SRI VENKATESWARA UNIVERSITY
BACHELOR OF COMPUTER APPLICATIONS
FIRST YEAR - SECOND SEMESTER
UNDER CBCS W.E.F. 2020-21

DATA STUCTURES

Semester	Course Code	Course Title	Hours/Week	Hours	Credits
II	C4	Data Structures	4	60	4

Course Objectives:

- The objective of the course is to make a student to implement data structures and organize data based on data structures for efficient access.

Course Outcomes:

- Identify data structures suitable to solve problems.
- Developing algorithms.
- Identifying the use of Time and Space Complexity.
- Implementing different sorting & searching techniques.

Syllabus

Unit I

Introduction and Overview- Elementary Data Organization, Data Structures, Data Structure Operations, *Algorithms:* Complexity, Time-Space Tradeoff.

Preliminaries-Mathematical Notation and Functions, Algorithmic Notation, Control Structures, Complexity of Algorithms. Other Asymptotic Notations, Sub algorithms, Variables, Data Types.

Unit II

String Processing – Storing Strings, Character Data Type, String Operations, Word Processing, Pattern Matching Algorithms.

Arrays, Records and Pointers – Linear Arrays, Representation and Traversing Linear Arrays, Inserting and Deleting, Bubble Sort, Linear Search, Binary Search, Multidimensional Arrays, Pointer Arrays, Record Structures, Representation of records in memory, Parallel Arrays, Matrices, Sparse Matrices.

Unit III

Linked Lists – Representation, Traversing, Searching, Memory Allocation: Garbage Collection, Insertion, Deletion, Header Linked Lists, Two-Way Lists

Stacks, Queues, Recursion- Stacks, Array representation, Linked List representation, Arithmetic Expressions; Polish notation, Quick sort, Recursion, Towers of Hanoi,

Implementation of recursive procedures by stacks, Queues, Linked representation of Queues, Dqeques, Priority Queues.

Unit IV

Trees- Binary trees, Representing and traversing binary trees, Traversal algorithms using stacks, Header nodes, Binary Search Trees, Searching, Insertion and Deletion in Binary Search Trees, AVL Search Trees, Insertion and Deletion in AVL trees, m-way search trees, searching, insertion and deletion in m-way search tree, B Trees, searching, insertion and deletion in a B-tree, Heap: Heap Sort, Huffman's Algorithms, General Trees

Unit V

Graphs- Terminology, Sequential representation of Graphs, Warshall's Algorithm, Linked representation of Graphs, Operations on Graphs, Traversing a Graph, Topological Sorting

Sorting and Searching- Insertion Sort, Selection sort, Merging, Merge sort, Radix sort, Searching and Data modification, Hashing

Text books:

1. Data Structures by Seymour Lipschutz, McGraw Hill(Schaum's Outlines).

REFERENCE BOOKS:

1. Data Structures & Algorithms Using C, Khanna Publishers

2. Theory and Problems of Data Structures by Seymour Lipschutz, McGraw Hill (Schaum's Outlines)

3. Data Structures & Algorithms in C by M.A.Weiss, Addison Wisley.

4. Data Structures Using C, Reema Thareja, oxford.

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DATA STUCTURES LAB

Semester	Course Code	Course Title	Hours/Week	Hours	Credits
II	C4-P	Data Structures Lab	2	30	1

List of Lab Experiments

1. Write a C program to Implement matrix multiplication.
2. Write a C program to Implement stack using arrays.
3. Write a C program to Implement queue using arrays.
4. Write a C program to Implement circular queue using arrays.
5. Write a C program to Implement dequeue using arrays.
6. Write a C program to Implement single linked list using the methods create(), insert(), search(), delete() and display().
7. Write a C program to Implement double linked list.
8. Write a C program to Implement stack using linked list.
9. Write a C program to Implement queue using linked list.
10. Give a solution to towers of Hanoi using C program.
11. Write a C program to Implement bubble sort.
12. Write a C program to Implement selection sort.
13. Write a C program to Implement insertion sort.
14. Write a C program to Implement merge sort.
15. Write a C program to Implement quick sort.

