square Tests
4. Perform the analysis of Variance.
5. Implement Linear Regression.

UNIT 1 (12 Hours)

Introduction to Data collection, Experiments and Surveys, Collection of Primary Data, Collection of Secondary Data, Selection of Appropriate Method for Data Collection, Case Study Method.

Data Preparation Process, Problems in Preparation Process, Missing Values and Outliers, Types of Analysis, Statistics in Research.

Descriptive Statistics: Measures of Central Tendency, Measures of Dispersion, Measures of Skewness, Kurtosis, Measures of Relationship, Association in Case of Attributes, Other Measures.

UNIT 2 (12 Hours)

Sampling and Statistical Inference: Parameter and Statistics, Sampling and Non-sampling Errors, Sampling Distribution, Degree of Freedom, Standard Error, Central Limit Theorem, Finite Population Correction, Statistical Interference.

Hypothesis. Basic Concepts Concerning Testing of Hypothesis, Testing the Hypothesis, Testing Statistic and Critical Region, Critical Value and Decision Rule, Procedure for Hypothesis Testing, Hypothesis Testing for Mean, Hypothesis Testing for Proportion, Hypothesis Testing for Variance, Hypothesis Testing for Difference of Two Mean, Hypothesis Testing for Difference of Two Proportions, Hypothesis Testing for Difference

of Two Variances, P-Value Approach, Power of the Test, Limitations of the Tests of Hypotheses.

UNIT 3 (12 Hours)

Chi-Square Tests: Test of Difference of more than Two Proportions, Test of Independence of Attributes – Alternative Formula, Yates Correction. Test of Goodness of Fit – Goodness of Fit Test for Normal Distribution, Caution in Using Chi Square Tests
The Anova Technique, The Basic Principle of ANOVA, One Way ANOVA – Analysis of Variance Table, Short-cut Method for one-way ANOVA; Two Way ANOVA – One Observation per cell, Latin-square Design.

UNIT 4 (12 Hours)

Dependent and Independent Variables, Simple Linear Regression Model –Least Square Estimation, Coefficient of Determination, Standard Error, Assumptions or Conditions Required; Multiple Linear Regression Model – Least Squares Estimation, R^2 and Adjusted R^2 Coefficients, Standard Error, Assumptions; Problem of Multicolinearity – Variable Elimination.
The Mathematical Basis, Important Methods of Factor Analysis – Centroid Method, Principle Components Method, Maximum Likelihood Method; Rotation in Factor Analysis, R-Type and Q-Type Factor Analysis, Merits and Demerits of Factor Analysis.

Recommended Readings:

1. C. R. Kothari, Gaurav Garg; Research Methodology – Methods and Techniques; New Age International (P) Limited, Publishers; Third Edition.

2. Ghosh B.N., Scientific Methods and Social Research; Sterling Publishers Pvt. Ltd. New Delhi; 1982.

3. Freedman P. The Principles of Scientific Research; Pergamon Press, New York, 1960; Second Edition.

4. John, Peter W.M.; Statistical Design and Analysis of Experiments; The MacMillan Co. New York, 1971

5. Yamane, T.; Statistics: An Introductory Analysis; Harper and Row, New York 1973; Third Edition.

IT 5.4 INTELLIGENT AGENTS

Subject Code	Name of the Subject	Scheme of Instruction Hrs/Week			Scheme of Examination						
		L	T	P	Th Duration (Hrs)	Marks					
						Th	S	TW	P	O	Total
IT 5.4	Intelligent Agents	3	1	2	3	100	25	25	-	-	**150**

Course Objectives:

1. To understand the concepts of Artificial intelligence.
2. Learn and understand the knowledge representation techniques for knowledge base.
3. Learn the method of solving problems using artificial intelligence.
4. To learn and understand the fundamentals of Neural Network.

Course Outcomes:

At the end of the course the student will be able to:

1. Analyze a problem which requires intelligent techniques to solve.
2. Apply different forms of Learning.
3. Implement the knowledge representation and manipulation techniques.
4. Demonstrate the application of Neural Networks to perform intelligent tasks.

UNIT 1 (12 Hours)

Intelligent agents: environment, properties and structure. Problem solving agents. Searching for solutions: Breadth-first search, Depth-first search, uniform-cost search, Depth-limited and Iterative deepening depth-first search. Heuristic search strategies: Best-first search, memory bounded heuristic search, Hill climbing search and simulated annealing search.Constraint Satisfaction problems, Game Playing, the minimax algorithm, alpha-beta pruning, imperfect-real time decisions, games involving an element of chance.

UNIT - 2 (12 Hours)

Propositional logic: Reasoning in propositional logic. First order predicate logic, Inference in First-order predicate logic, Unification algorithm, forward chaining, backward chaining, Conjunctive Normal Form for predicate logic, theorem proving by resolution principle. Semantic networks, Reasoning with default information. Truth maintenance system,

UNIT - 3 (12 Hours)

Planning: Components of Planning system, planning problem, planning with state space search, Partial order planning. Acting under uncertainty, conditional probability, the axioms of probability, full-joint distribution, independence, Bayes' rule. and its use.. Bayesian (belief) networks. Introduction to Natural language Processing: Syntactic analysis, augmented grammars, Semantic interpretation,

UNIT - 4 (12 Hours)

Expert Systems: Structure of Expert Systems, The Human element in Expert System, How Expert Systems Work, Benefits of Expert Systems, Types of Expert Systems.Learning: Forms of learning, Rote learning, Reinforcement Learning, Learning from observation,Inductive learning, learning decision trees. Neural Network Fundamentals, Neural Network Architecture, Training the network, Learning Algorithms, Back propagation, Benefits of Neural Networks.

