Major Course in Computer Science
at TDC(Science) Level

Eligibility: Higher Secondary (Science) pass with Mathematics as one of the subjects at the Higher Secondary level securing minimum pass mark in the subject.

A student taking major in Computer Science must have Mathematics and one of the subjects Physics/Electronics/Statistics as general course at TDS(Sc) level.

(Course break-up)

Semester - 1

Paper Code	Paper Name / Topics	Marks	Classes / week	Credit
M101	Introduction to Computer Fundamentals and Programming	75 marks (Internal 15 marks)	6 (5 lectures + 1 tutorial)	6
M102	Basic Electronics	75 marks (Internal 15 marks)	6	6
M103	Practical Programming in C Basic Electronics -	Total 50 marks 30 marks (Internal - 6 marks) 20 marks (internal 4 marks)	4 laboratory sessions	4

Semester - 2

Paper Code	Paper Name/Topics	Marks	Classes / week	Credit
M201	ICT Hardware	75 marks (Internal 15 marks)	6 (5 lectures + 1 tutorial)	6
M202	Discrete Mathematics	75 marks (Internal 15 marks)	6 (5 lectures + 1 tutorial)	6
M203	Practical ICT Hardware	50 marks (Internal 10 marks)	4 laboratory sessions	4

Semester - 3

Paper Code	Paper Name /Topics	Marks	Classes / week	Credit
M301	Data Structure	75 marks (Internal 15 marks)	6 (5 lectures + 1 tutorial)	6
M302	Computer Organization and Architecture	75 marks (Internal 15 marks)	6 (5 lectures + 1 tutorial)	6
M303	Practical Data Structure	50 marks (Internal 10 marks)	4 laboratory sessions	4

Semester - 4

Paper Code	Paper Name / Topics	Marks	Classes / week	Credit
M401	Operating System	75 marks (Internal 15 marks)	6 (5 lectures + 1 tutorial)	6
M402	Database Management System	75 marks (Internal 15 marks)	6 (5 lectures + 1 tutorial)	6
M403	Practical Operating System DBMS	Total 50 marks 15 marks (Internal 3 marks) 35 marks (Internal 7 marks)	4 laboratory sessions	4

Semester - 5

Paper Code	Paper Name/Topics	Marks	Classes / week	Credit
M501	Object Oriented Programming using C++	75 marks (Internal 15 marks)	6 (5 lectures + 1 tutorial)	6
M502	Computer Oriented Numerical Methods and Statistical Techniques	75 marks (Internal 15 marks)	6 (5 lectures + 1 tutorial)	6
M503	Computer Networks	75 marks	6	6

Paper Code	Paper Name / Topics	Marks	Classes / week	Credit
		(Internal 15 marks)	(5 lectures + 1 tutorial)	
M504	Microprocessor and Assembly Language Programming	75 marks (Internal 15 marks)	6 (5 lectures + 1 tutorial)	6
M505	Practical Object Oriented Programming Computer Networks	Total 75 marks 45 marks (Internal 9 marks) 30 marks (Internal 6 marks)	6 laboratory sessions	6
M506	Practical Computer Oriented NMST Microprocessor and Assembly Language Programming	Total 75 marks (Internal 15 marks) 30 (Internal 6 marks) 45 marks (Internal 9 marks)	6 laboratory sessions	6

Semester - 6

Paper Code	Paper Name / Topics	Marks	Classes / week	Credit
M601	Automata Theory and Languages	75 marks (Internal 15 marks)	6 (5 lectures + 1 tutorial)	6
M602	Web Technologies	75 marks (Internal 15 marks)	6 (5 lectures + 1 tutorial)	6
M603	System Administration using Linux	75 marks (Internal 15 marks)	6 (5 lectures + 1 tutorial)	6
M604	Practical Web Technologies System Administration using Linux	75 marks (Internal 15 marks) 40 marks (Internal 8 marks) 35 marks (Internal 7 marks)	6 laboratory sessions	6
M605	Project	150 marks (Internal 30 marks)	12 (4 tutorials + 8 laboratory sessions)	12