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OBJECT ORIENTED ANALYSIS AND DESIGN

Semester	Course Code	Course Title	Hours/Week	Hours	Credits
II	C5	OBJECT ORIENTED ANALYSIS AND DESIGN	4	60	4

Course Objectives:

- To provide a sound understanding of the fundamental concepts and historical evolution of the model.
- To facilitate a mastery of the notation and process of object-oriented analysis and design.

Course Outcomes:

By the end of the course, student will be able to:

- Have Knowledge in evolution and foundations of OO Model and its elements.
- Identify relationship between classes and objects.
- Know importance of classification and can identify classes and objects.
- Have basic knowledge of UML.
- Knowledge in syntax and semantics of UML.

Syllabus

UNIT I:

The Object Model-*The Evolution of the Object Model:* The generations of programming languages, The topology of Programming languages. *Foundations of the Object Model*: Object Oriented Analysis, Object Oriented design, Object Oriented Programming. *Elements of the Object Model:* Programming Paradigm(programming style), The Major and Minor Elements of the Object Models, Abstraction, Encapsulation, Modularity, Hierarchy(single inheritance, multiple inheritance, Aggregation), Static and Dynamic Typing, Concurrency, Persistence.

UNIT II:

Classes and Objects-*The Nature of an Object*: What is and what is not an Object, State, Behavior, and Identity. *Relationships among Objects*: Links, Aggregation. *The Nature of a Class*: Interface and Implementation, Class Lifecycle. *Relationships among Classes*: Association: Semantic Dependencies, Multiplicity, Inheritance, Polymorphism, Aggregation, Dependencies. *The Interplay of Classes and Objects*: Relationship between Classes and Objects, *On Building Quality Classes and Objects:* Measuring the Quality of an Abstraction, Choosing Operations, Choosing Relationships, Choosing Implementations.

UNIT III:

Classification-*The Importance of Proper Classification:* The Difficulty of Classification, The Incremental and Iterative Nature of Classification. *Identifying classes and Objects:* Classical and Modern Approaches. *Object Oriented Analysis*: Classical Approaches, Behavior Analysis, Domain Analysis, Use Case Analysis, CRC Cards, Informal English Description, Structured Analysis. *Key Abstractions and Mechanisms*: Identifying Key Abstractions: Refining Key Abstractions, Naming Key Abstractions. Identifying Mechanisms.

UNIT IV:

The Unified Modeling Language:*Diagram Taxonomy*: Structure Diagrams, Behavior Diagrams. *The Use of Diagrams in Practice*: Conceptual, Logical and Physical Models, The Role of Tools. *The Syntax and Semantics of the UML*: The Package Diagrams, Component Diagrams, Deployment Diagrams, Use Case Diagrams.

UNIT V:

The Syntax and Semantics of the UML: Activity Diagrams, Class Diagrams, Sequence Diagrams, Interaction Diagrams, Composite Structure Diagrams, State Machine Diagrams, Timing Diagrams, Object Diagrams, Communication Diagrams.

TEXT BOOK:

1. Object-Oriented Analysis and Design with Applications, 3rd Edition, By: Robert A. Maksimchuk, Bobbi J. Young, Grady Booch, Jim Conallen, Michael W. Engel, Kelli A. Houston, Pearson education.

REFERENCE BOOKS:

1.James Rumbaugh, Jacobson and Booch, Unified Modeling Language reference manual,PHI.

2. Ali Bahrami, Object oriented system development-using the unified modeling language, Tata McGraw Hill international edition, computer science series.

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OBJECT ORIENTED ANALYSIS AND DESIGN LAB

Semester	Course Code	Course Title	Hours/Week	Hours	Credits
II	C5-P	Object oriented analysis and design lab	2	30	1

