



ASSAM UNIVERSITY, SILCHAR

SYLLABUS UNDER

CHOICE BASED CREDIT SYSTEM

COMPUTER SCIENCE

(HONOURS)

TDC (CBCS) COURSE STRUCTURES
B.Sc. Computer Science (Honours)

Total Courses: - 26 Total Credits: - 148 Total Marks: - 2600

SEM	COURSES	CREDIT	L-T-P (Per Week)	CCA		ESE		TOTAL	
				FM	PM	FM	PM	FM	PM
I	CSC-C-101: Programming Fundamentals Using C/C++	4	4-0-0	20	8	50	20	70	28
	CSC-C-101-LAB: Programming Fundamentals Using C/C++	2	0-0-4	-	-	30	12	30	12
	CSC-C-102: Discrete Structures	6	5-1-0	30	12	70	28	100	40
	CSC-GE/DSC-101: Programming Fundamentals Using C/C++	4	4-0-0	20	8	50	20	70	28
	CSC-GE/DSC-101-LAB: Programming Fundamentals Using C/C++	2	0-0-4	-	-	30	12	30	12
II	CSC-C-201: Computer System Architecture	6	5-1-0	30	12	70	28	100	40
	CSC-C-202: Data Structures	4	4-0-0	20	8	50	20	70	28
	CSC-C-202-LAB: Data Structures	2	0-0-4	-	-	30	12	30	12
	CSC-GE/DSC-201: Computer System Architecture	6	5-1-0	30	12	70	28	100	40

SEM	COURSES	CREDIT	L-T-P (Per Week)	CCA		ESE		TOTAL	
				FM	PM	FM	PM	FM	PM
III	CSC-C-301: Programming in JAVA	4	4-0-0	20	8	50	20	70	28
	CSC-C-301-LAB: Programming in JAVA	2	0-0-4	-	-	30	12	30	12
	CSC-C-302: Computer Graphics	4	4-0-0	20	8	50	20	70	28
	CSC-C-302-LAB: Computer Graphics	2	0-0-4	-	-	30	12	30	12
	CSC-C-303: Operating Systems	6	5-1-0	30	12	70	28	100	40
	CSC-GE/DSC-301: Operating Systems	6	5-1-0	30	12	70	28	100	40
	CSC-SEC-301: UNIX/LINUX Programming	2	2-0-0	20	8	50	20	70	28
	CSC-SEC-301-LAB: UNIX/LINUX Programming	2	0-0-4	-	-	30	12	30	12
IV	CSC-C-401: Computer Networks	6	5-1-0	30	12	70	28	100	40
	CSC-C-402: Database Management Systems	4	4-0-0	20	8	50	20	70	28
	CSC-C-402-LAB: Database Management Systems	2	0-0-4	-	-	30	12	30	12
	CSC-C-403: Design and Analysis of Computer Algorithms	6	5-1-0	30	12	70	28	100	40
	CSC-GE/DSC-401: Database Management Systems	4	4-0-0	20	8	50	20	70	28
	CSC-GE/DSC-401-LAB: Database Management Systems	2	0-0-4	-	-	30	12	30	12
	CSC-SEC-401: Programming in Python	2	2-0-0	20	8	50	20	70	28
	CSC-SEC-301-LAB: Programming in Python	2	0-0-4	-	-	30	12	30	12

SEM	COURSES	CREDIT	L-T-P (Per Week)	CCA		ESE		TOTAL	
				FM	PM	FM	PM	FM	PM
V	CSC-C-501: Theory of Computation	6	5-1-0	30	12	70	28	100	40
	CSC-C-502: Internet Technologies	4	4-0-0	20	8	50	20	70	28
	CSC-C-502-LAB: Internet Technologies	2	0-0-4	-	-	30	12	30	12
	CSC-DSE-501: Numerical Methods	4	4-0-0	20	8	50	20	70	28
	CSC-DSE-501-LAB: Numerical Methods	2	0-0-4	-	-	30	12	30	12
	CSC-DSE-502: Network Programming	4	4-0-0	20	8	50	20	70	28
	CSC-DSE-502-LAB: Network Programming	2	0-0-4	-	-	30	12	30	12
VI	CSC-C-601: Artificial Intelligence	4	4-0-0	20	8	50	20	70	28
	CSC-C-601-LAB: Artificial Intelligence	2	0-0-4	-	-	30	12	30	12
	CSC-C-602: Software Engineering	6	5-1-0	30	12	70	28	100	40
	CSC-DSE-601: Information Security and Cyber Law	6	5-1-0	30	12	70	28	100	40
	CSC-DSE-602: Project/Dissertation	6	0-0-12	30	12	70	28	100	40

N.B: Compulsory papers:

- i. AECC1 – English Communication/MIL
- ii. AECC2 – Environment Studies

Computer Science Honours students can opt for Four papers of any one discipline listed below (GE 1 to GE4)

- i.** Mathematics **ii.** Physics **iii.** Statistics **iv.** Biotechnology

CCA – Continuous and Comprehensive Assessment (Internal Assessment), **ESE** – End Semester Examinations, **FM** – Full Marks, **PM** – Pass Marks

CSC- C-101
Programming Fundamentals using C/C++
(Credits: 04)
Full marks: 70 (External: 50; Sessional: 20)
Pass marks: 28 (External: 20; Sessional: 8)

This paper provides the fundamental concepts of programming using C/C++.

UNIT - I

Introduction to C and C++: History of C and C++, Overview of Procedural Programming and Object-Orientation Programming, Using main() function, Compiling and Executing Simple Programs in C++.

Data Types, Variables, Constants, Operators and Basic I/O: Declaring, Defining and Initializing Variables, Scope of Variables, Using Named Constants, Keywords, Data Types, Casting of Data Types, Operators (Arithmetic, Logical and Bitwise), Using Comments in programs, Character I/O (getc, getchar, putc, putchar etc), Formatted and Console I/O (printf(), scanf(), cin, cout), Using Basic Header Files (stdio.h, iostream.h, conio.h etc).

Expressions, Conditional Statements and Iterative Statements: Simple Expressions in C++ (including Unary Operator Expressions, Binary Operator Expressions), Understanding Operators Precedence in Expressions, Conditional Statements (if construct, switch-case construct), Understanding syntax and utility of Iterative Statements (while, do-while, and for loops), Use of break and continue in Loops, Using Nested Statements (Conditional as well as Iterative).

UNIT - II

Functions and Arrays: Utility of functions, Call by Value, Call by Reference, Functions returning value, Void functions, Inline Functions, Return data type of functions, Functions parameters, Differentiating between Declaration and Definition of Functions, Command Line Arguments/Parameters in Functions, Functions with variable number of Arguments. Creating and Using One Dimensional Arrays (Declaring and Defining an Array, Initializing an Array, Accessing individual elements in an Array, Manipulating array elements using loops), Use Various types of arrays (integer, float and character arrays / Strings) Two-dimensional Arrays (Declaring, Defining and Initializing Two Dimensional Array, Working with Rows and Columns), Introduction to Multi-dimensional arrays.

Derived Data Types (Structures and Unions): Understanding utility of structures and unions, Declaring, initializing and using simple structures and unions.

UNIT-III

Pointers and References in C++: Understanding a Pointer Variable, Simple use of Pointers (Declaring and Dereferencing Pointers to simple variables), Pointers to Pointers, Pointers to structures, Problems with Pointers, Passing pointers as function arguments, Returning a pointer from a function, using arrays as pointers, Passing arrays to functions. Pointers vs. References, Declaring and initializing references, Using references as function arguments and function return values.

Memory Allocation in C++: Differentiating between static and dynamic memory allocation, use of malloc, calloc and free functions, use of new and delete operators, storage of variables in static and dynamic memory allocation.

File I/O, Preprocessor Directives: Opening and closing a file (use of fstream header file, ifstream, ofstream and fstream classes), Reading and writing Text Files, Using put(), get(), read() and write() functions, Random access in files, Understanding the Preprocessor Directives (#include, #define, #error, #if, #else, #elif, #endif, #ifndef, #ifdef and #undef), Macros.

UNIT-IV

Using Classes in C++: Principles of Object-Oriented Programming, Defining & Using Classes, Class Constructors, Constructor Overloading, Function overloading in classes, Class Variables & Functions, Objects as parameters, specifying the Protected and Private Access, Copy Constructors

UNIT-V

Overview of Function Overloading and Operator Overloading: Need of Overloading functions and operators, Overloading functions by number and type of arguments, Looking at an operator as a function call, Overloading Operators (including assignment operators, unary operators).

Inheritance, Polymorphism and Exception Handling: Introduction to Inheritance (Multi-Level Inheritance, Multiple Inheritance), Polymorphism (Virtual Functions, Pure Virtual Functions), Basics Exceptional Handling (using catch and throw, multiple catch statements), Catching all exceptions, Restricting exceptions, Rethrowing exceptions.

Reference Books:-

1. Herbtz Schildt, "C++: The Complete Reference", Fourth Edition, McGraw Hill.2003.
2. Bjarne Stroustrup, "The C++ Programming Language", 4th Edition, Addison-Wesley , 2013.
3. Bjarne Stroustrup, "Programming -- Principles and Practice using C++", 2nd Edition, Addison-Wesley 2014.
4. E Balaguruswamy, "Object Oriented Programming with C++", Tata McGraw-Hill Education, 2008.
5. Paul Deitel, Harvey Deitel, "C++ How to Program", 8th Edition, Prentice Hall, 2011.
6. John R. Hubbard, "Programming with C++", Schaum's Series, 2nd Edition, 2000.
7. Andrew Koeni, Barbara, E. Moo, "Accelerated C++", Published by Addison-Wesley , 2000.
- 8 Harry, H. Chaudhary, "Head First C++ Programming: The Definitive Beginner's Guide", First Create space Inc, O-D Publishing, LLC USA.2014

CSC- C-101- LAB
Programming Fundamentals using C/C++
(Credits: 02)
Full marks: 30
Pass marks: 12

This paper provides the practical knowledge of programming using c/c++.