DETAILED SYLLABUS

M101 INTRODUCTION TO COMPUTER FUNDAMENTALS AND PROGRAMMING

Full marks: 75 (Internal 15)

Fundamentals **Marks :15**

Major components of a Digital Computer (A brief introduction of CPU, Main memory, Secondary memory devices and I/O devices) Keyboard, monitor, mouse, printers, Secondary storage devices (floppy disks, hard disks and optical disks), backup system and why it is needed ? Bootstrapping a Computer. Representation of numbers (only a brief introduction to be given) and characters in computer. ASCII. EDCDIC and Gray codes. Interpreter, Assembler, Linker and Loader. Definition and concepts of algorithm and its different implementations-pseudo code, flowchart and Computer programs.

Number System: Binary, Hexadecimal, Octal, BCD, and conversions of number systems. Representation of signed integers, Sign and magnitude, 1's complement and 2's complement representation. Arithmetic operations using 2's complement representation and conditions for overflow/underflow and its detection.

Introduction to C: **Marks : 25**

Elementary data types , variables, constants and identifiers. Integer, character floating point and string constants . variable declarations. Syntax and semantics. Reserved word. Initialization of variable during declarations Constant data types. Expression in C, precedence and   associativity of C operators, unary, binary and ternary operators. C arithmetic operators, assignment operators, relational operators, logical operators and bit –wise operators . L-value and R-value. Side effects of operators. Expression statement.

Conditional   Statement-if, if-else, switch

Iterative Statement-white, do-while, for

Other Statement –break , continue, goto, return, null Statement, block Statement. Function: function declaration. Calling a function. Parameters –Call by value, Call by reference and its absence in C. Recursion and how it works.

Cast and sizeof operator. Automatic type Conversion.

Simple programs like programs to compute an arithmetic expression, unit conversion, the sum of a series (like trigonometric series), GCD, factorial (both recursive and non-recursive version), fibonacci number (both recursive and non-recursive version), generation of prime numbers, reversing digits of an integer, finding the square root of a number, prime factors of an integer, base conversion of numbers, test if three points form a triangle and classify triangles as right angled, isosceles, equilateral etc., roots of a quadratic equation, generation of simple patterns of characters on screen.

Arrays and pointers: **Marks : 12**

Storage classes : Automatic, External, Static, Register. Scope and lifetime of variables.

Arrays and pointers and corresponding operators. Pointer arithmetic.

Programs using arrays and pointers like sum, average, minimum, maximum of an array of numbers. Add and delete an element of an array. Merge two sorted arrays. String manipulation programs like addition, subtraction, multiplication and their combinations. Sum of rows, columns, and diagonal elements of a matrix. Transpose of a matrix. Linear search, binary search. Selection sort and bubble sort.

Structures and Files: **Marks 8**

Structure – declaration and use. Structure member resolution and structure pointer member resolution operators.

Programs to show the use of structure.

Standard C library.

Files in C—opening, closing, reading and writing of files. Seeking forward and backward. Simple examples of file handling programs.

Suggested Reading:

1. Programming with C, B.S. Gottfried, Tata Mc-Graw Hill.
2. Programming in ANSI C, E.Balagurusamy, Tata McGraw – Hill
3. The C Programming Language, B.W. Kernighan and D.M.Ritchie, PHI
4. Computer Fundamentals, Anita Goel, Pearson, 2010.

M102 BASIC ELECTRONICS

Full marks: 75 (Internal 15)

Basic principles of Electricity and Electrical Circuits: Ohm's law, Kirchoffs Law, Norton and Thevenin's theorems, temperature coefficient, specific resistance of materials. Basic equation of capacitor, Relationship between current, charge, voltage, permittivity, parallel plate capacitor, its equation. Basic Equation of inductor, Relationship among voltage, current and field.

(8)

Conductors, Insulators, and Semiconductors. Intrinsic and Extrinsic semiconductors, P-type, N-type Semiconductors. Junction Diode. Biasing. V_I Characteristics. Other Semiconductor Devices: Zener Diode, Photo Diode, Varactor, SCR, LED, LDR.