Recommended Readings:

1. S. Russell and P. Norvig; Artificial Intelligence: A Modern Approach; Prentice Hall; 3/e, 2009
2. Elaine Rich, Kevin Knight, Shivashankar B Nair; Artificial Intelligence; TMH,3/e, 2009.
3. B. Yegnanarayana; Introduction to Artificial Neural Networks; (PHI)
4. Efraim Turban,Jay E. Aronson; Decision support & Intelligent systems; PHI,7/e
5. Patrick H. Winston ; Artificial Intelligent; Addison-Wesley, 3/e

List of Experiments in Intelligent Agents:

(At least 8 experiments should be conducted from the list of experiments. A certified journal reporting the experiments conducted should be submitted at the end of the term)

1. To implement Breadth First Search
2. To implement Depth First Search
3. To implement Tower Of Hanoi problem
4. To implement Tic-Tac-Toe problem
5. To implement Missionaries and Cannibals problem
6. To implement Water Jug Problem
7. To implement 8-puzzle problem
8. Case Study: Neural Networks
9. Case Study: Expert System
10. Case Study: Natural Language Processing

IT 5.5OPERATING SYSTEMS

Subject Code	Name of the Subject	Scheme of Instruction Hrs/Week			Scheme of Examination						
		L	T	P	Th Duration (Hrs)	Marks					
						Th	S	TW	P	O	Total
IT5.5	Operating Systems	3	1	2	3	100	25	--		25	**150**

Course Objectives:

The subject aims to provide the student with:

1. An understanding of how Operating system works
2. An understanding of the process and threads in operating system
3. An ability to understand the scheduling algorithm and deadlock management
4. An ability to understand the memory management I/O systems.
5. Learn features of different operating system.

Course Outcomes:

The student after undergoing this course will be able to:

1. Explain the fundamental concepts of operating systems, its evolution and various architectures.
2. Explain terminologies associated with operating system concepts such as processes, threads, concurrency control, synchronization, CPU scheduling and semaphores.
3. Implement algorithms for different scheduling algorithm.
4. Demonstrate and Implement algorithms for different memory management
5. Demonstrate use of different operating systems and commands

UNIT – 1 (12 Hours)

Introduction to Operating Systems: Overview and working of different operating systems. Functions of operating systems, Design approaches: layered, kernel based and virtual machine approach. Process management Concepts, Threads, CPU Scheduling, Process Synchronization, DeadlocksConcept, Deadlock prevention, Deadlock avoidance, Deadlock detection and recovery.

UNIT – 2 (12 Hours)

Memory management: Concept, Swapping, Contiguous memory allocation, Paging, Segmentation, Segmentation with paging. Virtual memory: Concept, Demand paging, Page replacement, Thrashing, File System: File system interface and File system implementation

UNIT – 3 (12 Hours)

I/O Systems: Overview of I/O Systems, Secondary storage structure, Tertiary storage structure. Multiprocessor Operating Systems - Introduction, structure of multiprocessor operating system, operatingsystem design issues, processor scheduling, reliability and fault tolerance. Protection and security issues

UNIT – 4 (12 Hours)

Concurrency Control: theoretical aspect, distributed database system, concurrency control algorithms. Case studies of operating systems:- Windows and Unix: Basic overview, commands, process management and memory management in each.Android operating system architecture and basic programming concepts.Android architecture, Linux kernel, android libraries, Android runtime and application framework.

Recommended Readings:

1. Silberschatz and Galvin;The Operating System Concepts;Wesley Publishing Co.;3rd Edition
2. W. Stallings; Operating Systems; PHI 5th Edition.
3. M Singhal and NG Sivaratri;Advanced Concepts in Operating Systems;TMH;
4. Sumitabha Das;UNIX - Concepts and applications;TMH;3rd edition.
5. Joseph joyner;Android Programming for Beginners: The Ultimate Android App Developer's Guide;Speedy publishing;
6. A.S Tanenbaum;Operating systems, Design and implementation;PHI
7. Achyut S. Godbole;Operating Systems;TMH;

List of Experiments:

(At least 8 experiments should be conducted from the list of experiments.)

1) Program to implement First Come First Serve Scheduling technique
2) Program to implement Shortest Job First Serve Scheduling technique
3) Program to implement Priority Scheduling technique
4) Program to implement Round Robin Scheduling technique
5) Program to implement First In First Out Page Replacement technique
6) Program to implement Least Recently Used Page Replacement technique
7) Program to implement Optimal Page Replacement technique
8) Basic Android Programming.