List of Lab Experiments

1. Demonstrate Package Diagram forHydroponics Gardening system.
2. Demonstrate Component Diagram for the Environmental control system.
3. Demonstrate Deployment Diagram for Environmental control system.
4. Identify Use Cases and develop the Use Case Diagram for Hydroponics Gardening system.
5. Demonstrate Activity Diagram for Hydroponics Gardening system.
6. Demonstrate Class Diagram for the Environmental control system.
7. Demonstrate sequence diagram Environmental controller system.
8. Demonstrate sequence diagram for returning and removing books for the library system
9. Demonstrate use case for returning book with fine for library system.
10. Draw the State Machine Diagram for the Duration Timer.
11. Draw the Interaction Diagram for Library system.
12. Draw the Composite structure diagram for the Hydroponics Gardening system's water tank.
13. Draw the Timing Diagram for a valve object that is controlled to fill the Water storage tank object in Hydroponics Gardening system.
14. Demonstrate Object Diagram for the library system.
15. Draw the Communication Diagram for the Hydroponics Gardening system.

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DATA BASE MANAGEMENT SYSTEM

Semester	Course Code	Course Title	Hours/Week	Hours	Credits
II	C6	DATA BASE MANAGEMENT SYSTEM	4	60	4

Course Objectives:

- Graduates will have the expertise in analyzing real time problems and providing appropriate solutions related to Computer Science & Engineering.
- Graduates will have the knowledge of fundamental principles and innovative technologies to succeed in higher studies and research.
- Graduates will continue to learn and to adapt technology developments combined with deep awareness of ethical responsibilities in profession.

Course Outcomes:

- An ability to apply Knowledge of computing and mathematics in Computer Science & Engineering.
- An ability to analyze a problem, identify and define the computing requirements appropriate to its solution.
- An ability to design, implement and evaluate a computer-based system to meet desired needs with appropriate societal considerations.
- An ability to conduct investigations, interpret data and provide conclusions in investigating complex problems related to Computer Science & Engineering.
- An ability to engage in continuing professional development and life-long learning.

Syllabus

UNIT-I

Overview of Database Systems: Managing Data, File System versus DBMS, Advantages of DBMS, Describing and storing Data in a DBMS, Queries in DBMS, Transaction Management, Structure of DBMS, People who work with DBMS

Introduction to Database 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.

UNIT-II

Relational Model: Introduction to the Relational Model - Integrity Constraints over Relations, Enforcing Integrity constraints, Querying relational data, Logical data base Design, Introduction to Views destroying/ altering Tables and Views.

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

UNIT-III

Working with MySQL - Introduction: What is MySQL?, Database Terms, Install MySQL on windows, Install MySQL on Ubuntu, Access MySQL, Start the Command Line Interface. **MySQL Command Syntax:** SQL Commands Syntax, Data Types Create a Database, Create a User, Create a Table. **Important SQL Commands :** Insert New Records, Modify a Table, Query a Database, Advanced Select Statements, Remove a Row, Limit Clause, Update the contents of a Field, Sort Results,LogicalOperators **Advanced Usage :** Primary Keys, MySQL Functions, MySQL string functions, MySQL date functions, MySQL aggregate functions

Basics of Functional Dependencies and Normalization for Relational Databases: Informal Design Guidelines for Relational Schemas, Functional Dependencies, Normal Forms Based on Primary Keys, General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Form, Multivalued Dependency and Fourth Normal Form, Join Dependencies and Fifth Normal Form

UNIT IV

Introduction to Transaction Processing Concepts and Theory: Introduction to Transaction Processing – Transaction and System Concepts – Desirable Properties of Transactions – Characterizing schedules based on Serializability – Characterizing schedules based on Recoverability

Concurrency Control Techniques: Two Phase Locking Techniques for Concurrency Control – Concurrency Control Based on Timestamp ordering – Multiversion Concurrency Control Techniques

UNIT-V

Disk Storage, Basic File Structures and Hashing: Introduction, Secondary Storage Devices, Buffering of Blocks, Placing file Records on Disk, Operations on Files, Files of Unordered Records, Files of Ordered Records, Hashing Techniques, Other Primary File Organizations, Parallelizing Disk Access using RAID Technology.

Indexing Structures for Files: Types of Single-Level Ordered Indexes, Multilevel Indexes, Dynamic Multilevel Indexes Using B-Trees and B+ Trees, Indexes on Multiple Keys, Other Types of Indexes.