1. WAP to print the sum and product of digits of an integer.
2. WAP to reverse a number.
3. WAP to compute the sum of the first n terms of the following series
 $S = 1 + 1/2 + 1/3 + 1/4 + \dots$
4. WAP to compute the sum of the first n terms of the following series
 $S = 1 - 2 + 3 - 4 + 5 - \dots$
5. Write a function that checks whether a given string is Palindrome or not. Use this function to find whether the string entered by user is Palindrome or not.
6. Write a function to find whether a given no. is prime or not. Use the same to generate the prime numbers less than 100.
7. WAP to compute the factors of a given number.
8. Write a macro that swaps two numbers. WAP to use it.
9. WAP to print a triangle of stars as follows (take number of lines from user):

```
*
***
*****
*****
*****
```

10. WAP to perform following actions on an array entered by the user:
 - i) Print the even-valued elements
 - ii) Print the odd-valued elements
 - iii) Calculate and print the sum and average of the elements of array
 - iv) Print the maximum and minimum element of array
 - v) Remove the duplicates from the array
 - vi) Print the array in reverse orderThe program should present a menu to the user and ask for one of the options. The menu should also include options to re-enter array and to quit the program.
11. WAP that prints a table indicating the number of occurrences of each alphabet in the text entered as command line arguments.
12. Write a program that swaps two numbers using pointers.
13. Write a program in which a function is passed address of two variables and then alter its contents.
14. Write a program which takes the radius of a circle as input from the user, passes it to another function that computes the area and the circumference of the circle and displays the value of area and circumference from the main() function.
15. Write a program to find sum of n elements entered by the user. To write this program, allocate memory dynamically using malloc() / calloc() functions or new operator.
16. Write a menu driven program to perform following operations on strings:13

- a) Show address of each character in string
 - b) Concatenate two strings without using strcat function.
 - c) Concatenate two strings using strcat function.
 - d) Compare two strings
 - e) Calculate length of the string (use pointers)
 - f) Convert all lowercase characters to uppercase
 - g) Convert all uppercase characters to lowercase
 - h) Calculate number of vowels
 - i) Reverse the string
17. Given two ordered arrays of integers, write a program to merge the two-arrays to get an ordered array.
 18. WAP to display Fibonacci series (i) using recursion, (ii) using iteration
 19. WAP to calculate Factorial of a number (i) using recursion, (ii) using iteration
 20. WAP to calculate GCD of two numbers (i) with recursion (ii) without recursion.
 21. Create Matrix class using templates. Write a menu-driven program to perform following Matrix Operations (2-D array implementation):
 - a) Sum b) Difference c) Product d) Transpose
 22. Create the Person class. Create some objects of this class (by taking information from the user). Inherit the class Person to create two classes Teacher and Student class. Maintain the respective information in the classes and create, display and delete objects of these two classes (Use Runtime Polymorphism).
 23. Create a class Triangle. Include overloaded functions for calculating area. Overload assignment operator and equality operator.
 24. Create a class Box containing length, breath and height. Include following methods in it:
 - a) Calculate surface Area
 - b) Calculate Volume
 - c) Increment, Overload ++ operator (both prefix & postfix)
 - d) Decrement, Overload -- operator (both prefix & postfix)
 - e) Overload operator == (to check equality of two boxes), as a friend function
 - f) Overload Assignment operator
 - g) Check if it is a Cube or cuboid

Write a program which takes input from the user for length, breath and height to test the above class.
 25. Create a structure Student containing fields for Roll No., Name, Class, Year and Total Marks. Create 10 students and store them in a file.
 26. Write a program to retrieve the student information from file created in previous question and print it in following format:

Roll No. Name Marks
 27. Copy the contents of one text file to another file, after removing all whitespaces.
 28. Write a function that reverses the elements of an array in place. The function must accept only one pointer value and return void.

CSC- C-102
Discrete Structures
(Credits: 06)

Full marks: 100 (External: 70; Sessional: 30)

Pass marks: 40 (External: 28; Sessional: 12)

This paper provides the concepts of set, growth of function, recurrence, graph theory and propositional logic.

UNIT I

Introduction: Sets - finite and Infinite sets, uncountably Infinite Sets; functions, relations, Properties of Binary Relations, Closure, Partial Ordering Relations; counting - Pigeonhole Principle,

UNIT II

Growth of Functions: Asymptotic Notations, Summation approximation by Integrals formulas and properties, Bounding Summations,

UNIT III

Recurrences: Recurrence Relations, generating functions, Linear Recurrence Relations with constant coefficients and their solution, Substitution Method, Recurrence Trees, Master Theorem

UNIT IV

Graph Theory: Basic Terminology, Models and Types, multigraphs and weighted graphs, Graph Representation, Graph Isomorphism, Connectivity, Euler and Hamiltonian Paths and Circuits, Planar Graphs, Graph Coloring, Trees, Basic Terminology and properties of Trees, Introduction to Spanning Trees.

UNIT V

Propositional Logic: Logical Connectives, Well-formed Formulas, Tautologies, Equivalences, Inference Theory.

Reference Books:-

1. C.L. Liu , D.P. Mahopatra, Elements of Discrete mathematics, 2nd Edition , Tata McGraw Hill, 1985,
2. Kenneth Rosen, Discrete Mathematics and Its Applications, Sixth Edition, McGraw Hill 2006
3. T.H. Cormen, C.E. Leiserson, R. L. Rivest, Introduction to algorithms, 3rd edition Prentice Hall on India, 2009
4. M. O. Albertson and J. P. Hutchinson, Discrete Mathematics with Algorithms , John wiley Publication, 1988
5. J. L. Hein, Discrete Structures, Logic, and Computability, 3rd Edition, Jones and Bartlett Publishers, 2009
6. D.J. Hunter, Essentials of Discrete Mathematics, Jones and Bartlett Publishers, 2008

CSC- C-201
Computer System Architecture
(Credits: 06)

Full marks: 100 (External: 70; Sessional:30)
Pass marks: 40 (External: 28; Sessional: 12)

This paper provides the concepts of system architecture, organization of a computer & design, memory organization, input-output organization.

UNIT I

Introduction: Logic gates, boolean algebra, combinational circuits, circuit simplification, flip-flops and sequential circuits, decoders, multiplexers, registers, counters and memory units.

UNIT II

Data Representation and Basic Computer Arithmetic: Number systems, complements, fixed and floating point representation, character representation, addition, subtraction, magnitude comparison, multiplication and division algorithms for integers

UNIT III

Basic Computer Organization and Design: Computer registers, bus system, instruction set, timing and control, instruction cycle, memory reference, input-output and interrupt, Interconnection Structures, Bus Interconnection design of basic computer.

UNIT IV

Central Processing Unit: Register organization, arithmetic and logical micro-operations, stack organization, micro programmed control. Instruction formats, addressing modes, instruction codes, machine language, assembly language, input output programming, RISC, CISC architectures.

Memory Organization Cache memory, Associative memory, mapping.

UNIT V

Input-Output Organization: Input / Output: External Devices, I/O Modules, Programmed I/O, Interrupt-Driven I/O, Direct Memory Access, I/O Channels.

Recommended Books:

1. M. Mano, Computer System Architecture, Pearson Education 1992
2. A. J. Dos Reis, Assembly Language and Computer Architecture using C++ and JAVA, Course Technology, 2004th
3. W. Stallings, Computer Organization and Architecture Designing for Performance, 8 Edition, Prentice Hall of India, 2009
4. M.M. Mano , Digital Design, Pearson Education Asia, 2013.
5. Carl Hamacher, Computer Organization, Fifth edition, McGrawHill, 2012.

CSC- C-202
Data Structures
(Credits: 04)

Full marks: 70 (External: 50; Sessional: 20)
Pass marks: 28 (External: 20; Sessional: 8)

This paper provides the concepts of arrays, stacks, linked lists, queues, recursion, trees, hashing, searching & sorting and their representation in computer memory.

UNIT I

Arrays: Single and Multi-dimensional Arrays, Sparse Matrices (Array and Linked Representation).

Stacks: Implementing single / multiple stack/s in an Array; Prefix, Infix and Postfix expressions, Utility and conversion of these expressions from one to another; Applications of stack; Limitations of Array representation of stack.

UNIT II

Linked Lists: Singly, Doubly and Circular Lists (Array and Linked representation); Normal and Circular representation of Stack and Linked Lists.

Queues: Array and Linked representation of Queue, De-queue, Priority Queues

UNIT III

Recursion: Developing Recursive Definition of Simple Problems and their implementation; Advantages and Limitations of Recursion; Understanding what goes behind Recursion (Internal Stack Implementation)

Trees: Introduction to Tree as a data structure; Binary Trees (Insertion, Deletion, Recursive and Iterative Traversals on Binary Search Trees); Threaded Binary Trees (Insertion, Deletion, Traversals); Height-Balanced Trees (Various operations on AVL Trees).

UNIT IV

Searching and Sorting: Linear Search, Binary Search, Comparison of Linear and Binary Search, Selection Sort, Insertion Sort, Insertion Sort, Shell Sort, and Comparison of Sorting Techniques.

UNIT V

Hashing: Introduction to Hashing, Deleting from Hash Table, Efficiency of Rehash Methods, Hash Table Reordering, Resolving collusion by Open Addressing,

Reference Books:

1. Adam Drozdek, "Data Structures and algorithm in C++", Third Edition, Cengage Learning, 2012.
2. SartajSahni, Data Structures, "Algorithms and applications in C++", Second Edition, Universities Press, 2011.
3. Aaron M. Tenenbaum, Moshe J. Augenstein, YedidyahLangsam, "Data Structures Using C and C++", Second edition, PHI, 2009.