IT 5.6 Database Management System

Subject Code	Name of the Subject	Scheme of Instruction Hrs/Week			Scheme of Examination						
		L	T	P	ThDuration (Hrs)	Marks					
						Th	S	TW	P	O	Total
IT 5.6	Database Management System	3	1	2	3	100	25	--	50		**175**

Course Objectives:

1. To understand the basic concepts and the applications of database systems.
2. To master the basics of SQL and construct queries using SQL.
3. To understand the relational database design principles.
4. To become familiar with the basic issues of transaction processing and concurrency control.

Course Outcomes:

The student after undergoing this course will be able to:

1. Demonstrate the basic elements of a relational database management system
2. Identify the data models for relevant problems.
3. Design an entity relationship model, convert entity relationship diagrams into RDBMS and formulate SQL queries.
4. Apply normalization for the development of application software.

UNIT – 1 (12 Hours)

Database System Applications, Purpose of Database Systems, View of Data - Data Abstraction, Instances and Schemas, Data Models, Database Languages - DDL, DML, Database Architecture, Database Users and Administrators, History of Data base Systems.

Introduction to Data base design, ER diagrams, Beyond ER Design, Entities, Attributes and Entity sets, Relationships and Relationship sets, Additional features of ER Model, Conceptual Design with the ER Model, Conceptual Design for Large enterprises. Relational Model: Integrity Constraints over Relations, Enforcing Integrity constraints, Querying relational data, Logical data base Design, Introduction to Views destroying/altering Tables and Views.

UNIT – 2 (12 Hours)

Relational Algebra - Selection and Projection, Set operations, Renaming, Joins, Division, Examples of Algebra Queries, Relational calculus - Tuple relational Calculus - Domain relational calculus

Form of Basic SQL Query - Examples of Basic SQL Queries, Introduction to Nested Queries, Correlated Nested Queries, Set - Comparison Operators, Aggregate Operators, NULL values - Comparison using Null values - Logical connectives - AND, OR and NOT - Impact on SQL Constructs, Outer Joins, Disallowing NULL values, Complex Integrity Constraints in SQL Triggers and Active Data bases.

UNIT – 3 (12 Hours)

Introduction to Schema Refinement - Problems Caused by redundancy, Decompositions - Problem related to decomposition, Functional Dependencies - Reasoning about FDS, Normal Forms - FIRST, SECOND, THIRD Normal forms - BCNF - Properties of Decompositions - Loss less join Decomposition, Dependency preserving Decomposition, Schema Refinement in Data base Design - Multi valued Dependencies - FOURTH Normal Form, Join Dependencies, FIFTH Normal form, Inclusion Dependencies.

Transaction Management - Transaction Concept - Transaction State - Implementation of Atomicity and Durability - Concurrent - Executions - Serializability - Recoverability - Implementation of Isolation - Testing for serializability.

Concurrency Control - Lock - Based Protocols - Timestamp Based Protocols - Validation - Based Protocols - Multiple Granularity.

UNIT – 4 (12 Hours)

Overview of Storage and Indexing: Data on External Storage, File Organization and Indexing - Clustered Indexes, Primary and Secondary Indexes, Index data Structures - Hash Based Indexing, Tree based Indexing, Comparison of File Organizations.

Tree Structured Indexing: Intuitions for tree indexes, Indexed Sequential Access Methods(ISAM) B+ Trees: A Dynamic Index Structure, Search, Insert, Delete.

Hash Based Indexing: Static Hashing, Extendable hashing, Linear Hashing, Extendible vs. Linear Hashing.

Recommended Readings:

1. Data base Management Systems, Raghurama Krishnan, Johannes Gehrke, TATA McGrawHill, 3rd Edition, 2003.
2. Data base System Concepts, A.Silberschatz, H.F. Korth, S.Sudarshan, McGraw Hill, VI edition, 2006.
3. Database Systems, 6th edition, RamezElmasri, ShamkatB.Mavathe, Pearson Education, 2013.
4. Database Principles, Programming, and Performance, P.O'Neil, E.O'Neil, 2nd ed., ELSEVIER.

5. Database Systems, A Practical approach to Design implementation and Management Fourth edition, Thomas Connolly, Carolyn Begg, Pearson education.
6. Database Systems Concepts, Peter Rob & Carlos Coronel, Cengage Learning, 2008.
7. Fundamentals of relational Database Management Systems, S. Sumathi, S.Esakkirajan, Springer.
8. Database Management System Oracle SQL and PL/SQL, P.K. Das Gupta, PHI.
9. Introduction to Database Management, M.L. Gillenson and others, Wiley Student Edition.
10. Database Development and Management, Lee Chao, Auerbach publications, Taylor & Francis Group.
11. Introduction to Database Systems, C.J. Date, Pearson Education.
12. Database Management Systems, G.K. Gupta, TMH.

List of Experiments in Database Management System

(At least 8 experiments should be conducted.. A certified journal reporting the experiments conducted should be submitted at the end of the term)

1. To study Data Definition language Statements.
2. To study Data Manipulation Statatements.
3. Study of SELECT command with different clauses
4. Study of GROUP functions (avg, count, max, min, Sum).
5. Study of various type of SET OPERATORS (Union, Intersect, Minus).
6. Study of various type of Integrity Constraints.
7. Study of Various type of JOINS.
8. To study Views
9. To Study Triggers

IT 6.1 DATA MINING

Subject Code	Name of the Subject	Scheme of Instruction Hrs/Week			Scheme of Examination						
		L	T	P	Th Duration (Hrs)	Marks					
						Th	S	TW	P	O	Total
IT6.1	Data Mining	3	1	2	3	100	25	--	--	--	**125**

Course Objectives:

The subject aims to provide the student with ability to:

1. Understand the basic concepts and techniques of data mining.
2. Understanding various aspects of data mining such as data preprocessing, data modeling, DMQL.
3. Learn the association rules, classification and prediction methods and also the several clustering techniques.
4. Learn anomaly detection schemes
5. Understand the design of data warehouse.