TEXT BOOKS:

1. Data base Management Systems, Raghurama Krishnan, Johannes Gehrke, TATA McGrawHill, 3rd Edition, 2003.
2. MySQL Introduction by byAntunPeicevic, First edition, Technical editor: Marko Maslac Copyright© 2016 Geek University Press (UNIT-III Chapter 1)
3. Fundamentals of Database Systems, RamezElmasri, Shamkant B. Navathe, Sixth Edition (for UNIT-III Chapter 2 and UNIT-IV,UNIT V)

REFERENCES BOOKS:

1. Database Principles, Programming, and Performance, P.O'Neil, E.O'Neil, 2nd ed., ELSEVIER.
2. Database Systems, A Practical approach to Design implementation and Management Fourth edition, Thomas Connolly, carolynBegg, Pearson education.
3. Database Systems Concepts, Peter Rob & Carlos Coronel, Cengage Learning, 2008.

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DATA BASE MANAGEMENT SYSTEM LAB

Semester	Course Code	Course Title	Hours/Week	Hours	Credits
II	C6-P	DATA BASE MANAGEMENT SYSTEM LAB	2	30	1

List of Experiments

Cycle-I: Aim: Marketing company wishes to computerize their operations by using following tables.

Table Name: Client- Master
Description: Used to store client information

Column Name	Data Type	Size	Attribute
CLIENT_ NO	Varchar2	6	Primary key and first letter must start with 'C'
NAME	Varchar2	20	Not null
ADDRESS 1	Varchar2	30	
ADDRESS S	Varchar2	30	
CITY	Varchar2	15	
PINCODE	Varchar2	8	
STATE	Varchar2	15	
BAL_DUE	Number	10,2	

Table Name: Product_ Master
Description: Used to store product information

Column Name	Data Type	Size	Attribute
PRODUCT _NO	Varchar2	6	Primary key and first letter must start with 'P'
DESCRIPTION	Varchar2	15	Not null
PROFIT _PERCENT	Number	4,2	Not null
UNIT _MEASUE	Varchar2	10	
QTY_ ON_ HAND	Number	8	
REORDER_ LVL	Number	8	
SELL _PRICE	Number	8, 2	Not null, cannot be 0

COST _PRICE	Number	8,2	Not null, cannot be 0

Table Name: Salesman_master
Description: Used to store salesman information working for the company.

Column Name	Data Type	Size	Attribute
SALESMAN_ NO	Varchar2	6	Primary key and first letter must start with 'S'
SALESMAN _NAME	Varchar2	20	Not null
ADDRESS1	Varchar2	30	
ADDRESS2	Varchar2	30	
CITY	Varchar2	20	
PINCODE	Number	8	
STATE	Vachar2	20	
SAL_AMT	Number	8,2	Not null, cannot be 0
TGT_TO_GET	Number	6,2	Not null, cannot be 0
YTD _SALES	Number	6,2	Not null
REMARKS	Varchar2	20	

Table Name: SALES-ORDER
Description: Used to store client's orders

Column Name	Data Type	Size	Attribute
ORDER_ NO	Varchar2	6	Primary key and first letter must start with 'S'
CLIENT _NO	Varchar2	6	Foreign Key
ORDER _DATE	Date		
DELY _ADDRESS	Varchar2	25	
SALESMAN_ NO	Varchar2	6	Foreign Key
DELY _TYPE	Char	1	Delivery: part(p)/ full(f) and default 'F'
BILL_ YN	Char	1	
DELY_ DATE	Date		Can't be less than order date
ORDER _STATUS	Varchar2	10	Values ("In Process", " Fulfilled", "Back Order", "Cancelled.

Table Name: SALES_ORDER_DETAILS
Description: Used to store client's order with details of each product ordered.

Column Name	Data Type	Size	Attribute
ORDER _NO	Varchar2	6	Primary key references SALES_ORDER table
PRODUCT_ NO	Varchar2	6	Foreign Key references SALES_ORDER_table
QTY_ ORDERED	Number	8	
QTY_ DISP	Number	8	
PRODUCT _RATE	Number	10,2	Foreign Key

Solve the following queries by using above tables.