4. Robert L. Kruse, "Data Structures and Program Design in C++", Pearson, 1999.
5. D.S Malik, Data Structure using C++, Second edition, Cengage Learning, 2010.
6. Mark Allen Weiss, "Data Structures and Algorithms Analysis in Java", Pearson Education, 3rd edition, 2011
7. Aaron M. Tenenbaum, Moshe J. Augenstein, YedidyahLangsam, "Data Structures Using Java, 2003.
8. Robert Lafore, "Data Structures and Algorithms in Java, 2/E", Pearson/ Macmillan Computer Pub, 2003
9. John Hubbard, "Data Structures with JAVA", McGraw Hill Education (India) Private Limited; 2 edition, 2009
10. Goodrich, M. and Tamassia, R. "Data Structures and Algorithms Analysis in Java", 4th Edition, Wiley, 2013
11. Herbert Schildt, "Java The Complete Reference (English) 9th Edition Paperback", Tata McGraw Hill, 2014.
12. D. S. Malik, P.S. Nair, "Data Structures Using Java", Course Technology, 2003.

CSC- C-202- LAB

Data Structures (Credits: 02)

Full marks: 30

Pass marks: 12

This paper provides the practical knowledge of different operations of Data Structures.

1. Write a program to search an element from a list. Give user the option to perform Linear or Binary search. Use Template functions.
2. WAP using templates to sort a list of elements. Give user the option to perform sorting using Insertion sort, Bubble sort or Selection sort.
3. Implement Linked List using templates. Include functions for insertion, deletion and search of a number, reverse the list and concatenate two linked lists (include a function and also overload operator +).
4. Implement Doubly Linked List using templates. Include functions for insertion, deletion and search of a number, reverse the list.
5. Implement Circular Linked List using templates. Include functions for insertion, deletion and search of a number, reverse the list.
6. Perform Stack operations using Linked List implementation.
7. Perform Stack operations using Array implementation. Use Templates.
8. Perform Queues operations using Circular Array implementation. Use Templates.
9. Create and perform different operations on Double-ended Queues using Linked List implementation.
10. WAP to scan a polynomial using linked list and add two polynomial.
11. WAP to calculate factorial and to compute the factors of a given no. (i) using recursion, (ii) using iteration
12. (ii) WAP to display fibonacci series (i) using recursion, (ii) using iteration
13. WAP to calculate GCD of 2 number (i) with recursion (ii) without recursion
14. WAP to create a Binary Search Tree and include following operations in tree: (a) Insertion (Recursive and Iterative Implementation)
(b) Deletion by copying (c) Deletion by Merging

- (d) Search a no. in BST
- (e) Display its preorder, postorder and inorder traversals Recursively
- (f) Display its preorder, postorder and inorder traversals Iteratively
- (g) Display its level-by-level traversals
- (h) Count the non-leaf nodes and leaf nodes
- (i) Display height of tree
- (j) Create a mirror image of tree
- (k) Check whether two BSTs are equal or not
- 15. WAP to convert the Sparse Matrix into non-zero form and vice-versa.
- 16. WAP to reverse the order of the elements in the stack using additional stack.
- 17. WAP to reverse the order of the elements in the stack using additional Queue.
- 18. WAP to implement Diagonal Matrix using one-dimensional array.
- 19. WAP to implement Lower Triangular Matrix using one-dimensional array.
- 20. WAP to implement Upper Triangular Matrix using one-dimensional array.
- 21. WAP to implement Symmetric Matrix using one-dimensional array.
- 22. WAP to create a Threaded Binary Tree as per inorder traversal, and implement operations like finding the successor / predecessor of an element, insert an element, inorder traversal.
- 23. WAP to implement various operations on AVL Tree.

CSC- C-301
Programming in Java
(Credits: 04)

Full marks: 70 (External: 50; Sessional: 20)
Pass marks: 28 (External: 20; Sessional: 8)

This paper provides the programming concepts of Java.

UNIT I

Introduction to Java : Java Architecture and Features, Understanding the semantic and syntax differences between C++ and Java, Compiling and Executing a Java Program, Variables, Constants, Keywords Data Types, Operators (Arithmetic, Logical and Bitwise) and Expressions, Comments, Doing Basic Program Output, Decision Making Constructs (conditional statements and loops) and Nesting, Java Methods (Defining, Scope, Passing and Returning Arguments, Type Conversion and Type and Checking, Built-in Java Class Methods),

UNIT II

Arrays, Strings and I/O: Creating & Using Arrays (One Dimension and Multi-dimensional), Referencing Arrays Dynamically, Java Strings: The Java String class, Creating & Using String Objects, Manipulating Strings, String Immutability & Equality, Passing Strings To & From Methods, String Buffer Classes. Simple I/O using System.out and the Scanner class, Byte and Character streams, Reading/Writing from console and files.

Object-Oriented Programming Overview: Principles of Object-Oriented Programming, Defining & Using Classes, Controlling Access to Class Members, Class Constructors, Method Overloading, Class Variables & Methods, Objects as parameters, final classes, Object class, Garbage Collection.

UNIT III

Inheritance, Interfaces, Packages, Enumerations, Autoboxing and Metadata: Inheritance: (Single Level and Multilevel, Method Overriding, Dynamic Method Dispatch, Abstract Classes), Interfaces and Packages, Extending interfaces and packages, Package and Class Visibility, Using Standard Java Packages (util, lang, io, net), Wrapper Classes, Autoboxing/Unboxing, Enumerations and Metadata.

UNIT IV

Exception Handling, Threading, Networking and Database Connectivity: Exception types, uncaught exceptions, throw, built-in exceptions, Creating your own exceptions; Multi-threading: The Thread class and Runnable interface, creating single and multiple threads, Thread, Accessing and manipulating databases using JDBC.

UNIT V

Applets and Event Handling: Java Applets: Introduction to Applets, Writing Java Applets, Working with Graphics, Incorporating Images & Sounds. Event Handling Mechanisms, Listener Interfaces, Adapter and Inner Classes. The design and Implementation of GUIs using the AWT controls, Swing components of Java Foundation Classes such as labels, buttons, textfields, layout managers, menus, events and listeners; Graphic objects for drawing figures such as lines, rectangles, ovals, using different fonts. Overview of servlets.

Reference Books

1. Ken Arnold, James Gosling, David Holmes, "The Java Programming Language", 4th Edition, 2005.
2. James Gosling, Bill Joy, Guy L Steele Jr, Gilad Bracha, Alex Buckley "The Java Language Specification, Java SE 8 Edition (Java Series)", Published by Addison Wesley, 2014.
3. Joshua Bloch, "Effective Java" 2nd Edition, Publisher: Addison-Wesley, 2008.
4. Cay S. Horstmann, Gary Cornell, "Core Java 2 Volume 1 ,9th Edition, Printice Hall.2012
5. Cay S. Horstmann, Gary Cornell, "Core Java 2 Volume 2 - Advanced Features)", 9th Edition, Printice Hall.2013
6. Bruce Eckel, "Thinking in Java", 3rd Edition, PHI, 2002.
7. E. Balaguruswamy, "Programming with Java", 4th Edition, McGraw Hill.2009.
8. Paul Deitel, Harvey Deitel, "Java: How to Program", 10th Edition, Prentice Hall, 2011.
9. "Head First Java", Orielly Media Inc. 2nd Edition, 2005.
10. David J. Eck, "Introduction to Programming Using Java", Published by CreateSpace Independent Publishing Platform, 2009.
11. John R. Hubbard, "Programming with JAVA", Schaum's Series, 2nd Edition, 2004.

CSC- C-301- LAB
Programming in JAVA
(Credits: 02)
Full marks: 30
Pass marks: 12

This paper provides the practical knowledge of programming in Java.

1. To find the sum of any number of integers entered as command line arguments
2. To find the factorial of a given number
3. To learn use of single dimensional array by defining the array dynamically.
4. To learn use of length in case of a two dimensional array
5. To convert a decimal to binary number
6. To check if a number is prime or not, by taking the number as input from the keyboard
7. To find the sum of any number of integers interactively, i.e., entering every number from the keyboard, whereas the total number of integers is given as a command line argument
8. Write a program that show working of different functions of String and StringBuffer classes like setCharAt(), setLength(), append(), insert(), concat() and equals().
9. Write a program to create a —distance class with methods where distance is computed in terms of feet and inches, how to create objects of a class and to see the use of this pointer
10. Modify the —distance class by creating constructor for assigning values (feet and inches) to the distance object. Create another object and assign second object as reference variable to another object reference variable. Further create a third object which is a clone of the first object.
11. Write a program to show that during function overloading, if no matching argument is found, then java will apply automatic type conversions (from lower to higher data type).
12. Write a program to show the difference between public and private access specifiers. The program should also show that primitive data types are passed by value and objects are passed by reference and to learn use of final keyword.
13. Write a program to show the use of static functions and to pass variable length arguments in a function.
14. Write a program to demonstrate the concept of boxing and unboxing.
15. Create a multi-file program where in one file a string message is taken as input from the user and the function to display the message on the screen is given in another file (make use of Scanner package in this program).
16. Write a program to create a multilevel package and also creates a reusable class to generate Fibonacci series, where the function to generate Fibonacci series is given in a different file belonging to the same package.
17. Write a program that creates illustrates different levels of protection in classes/subclasses belonging to same package or different packages.
18. Write a program —DivideByZero that takes two numbers a and b as input, computes a/b, and invokes Arithmetic Exception to generate a message when the denominator is zero.
19. Write a program to show the use of nested try statements that emphasizes the sequence of checking for catch handler statements.
20. Write a program to create your own exception types to handle situation specific to your application (Hint: Define a subclass of Exception which itself is a subclass of Throwable).
21. Write a program to demonstrate priorities among multiple threads.

22. Write a program to demonstrate multithread communication by implementing synchronization among threads (Hint: you can implement a simple producer and consumer problem).
23. Write a program to create URL object, create a URLConnection using the openConnection() method and then use it to examine the different components of the URL and content.
24. Write a program to implement a simple datagram client and server in which a message that is typed into the server window is sent to the client side where it is displayed.
25. Write a program that creates a Banner and then creates a thread to scroll the message in the banner from left to right across the applet's window.
26. Write a program to get the URL/location of code (i.e. java code) and document (i.e. html file).
27. Write a program to demonstrate different mouse handling events like mouseClicked(), mouseEntered(), mouseExited(), mousePressed(), mouseReleased() and mouseDragged().
28. Write a program to demonstrate different keyboard handling events.
29. Write a program to generate a window without an applet window using main() function.
30. Write a program to demonstrate the use of push buttons.