Course Outcomes:

The student after undergoing this course will be able to:

a) Explain data mining fundamentals and mechanisms.
b) Demonstrate data mining techniques to implement data mining algorithms.
c) Describe data warehousing concepts and components.
d) Explain the importance of outlier detection.
e) Illustrate Web mining.

UNIT – 1 (10 Hours)

Introduction to Data Mining: Basic Data Mining Tasks, Data Mining Functionalities, Data Mining from a Database Perspective, Data Mining Issues. Data Preprocessing: Data Cleaning, Data Integration & Transformation, Data Reduction, Discretization & Concept Hierarchy generation.

Data Modeling. Data Mining Query Language.
Data Mining Association Rules. Association Rule Mining. Mining Single Dimensional Boolean Association Rules from Transactional Databases.

UNIT –2 (14 Hours)

Introduction to Classification & Prediction: Classification by Decision tree induction, Bayesian Classification, k-Nearest Neighbor Classifier,Classification by Back propagation, Introduction to Prediction Concept.
Introduction to Cluster Analysis. Types of data in cluster analysis, Clustering Methods, Partitioning Methods, Hierarchical Methods, Density Methods, Grid-Based Methods, Model-Based Clustering Methods.

UNIT –3 (12 Hours)

Data Mining Anomaly Detection: Variants of Anomaly/Outlier Detection Problems, Applications. Types of anomaly detection schemes: Graphical & Statistical-based, Distance-based, and Model-based.
Graph Mining, Social Network Analysis, Multidimensional Analysis and Descriptive Mining of complex data objects, Spatial Data Mining, Multimedia data mining, Text Mining, Mining World Wide Web.

UNIT –4 (12 Hours)

Data Warehousing: Concepts and Mechanisms: Need, Functions & Application. Data Warehousing Components: Overall architecture, Data Warehouse Implementation, Multidimensional Data Model, Efficient Computation of Data Cube, OLTP v/s Data Warehousing.
Building a Data Warehouse: Planning a Data Warehouse, Conceptual Data Warehouse Modeling.

OLAP Servers: Need for OLAP, Multidimensional v/s Multi relational OLAP. Categorization of OLAP tools: MOLAP, ROLAP. OLAP tools & Internet. Data Extraction, Cleanup and transformation. Metadata. Query and Reporting tools.

Recommended Reading

1. Data mining - Concepts and Techniques -Jiawei Han and Micheline Kamber, Morgan Kuaffman publisher, ISBN:1-55860-489-8
2. Data Warehousing, Data Mining & OLAP – Alex Berson, Stephen J. Smith, TMH publication, ISBN: 0-07-058741-8
3. Introduction to Data Mining with case studies- G.K. Gupta, PHI Publisher, ISBN:81-203-3053-6
4. Mastering Data Mining-Michel. J. A. Berry. Gordon S.Linoff, Wiley Publications, ISBN: 978-0-471-33123-0
5. Data Mining-Pieter Adriaans and Dolf Zantinge.- PEA, **ISBN**:8178084252

List of Experiments

(**At least 8 experiments should be conducted from the list of experiments.)**

1. Study of Data mining Tools and Techniques
2. Write program to implement data Smoothening
3. Write program to implement normalization
4. Write program to implement Apriori Algorithm.
5. Write program to implement FP Tree
6. Write program to implement Decision Tree Induction
7. Write program to implement classification by back propagation.
8. Write program to implement K nearest Neighbor
9. Write program to implement Density Based clustering
10. Model and design data warehouse

IT6.2 THEORY OF COMPUTATION

Subject Code	Name of the Subject	Scheme of Instruction Hrs/Week			Scheme of Examination						
		L	T	P	ThDuration (Hrs)	Marks					
						Th	S	TW	P	O	Total
IT6.2	Theory of Computation	3	0	2	3	100	25	--	--	--	125

Course Objectives:

The subject aims to provide the students with:

1. An ability to understand how efficiently problems can be solved on a model of computation, using an algorithm.
2. An understanding of the basic concepts in theoretical computer science, and the formal relationships among machines, languages and grammars.

Course Outcomes:

The student after undergoing this course will be able to:

1. Explain the basic concepts of deterministic and non-deterministic finite automata.
2. Design a finite automaton to recognize a given regular language.
3. Describe the formal relationships among machines,languages and grammars,
4. Explain the uses of Turing Machine.

UNIT – 1 (12 Hours)

Basic Mathematical objects:-Sets,logic,Functions,Relations,Languages.
Regular Expressions and Finite Automata: - Regular Languages and Regular Expressions, Finite Automata (DFA), Automata to implement union, intersection and complement operations.NFA, €-NFA,Kleene's theorem,Minimal finite Automata, The pumping lemma for regular languages, Moore and Mealy Machine.