1. Retrieve the list of names, city and the state of all the clients.
2. List all the clients who are located in 'Mumbai' or 'Bangalore'.
3. List the various products available from the product_master table.
4. Find the names of sales man who have a salary equal to Rs.3000.
5. List the names of all clients having 'a' as the second letter in their names.
6. List all clients whose Bal due is greater than value 1000.
7. List the clients who stay in a city whose first letter is 'M'.
8. List all information from sales-order table for orders placed in the month of July.
9. List the products whose selling price is greater than 1000 and less than or equal to 3000.
10. Find the products whose selling price is greater than 1000 and also find the new selling price as original selling price 0.50.
11. Find the products in the sorted order of their description.
12. Find the products with description as '540HDD' and 'Pen drive'.
13. Count the total number of orders.
14. Print the description and total qty sold for each product.
15. Calculate the average qty sold for each client that has a maximum order value of 15,000.
16. Find all the products whose quantity on hand is less than reorder level.
17. List the order number and day on which clients placed their order.
18. Find out the products and their quantities that will have to deliver in the current month.
19. Find the names of clients who have placed orders worth of 10000 or more.
20. Find the client names who have placed orders before the month of June,2008.

Cycle-II

Aim: A manufacturing company deals with various parts and various suppliers supply these parts. It consists of three tables to record its entire information. Those are as follows.

Supplier (Supplier_No, Sname, City, status)
Part(Part_no, pname, color, weight, city, cost)
Shipment (supplier_No, Part_no, city)
JX(project_no, project_name, city)
SPJX (Supplier_no, part_no, project_no, city)

1. Get supplier numbers and status for suppliers in Chennai with status > 20.
2. Get project names for projects supplied by supplier S.
3. Get colors of parts supplied by supplier S_1.
4. Get part numbers for parts supplied to any project in Mumbai.
5. Find the id's of suppliers who supply a red or pink parts.
6. Find the pnames of parts supplied by London supplier and by no one else.
7. Get the names of the parts supplied by the supplier 'Mart' and 'Miller'.
8. Get supplier names for suppliers who do not supply part P_2.
9. Get all parirs of supplier numbers such that the suppliers concerned are "colocated".

10. Get suppliers names for the suppliers who supply at least one red part.

Cycle –III Employee Database

Aim: An enterprise wishes to maintain a database to automate its operations. Enterprise divided into a certain departments and each department consists of employees. The following two tables describes the automation schemas.

Emp(Empno, Ename, Job, Mgr, Hiredate, Sal, Comm, Deptno)
Dept(Deptno, Dname, Loc)

1. List the details of employees who have joined before the end of September' 81.
2. List the name of the employee and designation of the employee, who does not report to anybody.
3. List the name, salary and PF amount of all the employees (PF is calculated as 10% of salary)
4. List the names of employees who are more than 2 years old in the organization.
5. Determine the number of employees, who are taking commission.
6. Update the employee salary by 20% , whose experience is greater than 12 years.
7. Determine the department does not contain any employees.
8. Create a view, which contains employee name and their manager names working in sales department.
9. Determine the employees, whose total salary is like the minimum salary of any department.
10. List the department numbers and number of employees in each department.
11. Determine the employees, whose total salary is like the minimum salary of any department.
12. List average salary for all departments employing more than five people.
13. Determine the names of employees, who take highest salary in their departments.
14. Determine the names of employees, who earn more than their managers.
15. Display ename, dname, even if no employee belongs to that department (use outer join)

Cycle- IV
An Airline system would like to keep track their information by using the following relations.

FLIGHTS(fl_no: integer, from: string, to: string, distance: integer, price: integer)
AIRCRAFT(aid: integer, aname: string, cruising_range: integer)
CERTIFIED(eid: integer, aid: integer)
Employees(eid: integer, ename: string, salary: real)

Note that the employees relation describes pilots and other kinds of employees as well; every pilot is certified for aircraft and only pilots are certified to fly. Resolve the following queries.

1. Find the names of pilots whose salary is less than the price of the cheapest route from Newyork to Chicago.
2. For each pilot who is certified for more than 2 aircraft, find the eid's and the maximum cruising range of the aircraft that he or she certified for.
3. For all aircraft with cruising range over 1,500 miles, find the name of the aircraft and the average salary of all pilots certified for this aircraft.
4. Find the aid's of all aircraft than can be used from chicaga to LosAngels.
5. Find the name of the pilots certified from some Boeing aircraft.