CSC- C-302
Computer Graphics
(Credits: 04)

Full marks: 70 (External: 50; Sessional: 20)

Pass marks: 28 (External: 20; Sessional: 8)

This paper provides the basic concepts of Computer Graphics.

UNIT I

Introduction: Basic elements of Computer graphics, Applications of Computer Graphics.

Graphics Hardware: Architecture of Raster and Random scan display devices, input/output devices.

UNIT II

Fundamental Techniques in Graphics: Raster scan line, circle and ellipse drawing, thick primitives, Polygon filling, line and polygon clipping algorithms,

UNIT III

Transformation & Projection: 2D and 3D Geometric Transformations, 2D and 3D Viewing Transformations (Projections- Parallel and Perspective),.

UNIT IV

Geometric Modeling: Representing curves & Surfaces.

Visible Surface determination: Hidden surface elimination.

UNIT V

Surface rendering: Illumination and shading models. Basic color models and Computer Animation.

Books Recommended:

1. J.D.Foley, A.Van Dam, Feiner, Hughes Computer Graphics Principles & Practice 2nd edition Publication Addison Wesley 1990.
2. D.Hearn, Baker: Computer Graphics, Prentice Hall of India 2008.
3. D.F.Rogers Procedural Elements for Computer Graphics, McGraw Hill 1997.
4. D.F.Rogers, Adams Mathematical Elements for Computer Graphics, McGraw Hill 2nd edition 1989.

**CSC- C-302- LAB:
Computer Graphics
(Credits: 02)**

Full marks: 30

Pass marks: 12

This paper provides the practical knowledge of Computer Graphics.

1. Write a program to implement Bresenham's line drawing algorithm.
2. Write a program to implement mid-point circle drawing algorithm.
3. Write a program to clip a line using Cohen and Sutherland line clipping algorithm.
4. Write a program to clip a polygon using Sutherland Hodgeman algorithm.
5. Write a program to apply various 2D transformations on a 2D object (use homogenous coordinates).
6. Write a program to apply various 3D transformations on a 3D object and then apply parallel and perspective projection on it.
7. Write a program to draw Hermite/Bezier curve.

**CSC- C-303:
Operating Systems
(Credits: 06)**

Full marks: 100 (External: 70; Sessional: 30)

Pass marks: 40 (External: 28; Sessional: 12)

This paper provides the basic concepts of Operating System and its different functions.

UNIT I

Introduction: Basic OS functions, resource abstraction, types of operating systems—multiprogramming systems, batch systems, time sharing systems; operating systems for personal computers & workstations, process control & real time systems.

Operating System Organization: Processor and user modes, kernels, system calls and system programs.

UNIT II

Process Management: System view of the process and resources, process abstraction, process hierarchy, threads, threading issues, thread libraries; Process Scheduling, non-pre-emptive and pre-emptive scheduling algorithms.

UNIT III

Process Coordination: Synchronization, concurrent processes, critical section, semaphores, methods for inter-process communication; deadlocks.

UNIT IV

Memory Management: Physical and virtual address space; memory allocation strategies -fixed and variable partitions, paging, segmentation, virtual memory

UNIT V

File and I/O Management: Directory structures, file operations, file allocation methods, device management.

Protection and Security: Policy mechanism, Authentication, Internal access Authorization.

Recommended Books:

1. A Silberschatz, P.B. Galvin, G. Gagne, Operating Systems Concepts, 8th Edition, John Wiley Publications 2008.
2. A.S. Tanenbaum, Modern Operating Systems, 3rd Edition, Pearson Education 2007.
3. G. Nutt, Operating Systems: A Modern Perspective, 2nd Edition Pearson Education 1997.
4. W. Stallings, Operating Systems, Internals & Design Principles , 5th Hall of India. 2008. Edition, Prentice.
5. M. Milenkovic, Operating Systems- Concepts and design, Tata McGraw Hill 1992.

CSC-SEC-301

UNIX/ LINUX Programming

(Credit: 02)

Full marks: 70 (External: 50; Sessional: 20)

Pass marks: 28 (External: 20; Sessional: 8)

This paper provides the concepts of UNIX/LINUX programming.

UNIT I

Introduction:

What are Linux/Unix Operating Systems?

Difference between Linux/Unix and other operating systems, Features and Architecture

Various Distributions available in the market, Installation, Booting and shutdown process

UNIT II

Introduction: System processes (an overview), External and internal commands

Creation of partitions in OS

Processes and its creation phases – Fork, Exec, wait

UNIT III

User Management and the File System

Types of Users, Creating users, Granting rights, User management commands
File quota and various file systems available
File System Management and Layout, File permissions
Login process, Managing Disk Quotas, Links (hard links, symbolic links)

UNIT IV

Shell: introduction & Shell Scripting

What is shell and various type of shell, Various editors present in linux , Different modes of operation in vi editor
What is shell script, Writing and executing the shell script
Shell variable (user defined and system variables)

UNIT V

Shell Scripting

System calls, Using system calls, Pipes and Filters
Decision making in Shell Scripts (If else, switch), Loops in shell, Functions
Utility programs (cut, paste, join, tr , uniq utilities), Pattern matching utility (grep)

Reference Books:

1. Sumitabha, Das, Unix Concepts And Applications, Tata McGraw-Hill Education, 2006.
2. Michael Jang RHCSA/ RHCE Red Hat Linux Certification: Exams (Ex200 & Ex300) (Certification Press), 2011.
3. Nemeth Synder & Hein, Linux Administration Handbook, Pearson Education, 2nd Edition ,2010.
4. W. Richard Stevens, Bill Fenner, Andrew M. Rudoff, Unix Network Programming, The sockets Networking API, Vol. 1, 3rd Edition,2014

CSC-SEC-301-LAB

UNIX/ LINUX Programming

(Credit: 02)

Full marks: 30

Pass marks: 12

This paper provides the practical knowledge of UNIX/LINUX programming.

1. Write a shell script to check if the number entered at the command line is prime or not.
2. Write a shell script to modify —call command to display calendars of the specified months.
3. Write a shell script to modify —call command to display calendars of the specified range of months.
4. Write a shell script to accept a login name. If not a valid login name display message —Entered login name is invalid.
5. Write a shell script to display date in the mm/dd/yy format.

6. Write a shell script to display on the screen sorted output of `—who` command along with the total number of users.
7. Write a shell script to display the multiplication table any number,
8. Write a shell script to compare two files and if found equal asks the user to delete the duplicate file.
9. Write a shell script to find the sum of digits of a given number.
10. Write a shell script to merge the contents of three files, sort the contents and then display them page by page.
11. Write a shell script to find the LCD(least common divisor) of two numbers.
12. Write a shell script to perform the tasks of basic calculator.
13. Write a shell script to find the power of a given number.
14. Write a shell script to find the binomial coefficient $C(n, x)$.
15. Write a shell script to find the permutation $P(n, x)$.
16. Write a shell script to find the greatest number among the three numbers.
17. Write a shell script to find the factorial of a given number.
18. Write a shell script to check whether the number is Armstrong or not.
19. Write a shell script to check whether the file have all the permissions or not.

CSC- C-401
Computer Networks
(Credits: 06)

Full marks: 100 (External: 70; Sessional: 30)
Pass marks: 40 (External: 28; Sessional: 12)

This paper provides the basic concepts of networks and functions of different OSI reference model.

UNIT I

Introduction to Computer Networks: Network definition; network topologies; network classifications; network protocol; layered network architecture; overview of OSI reference model; overview of TCP/IP protocol suite.

Data Communication Fundamentals and Techniques: Analog and digital signal; data-rate limits; digital to digital line encoding schemes; pulse code modulation; parallel and serial transmission; digital to analog modulation-; multiplexing techniques- FDM, TDM; transmission media.

UNIT II

Networks Switching Techniques and Access mechanisms: Circuit switching; packet switching- connectionless datagram switching, connection-oriented virtual circuit switching; dial-up modems; digital subscriber line; cable TV for data transfer.

UNIT III

Data Link Layer Functions and Protocol: Error detection and error correction techniques; data-link control- framing and flow control; error recovery protocols- stop and wait ARQ, go-back-n ARQ; Point to Point Protocol on Internet.

Multiple Access Protocol and Networks: CSMA/CD protocols; Ethernet LANS; connecting LAN and back-bone networks- repeaters, hubs, switches, bridges, router and gateways;

UNIT IV

Networks Layer Functions and Protocols: Routing; routing algorithms; network layer protocol of Internet- IP protocol, Internet control protocols.

UNIT V

Transport Layer Functions and Protocols : Transport services- error and flow control, Connection establishment and release- three way handshake;

Overview of Application layer protocol: Overview of DNS protocol; overview of WWW & HTTP protocol.

Reference Books

1. B. A. Forouzan: Data Communications and Networking, Fourth edition, THM ,2007.
2. A. S. Tanenbaum: Computer Networks, Fourth edition, PHI , 2002

CSC- C-402

Database Management Systems

(Credits: 04)

Full marks: 70 (External: 50; Sessional: 20)

Pass marks: 28 (External: 20; Sessional: 8)

This paper provides the concepts of database management, ER modeling, data model, database design, transaction processing, file structure & indexing.

UNIT I

Introduction: Characteristics of database approach, data models, database system architecture and data independence.

Entity Relationship(ER) Modeling: Entity types, relationships, constraints.

UNIT II

Relation data model: Relational model concepts, relational constraints, relational algebra, SQL queries

UNIT III

Database design: Mapping ER/EER model to relational database, functional dependencies, Lossless decomposition, Normal forms (upto BCNF).

UNIT IV

Transaction Processing: ACID properties, concurrency control

UNIT V

File Structure and Indexing: Operations on files, File of Unordered and ordered records, overview of File organizations, Indexing structures for files (Primary index, secondary index, clustering index), Multilevel indexing using B and B+ trees.