UNIT – 2 (12 Hours)

Context –free Languages and Push down Automata:- Regular Grammars, Context Free Grammars, Derivation Trees and Ambiguity. Simplified forms and Normal Forms – CNF, GNF. The Pumping Lemma for context –free languages.
Push Down Automata : Deterministic Pushdown automaton, A PDA corresponding to a given CFG, CFG corresponding to a given PDA.

UNIT – 3 (12 Hours)

Turing Machine and their languages: Computing a Partial function with a Turing machine, Combining Turing machines.
Variations of Turing Machine, Nondeterministic Turing Machine, Universal Turing Machine, Models of computation and the Church- Turing thesis.

UNIT – 4 (12 Hours)

Recursively Enumerable languages:- Recursively Enumerable and Recursive languages, Enumerating a Language, General Grammars - Unrestricted Grammars , Context-Sensitive Language and Chomsky Hierarchy.
Unsolvable Problems :- A non recursive language and unsolvable Decision problems, Reducing one problem to another- The halting problem, Rice's Theorem, Post's Correspondence Problem.

Recommended readings:

1. Introduction to languages and the theory of computation By John C. Martin, Tata McGraw Hill
2. An Introduction to Formal Languages and Automata By Peter Linz,Narosa Publishers.
3. Introduction to Automata Theory, Languages and Computation By Hopcraft and Ullman, Narosa Publishing House
4. Introduction to Theory of computation by Michael Sipser, Cengage Learning
5. Theory of Computer Science, Automata Languages & Computations by N.Chandrashekhar and K.L.P. Mishra , PHI publication

LIST OF EXPERIMENTS:

1) Program to implement a DFA
2) Program to implement a NFA.
3) Program to implement a Mealy Machine.
4) Program to implement a Moore machine.
4) Program to convert CFG to CNF.
5) Program to implement Push Down Automata.
6) Program to implement a Turing Machine.
7) Study of Java Formal Languages and Automata Tool(JFLAP).

IT 6.3 COMPUTER NETWORKS

Subject Code	Name of the Subject	Scheme of Instruction Hrs/Week			Scheme of Examination						
		L	T	P	Th Duration (Hrs)	Marks					
						Th	S	TW	P	O	Total
IT 6.3	Computer Networks	3	1	2	3	100	25	-	-	25	**150**

Course Objectives:

1. To introduce various types of computer networks.
2. To understand the TCP/IP and OSI models with merits and demerits.
3. To introduce UDP and TCP Models.
4. To introduce IP v6.

Course Outcomes:

At the end of the course, the student should be able to:

1. Explain basics of Computer Networks and various protocols.
2. Differentiate and explain the internetworking devices.
3. Apply different routing algorithms.
4. Explain the concepts of IP v6.

UNIT – 1 (12 Hours)

Reference Model: The OSI reference Model, TCP/IP reference model, Comparison of the OSI and TCP/IP reference model.Introduction to Physical Layer.Data Link Layer : Data Link Layer design issues, Medium Access Control Sub layer (MAC), the channel allocation problem, Multiple Access Protocols: ALOHA, Carrier Sense Multiple Access (CSMA) protocols, Collision-free protocol, Bit-Map Protocol, Binary Countdown, Limited contention protocols, Adaptive Tree Walk Protocol, WDMA (Wavelength Division Multiple Access) Protocol.

UNIT – 2 (12 Hours)

Network Layer: Network Layer design issues, Routing Algorithms - optimality principle, shortest path, flooding, Distance Vector Routing, Control to Infinity Problem, Link state Routing, Hierarchical Routing, Congestion Control algorithms, Need for congestion control, Congestion prevention policies, Congestion control in virtual circuit subnets and congestion control in datagram subnets, Quality of Service, Internet Protocol, IP Address, IP ver. 4, IP ver. 6, DHCP, Overview of OSPF and BGP.

Networking and Internetworking Devices - Repeaters, bridges, routers and gateways. Address Resolution Protocol, Reverse Address Resolution Protocol, Internet Control Message Protocol, Ports, Sockets, Socket types.

UNIT – 3 (12 Hours)

Transport Layer: UDP, Purpose of UDP, UDP Header, TCP, the TCP Service Model, The TCP Segment Header, TCP Connection Establishment, The TCP Connection Release, Comparison of TCP and UDP.

Application Layer: Domain Name System – DNS, Electronic Mail, MIME, File Transfer Protocol – FTP, TFTP, Telnet Protocol, Hyper Text Transfer Protocol (HTTP), Simple Mail Transfer Protocol (SMTP), Simple Network Management Protocol (SNMP).

UNIT – 4 (12 Hours)

ISDN: principles of ISDN, Evolution of ISDN, Objectives, Benefits, Services and Architecture of ISDN.

Frame Relay Congestion Control: congestion in frame relay networks approaches to congestion control, traffic rate management.

ATM: Cell format, Architecture, ATM Adaptation Layers.

Cellular Concept and Cellular System Fundamentals, WLAN Technology, Bluetooth: basics and Protocol Stack. Introduction to Wireless WANs.