6. Print the enames of pilots who can operate planes with cruising range greater than 3,500 miles, but are not certified by Boeing aircraft.
7. Find the eid's of employees who are certified for exactly 2 aircrafts.
8. Find the total amount paid to employees as salaries.
9. Find the aid's of all than can be used on non-stop flights from Chennai to Dubai.
10. Find the eid's of employee who make second highest salary.

PL/SQL PROGRAMS

1. Write a PL/SQL program to check the given number is strong or not.
2. Write a PL/SQL program to check the given string is palindrome or not.
3. Write a PL/SQL program to swap two numbers without using third variable.
4. Writ a PL/SQL program to generate multiplication tables for 2, 4, 6.
5. Write a PL/SQL program to check the given number is Amstrong or not.
6. Write a PL/SQL code to find the factorial of any number.
7. Write a PL/SQL program to display sum of even numbers and sum of odd numbers in the given range.
8. Write a PL/SQL program to check the given number is palindrome or not.
9. The HRD manager has decide to raise the employee salary by 15% write a PL/SQL block to accept the employee number and update the salary of that employee. Display appropriate message based on the existence of the record in Emp table.
10. Write a PL/SQL program to display to 10 rows in Emp table based on their job and salary.
11. Write a PL/SQL program to raise the employee salary by 10% for department number 30 people and also maintain the raised details in the raise table.
12. Write a procedure to update the salary of Employee, who are not getting commission by 10%.
13. Write a PL/SQL procedure to prepare an electricity bill by using following table.
    Table used: Elect

Name	Null?	Type
MNNO	NOT NULL	NUMBER(3)
CNAME		VARCHAR2(20)
CUR_READ		NUMBER(5)
PREV_READ		NUMBER(5)
NO_ UNITS		NUMBER(5)
AMOUNT		NUMBER(8,2)
SER_ TAX		NUMBER(8,2)
NET_AMT		NUMBER(9,2)

14. Write a PL/SQL program to prepare an telephone bill by using following table and print the monthly bills for each customer.

    Table used: Phone

Name	Null?	Type
TEL_NO	NOT NULL	NUMBER(6)
CNAME		VARCHAR2(20)
CITY		VARCHAR2(10)
PR_READ		NUMBER(5)
CUR_READ		NUMBER(5)
NET_AMT		NUMBER(5)
TOT-AMT		NUMBER(8,2)

15. Write a PL/SQL program to raise the employee salary by 10 %, who are completed ther 25 years of service and store the details at appropriate tables
    (Define the Retair_ Emp_Table)
16. Write a PL/SQL program to evaluate the grade of a student with following conditions:
    For pass: all marks > 40
    For I class: Total % > 59
    For II Class: Total % between >40 and < 60
    For III class: total % = 40
    And also maintain the details in abstract table.

1. Table STD

Name	Null?	Type
NO	NOT NULL	NUMBER
NAME		VARCHAR2(10)
INTNO		NUMBER
CLASS	NOT NULL	VARCHAR2(10)
M1		NUMBER
M2		NUMBER
M3		NUMBER
M4		NUMBER
M5		NUMBER

2.Table Abstract

Name	Null?	Type
STDNO		NUMBER
STDNAME		VARCHAR2(10)
CLASS		VARCHAR2(10)
MONTH		VARCHAR2(10)
INTNO (INTEGER NUMBER)		NUMBER
TOT		NUMBER
GRADE		VARCHAR2(10)
PERCENT		NUMBER
DAT_ENTER		DATE

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MODEL QUESTION PAPER

Time: 3 hours Marks: 75 marks

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer any five of the following questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks

PART – A

Answer any *Five* of the following question. (5X5=25M)

1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	

PART – B

Answer All The Questions. Each question carries 10 marks (5X10= 50M)

9.	(A) OR (B)
10.	(A) OR (B)
11.	(A) OR (B)
12.	(A) OR (B)
13.	(A) OR (B)