Books Recommended:

1. R. Elmasri, S.B. Navathe, Fundamentals of Database Systems 6th Edition, Pearson Education, 2010.
2. R. Ramakrishnan, J. Gehrke, Database Management Systems 3rd Edition, McGraw-Hill, 2002.
3. A. Silberschatz, H.F. Korth, S. Sudarshan, Database System Concepts 6th Edition, McGraw Hill, 2010.
4. R. Elmasri, S.B. Navathe Database Systems Models, Languages, Design and application Programming, 6th Edition, Pearson Education, 2013.

CSC- C-403- LAB
Database Management Systems
(Credits: 02)
Full marks: 30
Pass marks: 12

This paper provides the practical knowledge of Database Management Systems.

1. Create and use the following database schema to answer the given queries.

EMPLOYEE Schema

Field	Type	NULL KEY		DEFAULT
Eno	Char(3)	NO	PRI	NIL
Ename	Varchar(50)	NO		NIL
Job_type	Varchar(50)	NO		NIL
Manager	Char(3)	Yes	FK	NIL
Hire_date	Date	NO		NIL
Dno	Integer	YES	FK	NIL
Commission	Decimal(10,2)	YES		NIL
Salary	Decimal(7,2)	NO		NIL

DEPARTMENT Schema

Field	Type	NULL KEY	DEFAULT
Dno	Integer	No PRI	NULL
Dname	Varchar(50)	Yes	NULL

Query List

1. Query to display Employee Name, Job, Hire Date, Employee Number; for each employee with the Employee Number appearing first.
2. Query to display unique Jobs from the Employee Table.
3. Query to display the Employee Name concatenated by a Job separated by a comma.
4. Query to display all the data from the Employee Table. Separate each Column by a comma and name the said column as THE_OUTPUT.
5. Query to display the Employee Name and Salary of all the employees earning more than \$2850.
6. Query to display Employee Name and Department Number for the Employee No= 7900.
7. Query to display Employee Name and Salary for all employees whose salary is not in the range of \$1500 and \$2850.
8. Query to display Employee Name and Department No. of all the employees in Dept 10 and Dept 30 in the alphabetical order by name.
9. Query to display Name and Hire Date of every Employee who was hired in 1981.
10. Query to display Name and Job of all employees who don't have a current Manager.
11. Query to display the Name, Salary and Commission for all the employees who earn commission.
12. Sort the data in descending order of Salary and Commission.
13. Query to display Name of all the employees where the third letter of their name is _A'.
14. Query to display Name of all employees either have two _R's or have two _A's in their name and are either in Dept No = 30 or their Manger's Employee No = 7788.
15. Query to display Name, Salary and Commission for all employees whose Commission Amount is 14 greater than their Salary increased by 5%.
16. Query to display the Current Date.
17. Query to display Name, Hire Date and Salary Review Date which is the 1st Monday after six months of employment.
18. Query to display Name and calculate the number of months between today and the date each employee was hired.
19. Query to display the following for each employee <E-Name> earns < Salary> monthly but wants < 3 * Current Salary >. Label the Column as Dream Salary.
20. Query to display Name with the 1st letter capitalized and all other letter lower case and length of their name of all the employees whose name starts with _J', 'A' and _M'.
21. Query to display Name, Hire Date and Day of the week on which the employee started.
22. Query to display Name, Department Name and Department No for all the employees.
23. Query to display Unique Listing of all Jobs that are in Department # 30.
24. Query to display Name, Dept Name of all employees who have an _A' in their name.
25. Query to display Name, Job, Department No. And Department Name for all the employees working at the Dallas location.
26. Query to display Name and Employee no. Along with their Manger's Name and the Manager's employee no; along with the Employees' Name who do not have a Manager.
27. Query to display Name, Dept No. And Salary of any employee whose department No. and salary matches both the department no. And the salary of any employee who earns a commission.

28. Query to display Name and Salaries represented by asterisks, where each asterisk (*) signifies \$100.
29. Query to display the Highest, Lowest, Sum and Average Salaries of all the employees
30. Query to display the number of employees performing the same Job type functions.
31. Query to display the no. of managers without listing their names.
32. Query to display the Department Name, Location Name, No. of Employees and the average salary for all employees in that department.
33. Query to display Name and Hire Date for all employees in the same dept. as Blake.
34. Query to display the Employee No. And Name for all employees who earn more than the average salary.
35. Query to display Employee Number and Name for all employees who work in a department with any employee whose name contains a '_T'.
36. Query to display the names and salaries of all employees who report to King.
37. Query to display the department no, name and job for all employees in the Sales department.

CSC- C-403

Design and Analysis of Algorithms

(Credits: 06)

Full marks: 100 (External: 70; Sessional: 30)

Pass marks: 40 (External: 28; Sessional: 12)

This paper provides the concepts of algorithm design techniques, sorting and searching techniques, lower bound techniques, balance trees, graphs and string processing techniques.

UNIT I

Introduction: Basic Design and Analysis techniques of Algorithms, Correctness of Algorithm.

Algorithm Design Techniques: Iterative techniques, Divide and Conquer, Dynamic Programming, Greedy Algorithms.

UNIT II

Sorting and Searching Techniques: Elementary sorting techniques–Bubble Sort, Insertion Sort, Merge Sort, Advanced Sorting techniques - Heap Sort, Quick Sort, Sorting in Linear Time - Bucket Sort, Radix Sort and Count Sort, Searching Techniques, Medians & Order Statistics, complexity analysis;

UNIT III

Lower Bounding Techniques: Decision Trees

Balanced Trees: Red-Black Trees

UNIT IV

Advanced Analysis Technique: Amortized analysis

String Processing: String Matching, KMP Technique

UNIT V

Graphs: Graph Algorithms–Breadth First Search, Depth First Search and its Applications, Minimum Spanning Trees.

Recommended Books:

1. T.H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein Introduction to Algorithms, PHI, 3rd Edition 2009
2. Sarabasse & A.V. Gelder Computer Algorithm – Introduction to Design and Analysis, Publisher – Pearson 3rd Edition 1999

CSC-SEC-401

Python Programming

(Credit: 02)

Full marks: 70 (External: 50; Sessional: 20)

Pass marks: 28 (External: 20; Sessional: 8)

This paper provides the concepts of Python Programming.

UNIT I

Planning the Computer Program: Concept of problem solving, Problem definition, Program design, Debugging, Types of errors in programming, Documentation.

Techniques of Problem Solving: Flowcharting, decision table, algorithms, Structured programming concepts, Programming methodologies viz. top-down and bottom-up programming.

Overview of Programming: Structure of a Python Program, Elements of Python

UNIT II

Introduction to Python: Python Interpreter, Using Python as calculator, Python shell, Indentation. Atoms, Identifiers and keywords, Literals, Strings, Operators (Arithmetic operator, Relational operator, Logical or Boolean operator, Assignment, Operator, Ternary operator, Bit wise operator, Increment or Decrement operator).

UNIT III

Creating Python Programs: Input and Output Statements, Control statements (Branching, Looping, Conditional Statement, Exit function, Difference between break, continue and pass.), Defining Functions, default arguments, Errors and Exceptions

UNIT IV

Iteration and Recursion: Conditional execution, Alternative execution, Nested conditionals, The return statement, Recursion, Stack diagrams for recursive functions, Multiple assignment, The while statement, Tables, Two-dimensional tables Strings and Lists: String as a compound

data type, Length, Traversal and the for loop, String slices, String comparison, A find function, Looping and counting, List values, Accessing elements, List length, List membership, Lists and for loops, List operations, List deletion. Cloning lists, Nested lists

UNIT V

Object Oriented Programming: Introduction to Classes, Objects and Methods, Standard Libraries.

Data Structures: Arrays, list, set, stacks and queues.

Searching and Sorting: Linear and Binary Search, Bubble, Selection and Insertion Sorting

Reference Books :-

1. T. Budd, Exploring Python, TMH, 1st Ed, 2011
2. Python Tutorial/Documentation www.python.org 2015
3. Allen Downey, Jeffrey Elkner, Chris Meyers , How to think like a computer scientist : learning with Python , Freely available online.2012
4. <http://docs.python.org/3/tutorial/index.html>
5. <http://interactivepython.org/courselib/static/pythonds>
6. <http://www.ibiblio.org/g2swap/byteofpython/read/>

CSC-SEC-401-LAB

Python Programming

(Credit: 02)

Full marks: 30

Pass marks: 12

This paper provides the practical knowledge of python & visual python.

Practical: Software Lab using Python

Section: A (Simple programs)

1. Write a menu driven program to convert the given temperature from Fahrenheit to Celsius and vice versa depending upon user's choice.
2. WAP to calculate total marks, percentage and grade of a student. Marks obtained in each of the three subjects are to be input by the user. Assign grades according to the following criteria :
Grade A: Percentage ≥ 80
Grade B: Percentage ≥ 70 and < 80
Grade C: Percentage ≥ 60 and < 70
Grade D: Percentage ≥ 40 and < 60
Grade E: Percentage < 40
3. Write a menu-driven program, using user-defined functions to find the area of rectangle, square, circle and triangle by accepting suitable input parameters from user.
4. WAP to display the first n terms of Fibonacci series.
5. WAP to find factorial of the given number.
6. WAP to find sum of the following series for n terms: $1 - 2/2! + 3/3! - \dots - n/n!$

7. WAP to calculate the sum and product of two compatible matrices.

Section: B (Visual Python):

All the programs should be written using user defined functions, wherever possible.

1. Write a menu-driven program to create mathematical 3D objects

I. curve II. Sphere

III. Cone IV. Arrow

V. ring VI. Cylinder.

2. WAP to read n integers and display them as a histogram.

3. WAP to display sine, cosine, polynomial and exponential curves.

4. WAP to plot a graph of people with pulse rate p vs. height h. The values of p and h are to be entered by the user.

5. WAP to calculate the mass m in a chemical reaction. The mass m (in gms) disintegrates according to the formula $m=60/(t+2)$, where t is the time in hours. Sketch a graph for t vs. m, where $t \geq 0$.