Recommended Readings:

1. Andrew S Tanenbaum; Computer Networks; Pearson Education; 5/e
2. William Stallings; ISDN and Broadband ISDN with Frame relay and ATM; Pearson Education; 4/e
3. J.S Katre; Computer Network Technology; Tech-Max Publications; 2010.
4. Behrouz A. Forouzan; Data Communications and Networking; TMH; 2013, 5/e

List of Experiments in Computer Networks:

(At least 8 experiments should be conducted from the list of experiments. A certified journal reporting the experiments conducted should be submitted at the end of the term)

1. Study of Different Networking devices.
2. Study of connecting the Computer in LAN.
3. Study of basic networking commands.
4. Implementation of flag byte with bit stuffing framing techniques
5. Implementation of binary countdown Protocol
6. To find IP address of local & remote host

7. To access URL
8. Client Server Application
9. Case Study: Wireless Networks
10. Case Study: Network Security

IT 6.4 COMPUTER GRAPHICS

Subject Code	Name of the Subject	Scheme of Instruction Hrs/Week			Scheme of Examination						
		L	T	P	Th Duration (Hrs)	Marks					
						Th	S	TW	P	O	Total
IT 6.4	Computer Graphics	3	1	2	3	100	25	-	25	-	**150**

Course objectives:

The subject aims to provide the student with:

1. Introduction to the contemporary terminology and progress in Computer Graphics.
2. Introduction to various issues and trends in Computer Graphics.
3. An Understanding of 2D and 3D transformations.
4. An Understanding of geometric transformations, geometric algorithms, 3D object models (surface and volume),
5. An understanding of the animation techniques.

Course Outcomes:

The student after undergoing this course will be able to:

1. Explain the concepts of computer graphics system
2. Implement the algorithms for two dimensional transformations.
3. Demonstrate the techniques of clipping
4. Explain the basics of 3D Graphics and three dimensional transformations.
5. Design a simple animation system.

UNIT - 1 (12 Hours)

Overview of graphic systems: Raster scans systems, Random scan systems.

Output Primitives. Points and lines, Line drawing algorithms, DDA, Bresenhams line algorithm Circle generating algorithms, Properties of circles, Midpoint circle algorithm, Ellipse generating algorithm, Properties of Ellipses, Midpoint ellipse algorithm, Filled area primitives, Scan line polygon Fill algorithm, Inside – outside tests, Scan line fill of curved boundary, Boundary fill algorithm, Flood fill algorithm, Fill area functions.

UNIT - 2 (12 Hours)

Two Dimensional Geometric Transformations: Basic Transformations, Translation, Rotation, Scaling, Composite transformation, Translations, Rotations, Scaling, Other transformations- Reflection, Shear.

Two-Dimensional Viewing: The viewing pipeline, Viewing coordinate reference frame, Window to viewport coordinate transformation, 2-D viewing functions, Clipping operations, Point Clipping, Line clipping , Cohen- Sutherland Line Clipping, Polygon Clipping, Sutherland Hodgeman Polygon clipping, Weiler- Atherton Polygon Clipping, Curve clipping, Text clipping.

UNIT - 3 (12 Hours)

Three Dimensional Concepts: 3- Dimensional display methods, Parallel projections Perspective projection, Depth cueing, Surface rendering, Exploded and cutaway views. Three Dimensional Object representations- Polygon surfaces, Polygon tables, Three Dimensional Geometric and Modeling transformations- Translation Rotation, Coordinate Axes, rotations , Scaling , Reflections , Shears
Three Dimensional Viewing, Transformation from world to viewing coordinates Projections.
Picture Structure: Defining Symbols By Procedures, Display Procedures, Boxing, Structured Display Files. Techniques for Achieving Realism. Curves And Surfaces: Shape Description Requirements, Parametric Functions, Bezier Methods. B-Spline Methods.

UNIT - 4 (12 Hours)

Classification of visible – surface detection algorithms, Back – Face detection , Depth buffer method , A – Buffer method , Scan – Line method , Depth Sorting method , BSP- Tree method, Area Sub-division method.

Color Models and Color Applications- Properties of light ,Standard primaries and the, Chromaticity Diagram, XYZ Color model, CIE Chromaticity Diagram, RGB color model, YIQ Color Model , CMY Color Model, HSV Color Model, HLS Color Model

Computer Animation: Design of animation sequences, General computer animation functions, Raster Animations, Computer animation languages, Motion specification, Direct motion specification, Goal directed systems Kinematics and dynamics.

Recommended Readings:

1. Donald Hearn and M. P. Baker ; Computer Graphics; Prentice Hall of India Pvt. Ltd.
2. William Newman and Robert Sproull; Principles of Interactive Graphics; Tata McGraw hill Publishing company Ltd.
3. N. Krishnamurthy; Introduction to Computer Graphics; TMH
4. Steven Harrington; Computer Graphics; Tata McGraw Hill.
5. Foley, Van Dam, Feiner and Hughe; Computer Graphics: Principles and Practice

List of Experiments in Computer Graphics:

(At least 8 experiments should be conducted from the list of experiments. A certified journal reporting the experiments conducted should be submitted at the end of the term)