6. A population of 1000 bacteria is introduced into a nutrient medium. The population p grows as follows:

$$P(t) = (15000(1+t))/(15 + e^t)$$

where the time t is measured in hours. WAP to determine the size of the population at given time t and plot a graph for P vs t for the specified time interval.

7. Input initial velocity and acceleration, and plot the following graphs depicting equations of motion:

I. velocity wrt time ($v=u+at$)

II. distance wrt time ($s=u*t+0.5*a*t*t$) III. distance wrt velocity ($s=(v*v-u*u)/2*a$)

CSC- C-501

Theory of Computation

(Credits: 06)

Full marks: 100 (External: 70; Sessional: 30)

Pass marks: 40 (External: 28; Sessional: 12)

This paper provides the concepts of languages, finite automata, regular languages, context free languages, Turing machine & models of computation.

UNIT I

Languages: Alphabets, string, language, Basic Operations on language, Concatenation, KleeneStar

UNIT II

Finite Automata and Regular Languages: Regular Expressions, Transition Graphs, Deterministic and non-deterministic finite automata, NFA to DFA Conversion, Regular languages and their relationship with finite automata, Pumping lemma and closure properties of regular languages.

UNIT III

Context Free Languages: Context free grammars, parse trees, ambiguities in grammars and languages,

UNIT IV

Pushdown automata: Pushdown automata (Deterministic and Non-deterministic), Pumping Lemma, Properties of context free languages, normal forms.

UNIT V

Turing Machines and Models of Computation: Turing Machine as a model of computation, Universal Turing Machine, Language acceptability, decidability, halting problem, Recursively enumerable and recursive languages, unsolvability problems.

Reference Books:

1. Daniel I.A.Cohen, Introduction to computer theory, John Wiley,1996
2. Lewis & Papadimitriou, Elements of the theory of computation , PHI 1997.
3. Hopcroft, Aho, Ullman, Introduction to Automata theory, Language & Computation –3rd Edition, Pearson Education. 2006
4. P. Linz, An Introduction to Formal Language and Automata 4th edition Publication Jones Bartlett, 2006

CSC- C-502

Internet Technologies

(Credits: 04)

Full marks: 70 (External: 50; Sessional: 20)

Pass marks: 28 (External: 20; Sessional: 8)

This paper provides the concepts of different web authoring tools & internet technologies.

UNIT I

Java: Use of Objects, Array and ArrayList class

UNIT II

JavaScript: Data types, operators, functions, control structures, events and event handling.

UNIT III

JDBC: JDBC Fundamentals, Establishing Connectivity and working with connection interface, Working with statements, Creating and Executing SQL Statements, Working with Result Set Objects.

UNIT IV

JSP: Introduction to JavaServer Pages, HTTP and Servlet Basics, The Problem with Servlets, The Anatomy of a JSP Page, JSP Processing, JSP Application Design with MVC, Setting Up the JSP Environment, Implicit JSP Objects, Conditional Processing, Displaying Values, Using an

expression to Set an Attribute, Declaring Variables and Methods, Error Handling and Debugging, Sharing Data Between JSP Pages, Requests, and Users, Database Access.

UNIT V

Java Beans: Java Beans Fundamentals, JAR files, Introspection, Developing a simple Bean, Connecting to DB

Reference Books:

1. Ivan Bayross, Web Enabled Commercial Application Development Using Html, Dhtml, javascript, Perl Cgi , BPB Publications, 2009.
2. Cay Horstmann, BIG Java, Wiley Publication , 3rd Edition., 2009
3. Herbert Schildt , Java 7, The Complete Reference, , 8th Edition, 2009.
4. Jim Keogh ,The Complete Reference J2EE, TMH, , 2002.
5. O'Reilly , Java Server Pages, Hans Bergsten, Third Edition, 2003.

CSC- C-502- LAB Internet Technologies (Credits: 02)

**Full marks: 30
Pass marks: 12**

This paper provides the practical knowledge of different internet technologies.

Create event driven program for following:

1. Print a table of numbers from 5 to 15 and their squares and cubes using alert.
2. Print the largest of three numbers.
3. Find the factorial of a number n.
4. Enter a list of positive numbers terminated by Zero. Find the sum and average of these numbers.
5. A person deposits Rs 1000 in a fixed account yielding 5% interest. Compute the amount in the account at the end of each year for n years.
6. Read n numbers. Count the number of negative numbers, positive numbers and zeros in the list.

CSC- DSE-501 Numerical Methods (Credits: 04)

**Full marks: 70 (External: 50; Sessional: 20)
Pass marks: 28 (External: 20; Sessional: 8)**

This paper provides the concepts of numerical methods.

UNIT I

Floating point representation and computer arithmetic, Significant digits, Errors: Round-off error, Local truncation error, Global truncation error, Order of a method, Convergence and terminal conditions, Efficient computations

UNIT II

Bisection method, Secant method, Regula–Falsi method, Newton–Raphson method, Newton’s method for solving nonlinear systems Gauss elimination method (with row pivoting) and Gauss–Jordan method, Gauss Thomas method for tridiagonal systems

UNIT III

Iterative methods: Jacobi and Gauss-Seidel iterative methods, Interpolation: Lagrange’s form and Newton’s form Finite difference operators, Gregory Newton forward and backward differences Interpolation Piecewise polynomial interpolation: Linear interpolation, Cubic spline interpolation (only method)

UNIT IV

Numerical differentiation: First derivatives and second order derivatives, Richardson extrapolation
Numerical integration: Trapezoid rule, Simpson’s rule (only method), Newton–Cotes open formulas
Extrapolation methods: Romberg integration, Gaussian quadrature, Ordinary differential equation: Euler’s method

UNIT V

Modified Euler’s methods: Heun method and Mid-point method, Runge-Kutta second methods: Heun method without iteration, Mid-point method and Ralston’s method, Classical 4th order Runge-Kutta method, Finite difference method for linear ODE

REFERENCE BOOKS:

1. Laurence V. Fausett, Applied Numerical Analysis, Using MATLAB, Pearson, 2/e (2012)
2. M.K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Methods for Scientific and Engineering Computation, New Age International Publisher, 6/e (2012)
3. Steven C Chapra, Applied Numerical Methods with MATLAB for Engineers and Scientists, Tata McGraw Hill, 2/e (2010)

CSC- DSE-501- LAB Numerical Methods (Credits: 02)

Full marks: 30
Pass marks: 12

This paper provides the practical knowledge of numerical methods.

1. Find the roots of the equation by bisection method.
2. Find the roots of the equation by secant/Regula–Falsi method.
3. Find the roots of the equation by Newton’s method.
4. Find the solution of a system of nonlinear equation using Newton’s method.

5. Find the solution of tridiagonal system using Gauss Thomas method.
6. Find the solution of system of equations using Jacobi/Gauss-Seidel method.
7. Find the cubic spline interpolating function.
8. Evaluate the approximate value of finite integrals using Gaussian/Romberg integration.
9. Solve the boundary value problem using finite difference method.

Note: Programming is to be done in any one of Computer Algebra Systems: MATLAB / MATHEMATICA / MAPLE.

CSC- DSE-502
Network Programming
(Credits: 04)

Full marks: 70 (External: 50; Sessional: 20)

Pass marks: 28 (External: 20; Sessional: 8)

This paper provides the basic concepts of network programming.

UNIT I

Transport Layer Protocols: TCP, UDP, SCTP protocol.

UNIT II

Socket Programming: Socket Introduction; TCP Sockets; TCP Client/Server Example ; signal handling;

UNIT III

I/O multiplexing using sockets; Socket Options; UDP Sockets; UDP client server example; Address lookup using sockets.

UNIT IV

Network Applications: Remote logging; Email; WWW and HTTP. LAN administration: Linux

UNIT V

TCP/IP networking: Network Management and Debugging.

Reference Books:

1. W. Richard Stevens, Bill Fenner, Andrew M. Rudoff, Unix Network Programming, The sockets Networking API, Vol. 1, 3rd Edition, PHI.2003
2. B. A. Forouzan: Data Communications and Networking, Fourth edition, THM Publishing Company Ltd., 2003
3. Nemeth Synder & Hein, Linux Administration Handbook, Pearson Education, 2nd Edition,2010
4. R. Stevens, Unix Network Programming, PHI 2nd Edition,1990

CSC- DSE-502- LAB
Network Programming
(Credits: 02)

Full marks: 30
Pass marks: 12

This paper provides the practical knowledge of network programming.

1. Simulate Cyclic Redundancy Check (CRC) error detection algorithm for noisy channel.
2. Simulate and implement stop and wait protocol for noisy channel.
3. Simulate and implement go back n sliding window protocol.
4. Simulate and implement selective repeat sliding window protocol.
5. Simulate and implement distance vector routing algorithm
6. Simulate and implement Dijkstra algorithm for shortest path routing.
7. WAP to find the address of the local machine
8. WAP A program that prints the address of www.youtube.com
9. WAP A program that prints all the addresses of www.youtube.com
10. Write a program to implement following methods:

```
public String getHostName( )  
public byte[] getAddress( )  
public String getHostAddress( )
```
11. Describe the following methods in brief:

```
public boolean isAnyLocalAddress( )  
public boolean isLoopbackAddress( )
```
12. Write a program to testing the characteristics of an IP address i.e. you have to check whether given address is AnyLocalAddress, LoopbackAddress, LinkLocalAddress, SiteLocalAddress or MulticastAddress.
13. Write a program to enter the IP address of any node and check whether a particular node is reachable from the current host.
14. Write a program of protocol tester .It is a simple program for determining which protocols a virtual machine supports. It attempts to construct a URL object for each of 10 URL given below. If the protocol is not supported. a MalformedURLException is thrown and you know the protocol is not supported.