1. To study basic Graphics Primitive functions
2. To draw a Line using DDA line drawing algorithm
3. To draw a line using Breshenham's algorithm
4. To draw circle using midpoint circle algorithm
5. To draw an ellipse using mid-point ellipse algorithm.
6. To translate, rotate and scale the 2D object.
7. To translate, rotate and scale the 3D object.
8. To fill polygon using boundary fill algorithm.
9. To fill polygon using flood fill algorithm.
10. To implement Cohen–Sutherland 2D clipping and window–viewport mapping
11. To perform 2-D animation

IT 6.5 WEB TECHNOLOGY

Subject Code	Name of the Subject	Scheme of Instruction Hrs/Week			Scheme of Examination						
		L	T	P	Th Duration (Hrs)	Marks					
						Th	S	TW	P	O	Total
IT6.5	Web Technology	3	1	2	3	100	25	--	25	--	**150**

Course objectives:

The subject aims to provide the student with:

1. Introduction to the technologies behind today's web-based applications.
2. An Understanding of building real web applications.
3. An understanding of the basic design principles of the web model of computing.
4. Learning different technologies to building different real world applications.

Course Outcome:

At the end of the course, students should be able to:

1. Design and implement dynamic websites with good aesthetic sense of designing and latest technical know-how's.
2. Explain the Web Application Terminologies, Internet Tools, E-Commerce and other web services.
3. Explain the fundamentals of ASP and Web Hosting
4. Implement applications using different technologies like PHP.

UNIT -1 (12 hours)

Introduction to Web: Web Architecture, Web Applications, Web servers, Web Browsers, Internet standards.

HTML: Elements, Attributes, Tags, Forms, Frames, Tables, Overview and featuresof HTML5

Cascading Style Sheets: Need for CSS, basic syntax and structure of CSS, using CSS, background images, colors and properties,manipulating texts, using fonts, borders and boxes, margins, padding lists, positioning using CSS, Overview and features of CSS3.

XML: Introduction to XML, uses of XML, XML key components, DTD and Schemas, Transforming XML using XSL and XSLT

UNIT -2 (12 hours)

JavaScript: Introduction to client side scripting, documents, forms, statements, comments, variables, operators, conditional statements, loops, events, objects, functions.

AJAX: JavaScript for AJAX, Asynchronous data transfer with XML Http Request, Implementing AJAX Frameworks

jQuery: Introduction, Syntax, jQuery Selector, jQuery Events, jQuery effects, jQuery and HTML

UNIT -3 (12 hours)

PHP: Variables and Constants, Controlling Program Flow, Functions, Arrays, Files,
Directories, Forms and Database, Exploring Cookies, Sessions, and PHP Security

Case Study: Cross platform Web application development

UNIT -4 (12 hours)

Web Applications in ASP.Net: Application Structure and State, Web Forms: Standard Controls, Navigation Controls: TreeView, Menu and SiteMapPath, Validation Controls, Working with Database Controls

Web Applications in Java: JSP life cycle and implementation, Servlet Programming, Working with JDBC

Recommended Readings:

1. Kogent Learning Solutions Inc ;Web Technologies: HTML, JAVASCRIPT, PHP, JAVA, JSP, ASP.NET, XML and Ajax, Black Book; Dreamtech Press
2. Achyut Godbole; Web Technologies; Wesley Publishing Co
3. Jon Duckett; JavaScript and JQuery: Interactive Front-End Web Development.
4. Jonathan Peppers; Xamarin Crossplatform Application Development
5. Mridula Parihar; ASP.net Bible; Tata MCgraw Hill
6. P.J Deitel .H.M Deitel; Internet and World wide Web. How to program
7. E. Balaguruswamy; Programming with Java; TMG.
8. Herbert Schildt; Java 2 Complete Reference;
9. Raj kamal; Internet and web technologies;

List of Experiments:

(At least 8 experiments should be conducted based on broad areas listed below)

1. Create static web pages using HTML.
2. Create website to demonstrate use of various CSS styling techniques such as inline, internal and external.
3. Programs to demonstrate use of XML for maintaining and displaying information(XSLT).
4. Validating Web forms using JavaScript.
5. Web page to demonstrate the use of AJAX.
6. Web page to implement the concept of jQuery.
7. Creating a web application using PHP.
8. Creating a web application using ASP. Net.
9. Java Servlet programming.
10. Creating a three-tier applications using JSP and Databases.
11. Implementing Session tracking and cookies in JSP.
12. Implementing Session tracking and cookies in PHP

IT 6.6 SOFTWARE TESTING AND QUALITY ASSURANCE

Subject Code	Name of the subject	Scheme of Instruction Hrs/Week			Scheme of Examination Marks					
		L	T	P	Th	S	TW	P	O	TOTAL
IT 6.6	SOFTWARE TESTING AND QUALITY ASSURANCE	4	3	3	100	25	--	--	--	125

Course objectives:

The subject aims to provide the student with:

1. An understanding of importance of an effective testing strategy.
2. Skills to plan and prepare appropriate tests for all phases of software development.
3. An Understanding of measures and controls for the quality of testing
4. Techniques for early detection of errors and to resolve the same. Learning different technologies to building different real world applications.