Test protocols for following URL:

1. <http://www.adc.org>
2. <https://www.amazon.com/exec/obidos/order2/>
3. <file:///etc/passwd>
4. <ftp://metalab.unc.edu/pub/languages/java/javafaq>

5. <mailto:elharo@metalab.unc.edu>
6. <telnet://dibner.poly.edu/>
7. <nfs://utopia.poly.edu/usr/tmp/>
8. <gopher://gopher.unc.org.za/>
9. <verbatim:http://www.adc.org/>
10. <netdoc:/UsersGuide/release.html>

CSC- C-601
Artificial Intelligence
(Credits: 04)

Full marks: 70 (External: 50; Sessional: 20)
Pass marks: 28 (External: 20; Sessional: 8)

This paper provides the concepts of artificial intelligence & natural languages processing.

UNIT I

Introduction: Introduction to Artificial Intelligence, Background and Applications, Turing Test and Rational Agent approaches to AI, Introduction to Intelligent Agents, their structure, behavior and environment.

UNIT II

Problem Solving and Searching Techniques

Problem Characteristics, Production Systems, Control Strategies, Breadth First Search, Depth First Search, Hill climbing and its Variations, Heuristics Search Techniques: Best First Search, A* algorithm, Constraint Satisfaction Problem, Means-End Analysis, Introduction to Game Playing, Min-Max and Alpha-Beta pruning algorithms.

UNIT III

Knowledge Representation: Introduction to First Order Predicate Logic, Resolution Principle, Unification, Semantic Nets, Conceptual Dependencies, Frames, and Scripts, Production Rules, Conceptual Graphs. Programming in Logic (PROLOG)

UNIT IV

Dealing with Uncertainty and Inconsistencies: Truth Maintenance System, Default Reasoning, Probabilistic Reasoning, Bayesian Probabilistic Inference, Possible World Representations.

UNIT V

Understanding Natural Languages: Parsing Techniques, Context-Free and Transformational Grammars, Recursive and Augmented Transition Nets.

Reference Books:

1. DAN.W. Patterson, Introduction to A.I and Expert Systems – PHI, 2007.
2. Russell & Norvig, Artificial Intelligence-A Modern Approach, LPE, Pearson Prentice Hall,

2nd edition, 2005.

3. Rich & Knight, Artificial Intelligence – Tata McGraw 2nd Hill,

4. W.F. Clocksin and Mellish, Programming in PROLOG, Narosa Publishing edition, 1991. House, 3rd edition, 2001.

5. Ivan Bratko, Prolog Programming for Artificial Intelligence, Addison-Wesley, Pearson Education, 3rd edition, 2000.

CSC- C-601- LAB
Artificial Intelligence
(Credits: 02)

Full marks: 30
Pass marks: 12

This paper provides the practical knowledge of Artificial Intelligence.

1. Write a prolog program to calculate the sum of two numbers.
2. Write a prolog program to find the maximum of two numbers.
3. Write a prolog program to calculate the factorial of a given number.
4. Write a prolog program to calculate the nth Fibonacci number.
5. Write a prolog program, insert_nth(item, n, into_list, result) that asserts that result is the list into_list with item inserted as the n'th element into every list at all levels.
6. Write a Prolog program to remove the Nth item from a list.
7. Write a Prolog program, remove-nth(Before, After) that asserts the After list is the Before list with the removal of every n'th item from every list at all levels.
8. Write a Prolog program to implement append for two lists.
9. Write a Prolog program to implement palindrome(List).
10. Write a Prolog program to implement max(X,Y,Max) so that Max is the greater of two numbers X and Y.
11. Write a Prolog program to implement maxlist(List,Max) so that Max is the greatest number in the list of numbers List.
12. Write a Prolog program to implement sumlist(List,Sum) so that Sum is the sum of a given list of numbers List.
13. Write a Prolog program to implement two predicates evenlength(List) and oddlength(List) so that they are true if their argument is a list of even or odd length respectively.
14. Write a Prolog program to implement reverse(List,ReversedList) that reverses lists.
15. Write a Prolog program to implement maxlist(List,Max) so that Max is the greatest number in the list of numbers List using cut predicate.
16. Write a Prolog program to implement GCD of two numbers.
17. Write a prolog program that implements Semantic Networks/Frame Structures.

CSC- C-602
Software Engineering
(Credits: 06)
Full marks: 100 (External: 70; Sessional: 30)
Pass marks: 40 (External: 28; Sessional: 12)

This paper provides the concepts of software engineering theory.

UNIT I

Introduction: The Evolving Role of Software, Software Characteristics, Changing Nature of Software, Software Engineering as a Layered Technology, Software Process Framework, Framework and Umbrella Activities, Process Models, Capability Maturity Model Integration (CMMI).

UNIT II

Requirement Analysis: Software Requirement Analysis, Initiating Requirement Engineering Process, Requirement Analysis and Modeling Techniques, Flow Oriented Modeling, Need for SRS, Characteristics and Components of SRS.

Software Project Management: Estimation in Project Planning Process, Project Scheduling.

UNIT III

Risk Management: Software Risks, Risk Identification, Risk Projection and Risk Refinement, RMMM Plan.

Quality Management: Quality Concepts, Software Quality Assurance, Software Reviews, Metrics for Process and Projects.

UNIT IV

Design Engineering: Design Concepts, Architectural Design Elements, Software Architecture, Data Design at the Architectural Level and Component Level, Mapping of Data Flow into Software Architecture, Modeling Component Level Design.

UNIT V

Testing Strategies & Tactics: Software Testing Fundamentals, Strategic Approach to Software Testing, Test Strategies for Conventional Software, Validation Testing, System testing, Black-Box Testing, White-Box Testing and their type, Basis Path Testing.

Reference Books:

1. R.S. Pressman, Software Engineering: A Practitioner's Approach (7th Edition), McGraw-Hill, 2009.
2. P. Jalote, An Integrated Approach to Software Engineering (2nd Edition), Narosa Publishing House, 2003.
3. K.K. Aggarwal and Y. Singh, Software Engineering (2nd Edition), New Age International Publishers, 2008.
4. I. Sommerville, Software Engineering (8th edition), Addison Wesley, 2006.
5. D. Bell, Software Engineering for Students (4th Edition), Addison-Wesley, 2005.
6. R. Mall, Fundamentals of Software Engineering (2nd Edition), Prentice-Hall of India, 2004.

CSC- DSE-601
Information Security and Cyber Laws
(Credits: 06)

Full marks: 100 (External: 70; Sessional: 30)
Pass marks: 40 (External: 28; Sessional: 12)

This paper provides the Information Security, Cyber Laws, Cryptography & its applications.

UNIT I

Course Introduction: Computer network as a threat, hardware vulnerability, software vulnerability, importance of data security.

Digital Crime: Overview of digital crime, criminology of computer crime.

UNIT II

Information Gathering Techniques: Tools of the attacker, information and cyber warfare, scanning and spoofing, password cracking, malicious software, session hijacking.

UNIT III

Risk Analysis and Threat: Risk analysis, process, key principles of conventional computer security, security policies, authentication, data protection, access control, internal vs external threat, security assurance, passwords, authentication, and access, control, computer forensics and incident response

UNIT IV

Introduction to Cryptography and Applications : Important terms, Threat, Flaw, Vulnerability, Exploit, Attack, Ciphers, Codes, Caesar Cipher, Rail-Fence Cipher, Public key cryptography (Definitions only), Private key cryptography (Definition and Example).

UNIT V

Safety Tools and Issues : Firewalls, logging and intrusion detection systems, Windows and windows XP / NT security, Unix/Linux security, ethics of hacking and cracking

Cyber laws to be covered as per IT 2008:

- Chapter 1: Definitions
- Chapter 2: Digital Signature And Electronic Signature
- [Section 43] Penalty and Compensation for damage to computer, computer system, etc.
- [Section 65] Tampering with Computer Source Documents
- [Section 66 A] Punishment for sending offensive messages through communication service, etc.
- [Section 66 B] Punishments for dishonestly receiving stolen computer resource or communication device
- [Section 66C] Punishment for identity theft
- [Section 66D] Punishment for cheating by personation by using computer resource
- [Section 66E] Punishment for violation of privacy
- [Section 66F] Punishment for cyber terrorism
- [Section 67] Punishment for publishing or transmitting obscene material in electronic form

- [Section 67A] Punishment for publishing or transmitting of material containing sexually explicit act, etc. in electronic form
- [Section 67B] Punishment for publishing or transmitting of material depicting children in sexually explicit act, etc. in electronic form
- [Section 72] Breach of confidentiality and privacy

Reference Books:

1. M. Merkow, J. Breithaupt, Information Security Principles and Practices, Pearson Education.2005
2. G.R.F. Snyder, T. Pardoe, Network Security, Cengage Learning, 2010
3. A. Basta, W.Halton, Computer Security: Concepts, Issues and Implementation, Cengage Learning India, 2008

CSC-DSE-602

Project work/ Dissertation

(Credits: 06)

Full marks: 100 (External: 70; Sessional: 30)

Pass marks: 40 (External: 28; Sessional: 12)

- ❖ This option to be offered only in 6th Semester.
- ❖ The students will be allowed to work on any project based on the concepts studied in core / elective or skill based elective courses.
- ❖ The group size should be maximum of three (03) students.
- ❖ Each group will be assigned a teacher as a supervisor who will handle both their theory as well lab classes.
- ❖ A maximum of Four (04) projects would be assigned to one teacher.

CSC-GE/DSC-101

Programming Fundamentals using C/C++

(Credits: 04)

Full marks: 70 (External: 50; Sessional: 20)

Pass marks: 28 (External: 20; Sessional: 8)

This paper provides the fundamental concepts of programming using C/C++.

UNIT - I

Introduction to C and C++: History of C and C++, Overview of Procedural Programming and Object-Orientation Programming, Using main() function, Compiling and Executing Simple Programs in C++.

UNIT IV

Central Processing Unit: Register organization, arithmetic and logical micro-operations, stack organization, micro programmed control. Instruction formats, addressing modes, instruction codes, machine language, assembly language, input output programming, RISC, CISC architectures.