Course Outcomes: After successful completion of this course the student will

1. Manage, plan and prepare rigorous, formal, visible and repeatable tests that will fully exercise software, in the development of quality systems.
2. Apply different testing approaches to all stages of software development.
3. Prepare test plans, strategy, specifications, procedures and controls to provide a structured approach to testing.
4. Apply the techniques and methods covered to testing packages.
5. Describe the different types of testing tools available and identify the appropriate types of tools for their needs.

UNIT – 1 (12 Hrs)

Basic Concepts and Preliminaries: Role of Testing, Verification and Validation, Failure, Error, fault and Defect, Notion of Software Reliability, Objectives of Testing, What is a Test case? Expected Outcome, Concept of Complete Testing, Central Issue in Testing, testing Activities, Test Levels, White-box and Black-box Testing, Monitoring and Measuring Test Execution, Test Team Organization and Management

Software Quality: 5 views of SW Quality, McCall's Quality Factors and Criteria, ISO 9126 Quality Characteristics, ISO 9000:2000 Software Quality Standard

Unit Testing: Concept of Unit Testing, Static & Dynamic Unit Testing, Defect Prevention, Mutation Testing, Debugging, Unit Testing in XP, JUnit Framework, Tools for Unit Testing

UNIT – 2 **(12 Hrs)**

Control Flow Testing: Basic Idea, Outline, Paths in a Control Flow Graph, Path Selection Criteria, Generating Test Input,

Data Flow Testing: General Idea, Data Flow Anomaly, Overview of Dynamic Data Flow Testing, Data Flow Graph & Terms, Data Flow Testing Criteria, Comparison of Testing Techniques

Functional Testing: Concepts of Howden, Complexity of applying Functional Testing, Pair wise Testing, Equivalence Class Partitioning, Boundary Value Analysis, Decision Tables, Error Guessing

UNIT – 3 **(12 Hrs)**

System Integration Testing: Concept, Different types of Interfaces & Interface Errors, Granularity of System Integration Testing, Techniques, Software Hardware Integration, Test Plan for System Integration, Off-the-shelf Component Integration

System Test Design: Test Design Factors, Requirements Identification, Characteristics of Testable Requirements, Test Objective Identification, Modelling a Test Design Process & Results, Test Case Design Effectiveness

UNIT – 4 **(12 Hrs)**

System Test Planning and Automation: Structure of a System Test Plan, Intro & Feature Description, Assumptions, Test Approach, Test Suite Structure, Test Environment, test Execution Strategy, test Effort Estimation, Scheduling & Test Milestones, System test Automation, Evaluation & Selection of Test Automation Tools, Test Selection Guidelines for Automation, Characteristics of Automated Test cases, Structure of an Automated Test case, Test Automation Infrastructure,

System Test Execution: Modelling Defects, Metrics for tracking System Test, Orthogonal Defect Classification, Defect Causal Analysis, Beta Testing, First Customer Shipment, System Test Report, Product Sustaining, Measuring Test Effectiveness

Recommended Readings:

1. Kshirasagar Naik and Priyadarshi Tripathy; Software Testing and Quality Assurance: Theory and Practice; Wiley Publications
2. William E. Perry; Effective Methods for Software Testing Third Edition; Wiley Publications
3. Jeff Tian ; Software Quality Engineering – Testing, Quality Assurance and Quantifiable Improvement; Edition 2006, ISBN: 81-265-0805-1
4. Louise Tamares ; Introducing Software testing; ISBN: 81-7808-678-6

List of Experiments:

(At least 8 experiments should be conducted based on broad areas listed below)

1. Case study on software Testing and Quality Assurance
2. Manual Debugging in Visual studio
3. Study and use of any one Software Testing Tools
4. Software Requirement Specification of Mini project
5. Implementation of Project
6. Testing of project
7 To perform case study on Test Driven Development
8. To perform case study on Scenario Testing and Reporting

APPENDIX

QUESTION PAPER PATTERN

Syllabus in each subject will have 4units.

Question paper shall be drawn as follows:

Question No	From Units	No. of Questions to be Set	No. of Questions to be Answered	Remarks
1-3	1-2	3 x 20marks	2 x 20 marks	Each unit shall have minimum 20 marks
4-6	3-4	3 x 20 marks	2 x 20 marks	Each unit shall have minimum 20 marks
7-8	1-4	2 x 20 marks	1 x 20 marks	---
		8 - 160 marks	5 - 100 marks	

SAMPLE QUESTION PAPER

SUBJECT: MARKS: 100

MAXIMUM DURATION: 3 hours

Instructions to the candidates:

1.

2

Part –A (Questions to be drawn from units 1 & 2)

Answer any **TWO** questions from the following: 2 x 20= 40 Marks

Question-1 .....20 Marks

a)

b)

..

Question-2 .....20 Marks

a)

b)

..

Question-3 .....20 Marks

a)

b)

..

Part –B (Questions to be drawn from units 3 & 4)

Answer any **TWO** questions from the following: 2 x 20= 40 Marks

Question-4 .....20 Marks

a)

b)

..

Question-5 .....20 Marks

a)

b)

..

Question-6 .....20 Marks

a)

b)

..

Part –C (Questions to be drawn from all units i.e. units 1 - 4)

Answer any **ONE** question from the following: 1 x 20= 20 Marks

Question-7 .....20 Marks

a)

b)

..

Question-8 .....20 Marks

a)

b)

..

..