Memory Organization Cache memory, Associative memory, mapping.

UNIT V

Input-Output Organization: Input / Output: External Devices, I/O Modules, Programmed I/O, Interrupt-Driven I/O, Direct Memory Access, I/O Channels.

Recommended Books:

1. M. Mano, Computer System Architecture, Pearson Education 1992
2. A. J. Dos Reis, Assembly Language and Computer Architecture using C++ and JAVA, Course Technology, 2004th
3. W. Stallings, Computer Organization and Architecture Designing for Performance, 8 Edition, Prentice Hall of India, 2009
4. M.M. Mano , Digital Design, Pearson Education Asia, 2013.
5. Carl Hamacher, Computer Organization, Fifth edition, McGrawHill, 2012.

CSC-GE/DSC-301

Operating Systems

(Credits: 06)

Full marks: 100 (External: 70; Sessional: 30)

Pass marks: 40 (External: 28; Sessional: 12)

This paper provides the basic concepts of Operating System and its different functions.

UNIT I

Introduction: Basic OS functions, resource abstraction, types of operating systems– multiprogramming systems, batch systems , time sharing systems; operating systems for personal computers & workstations, process control & real time systems.

Operating System Organization: Processor and user modes, kernels, system calls and system programs.

UNIT II

Process Management: System view of the process and resources, process abstraction, process hierarchy, threads, threading issues, thread libraries; Process Scheduling, non-pre-emptive and pre-emptive scheduling algorithms.

UNIT III

Process Coordination: Synchronization, concurrent processes, critical section, semaphores, methods for inter-process communication; deadlocks.

UNIT IV

Memory Management: Physical and virtual address space; memory allocation strategies -fixed and variable partitions, paging, segmentation, virtual memory

UNIT V

File and I/O Management: Directory structures, file operations, file allocation methods, device management.

Protection and Security: Policy mechanism, Authentication, Internal access Authorization.

Recommended Books:

1. A Silberschatz, P.B. Galvin, G. Gagne, Operating Systems Concepts, 8th Edition, John Wiley Publications 2008.
2. A.S. Tanenbaum, Modern Operating Systems, 3rd Edition, Pearson Education 2007.
3. G. Nutt, Operating Systems: A Modern Perspective, 2nd Edition Pearson Education 1997.
4. W. Stallings, Operating Systems, Internals & Design Principles , 5th Hall of India. 2008. Edition, Prentice.
5. M. Milenkovic, Operating Systems- Concepts and design, Tata McGraw Hill 1992.

CSC-GE/DSC-401

Database Management Systems

(Credits: 04)

Full marks: 70 (External: 50; Sessional: 20)

Pass marks: 28 (External: 20; Sessional: 8)

This paper provides the concepts of database management systems, ER & Enhanced ER modeling, Relational Data Model, database design.

UNIT I

Introduction to Database Management Systems: Characteristics of database approach, data models, DBMS architecture and data independence.

UNIT II

Entity Relationship and Enhanced ER Modeling: Entity types, relationships, SQL-99: Schema Definition, constraints, and object modeling.

UNIT III

Relational Data Model: Basic concepts, relational constraints, relational algebra, SQL queries.

UNIT IV

Database design: ER and EER to relational mapping, functional dependencies, normal forms up to third normal form.

UNIT V

Transaction Processing: ACID properties, concurrency control

Reference Books:

1. R. Elmasri, S.B. Navathe, Fundamentals of Database Systems 6th Edition, Pearson Education, 2010.
2. R. Ramakrishnan, J. Gehrke, Database Management Systems 3rd Edition, McGraw-Hill, 2002.
3. A. Silberschatz, H.F. Korth, S. Sudarshan, Database System Concepts 6th Edition, McGraw Hill, 2010.
4. R. Elmasri, S.B. Navathe Database Systems Models, Languages, Design and application Programming, 6th Edition, Pearson Education, 2013.

CSC-GE/DSC-401-LAB
Database Management Systems
(Credits: 02)

Full marks: 30
Pass marks: 12

This paper provides the practical knowledge of Database Management Systems.

Practical: Database Management Systems

Note: MyAccess/MySQL may be used.

The following concepts must be introduced to the students:

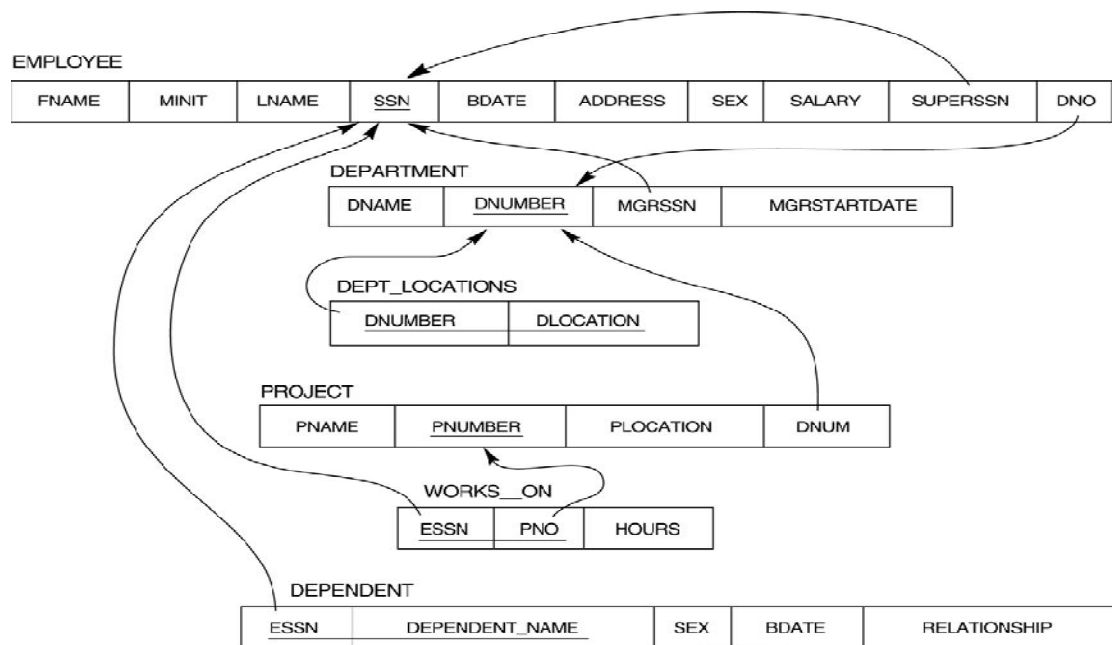
DDL Commands

- Create table, alter table, drop table

DML Commands

- Select , update, delete, insert statements
- Condition specification using Boolean and comparison operators (and, or, not, =, <>, >, <, >=, <=)
- Arithmetic operators and aggregate functions (Count, sum, avg, Min, Max)
- Multiple table queries (join on different and same tables)
- Nested select statements
- Set manipulation using (any, in, contains, all, not in, not contains, exists, not exists, union, intersect, minus, etc.)
- Categorization using group by.....having
- Arranging using order by

Relational Database Schema - COMPANY



Questions to be performed on above schema

1. Create tables with relevant foreign key constraints
2. Populate the tables with data
3. Perform the following queries on the database :
 1. Display all the details of all employees working in the company.
 2. Display ssn, lname, fname, address of employees who work in department no 7.
 3. Retrieve the birthdate and address of the employee whose name is 'Franklin T. Wong'
 4. Retrieve the name and salary of every employee
 5. Retrieve all distinct salary values
 6. Retrieve all employee names whose address is in 'Bellaire'
 7. Retrieve all employees who were born during the 1950s
 8. Retrieve all employees in department 5 whose salary is between 50,000 and 60,000(inclusive)
 9. Retrieve the names of all employees who do not have supervisors
 10. Retrieve SSN and department name for all employees
 11. Retrieve the name and address of all employees who work for the 'Research' department
 12. For every project located in 'Stafford', list the project number, the controlling department number, and the department manager's last name, address, and birthdate.
 13. For each employee, retrieve the employee's name, and the name of his or her immediate supervisor.
 14. Retrieve all combinations of Employee Name and Department Name
 15. Make a list of all project numbers for projects that involve an employee whose last name is 'Narayan' either as a worker or as a manager of the department that controls the project.
 16. Increase the salary of all employees working on the 'ProductX' project by 15%. Retrieve employee name and increased salary of these employees.
 17. Retrieve a list of employees and the project name each works in, ordered by the employee's department, and within each department ordered alphabetically by employee first name.

18. Select the names of employees whose salary does not match with salary of any employee in department 10.
19. Retrieve the name of each employee who has a dependent with the same first name and same sex as the employee.
20. Retrieve the employee numbers of all employees who work on project located in Bellaire, Houston, or Stafford.
21. Find the sum of the salaries of all employees, the maximum salary, the minimum salary, and the average salary. Display with proper headings.
22. Find the sum of the salaries and number of employees of all employees of the 'Marketing' department, as well as the maximum salary, the minimum salary, and the average salary in this department.
23. Select the names of employees whose salary is greater than the average salary of all employees in department 10.
24. For each department, retrieve the department number, the number of employees in the department, and their average salary.
25. For each project, retrieve the project number, the project name, and the number of employees who work on that project.
26. Change the location and controlling department number for all projects having more than 5 employees to 'Bellaire' and 6 respectively.
27. For each department having more than 10 employees, retrieve the department no, no of employees drawing more than 40,000 as salary.
28. Insert a record in Project table which violates referential integrity constraint with respect to Department number. Now remove the violation by making necessary insertion in the Department table.
29. Delete all dependents of employee whose ssn is '123456789'.
30. Delete an employee from Employee table with ssn = '12345' (make sure that this employee has some dependents, is working on some project, is a manager of some department and is supervising some employees). Check and display the cascading effect on Dependent and Works on table. In Department table MGRSSN should be set to default value and in Employee table SUPERSSN should be set to NULL
31. Perform a query using alter command to drop/add field and a constraint in Employee Table