Transistor: PNP and NPN, photo transistor. CC, CE, CB configurations. Biasing of transistors. V-I relations, Load Line. FET and MOSFET. Op-Amps & Integrated Circuits**.** **(8)**

Power rectifier and filter: Rectifier, filter. Working of a simple power supply using transformer, rectifier and filter. **(8)**

Boolean Algebra and Logic Gates: De Morgan's theorem, Boolean Identity. OR, AND, NOT, NAND, NOR and Ex OR gates. Truth Tables. Positive and Negative logic. **(12)**

Reduction Techniques: Standard representation of Boolean expressions, SOP and POS forms, Combinational and sequential circuits, Minterm and Maxterm expressions, Map reduction techniques, K-Map. Code Conversions: Binary to Gray, BCD to decimal etc. **(12)**

Binary Arithmetic: Half Adder, Full Adder. Multiplexer, Demultiplexer, Decoder, Encoders, Comparators. Flip Flops: S/R, J/K, D and T. Latches, Digital Counters. Registers. **(12)**

Books:
1. Digital Logic and Computer Design, M. M. Mano, PHI
2. Electronics Devices and Circuits: Millman and Halkias; Tata Mc Graw Hill.
3. Digital Computer Electronics: Malvino; Tata Mc Graw Hill.

M103 PRACTICAL

Part 1- Programming in C: 30 marks (Internal 6 marks)

At least 20 programming assignments have to be done by each student from the following list. The assignments should be selected in such a way that all the features of C language are covered.

1. Write a program to convert a given temperature value from Fahrenheit scale to Centigrade scale and vice versa.
2. Write a program to display ASCII value of a character.
3. Write a program to check whether a number is perfect or not.
4. Write a program to find out the biggest of three numbers using nested if.
5. A company insures its drivers if either of the following conditions are satisfied
    - Driver is married.
    - Driver is an unmarried, male and above 30 years of age.
    - Driver is unmarried, female and above 25 years of age.

    Write a program to decide if a driver is to be insured using logical operators.
6. Write a program to read a list of positive integers terminated by -1 and display the odd and even numbers separately and also their respective counts.
7. Write a program to read values of n and x and print the value of y using switch case where
    a. y=n+x   when n=1
    b. y=1+x/n   when n=2
    c. y= n+3x   when n=3
    d. y=1+nx   when n>3 or n<1.
8. Write a program to n values of sales and then calculate the commission on sales amount where the commission is calculated as follows:
    a. If sales <= Rs.500, commission is 5%.
    b. If sales > 500 but <= 2000, commission is Rs 35 plus 10% above Rs 500.
    c. If sales > 2000 but <= 5000,commission is Rs 185 plus 12% above Rs.2000.
    d. If sales > 5000 ,commission is 12.5%.
9. Write a program to find out minimum, maximum, sum and average of n numbers without using array.
10. Write a program to find out the roots of a quadratic equation. Use proper testing to find checks for real and complex roots.
11. Write a program to print the digits of a number in words. (eg. if a number 841 is entered through the keyboard your program should print "Eight Four One".)
12. Write a program to print the PASCAL Triangle up to the n-th row where n is an input to the program.
13. Write a function to return the HCF of two positive integers. Write a main function to read two positive integers and print their HCF and LCM by using the above function.
14. Write a program to convert a decimal number into binary number using function.
15. Write a program to display the result of sine series using function.
16. Write a program to find the sum of the following series

$1+x-x^3/3!+x^5/5!-x^7/7!+$ . . . . . corrected up to the 3 decimal place.

17. Write a program to read n numbers in a sorted array and insert a given element in a particular position

18. Write functions to compute the factorial of a number using both recursive and non-recursive procedure.

19. Write a program to print the values of ^nc_r and ^np_r for given positive integers $n \geq r > 0$. Use a function fact(n) to return the factorial of a non-negative integer.n.
$$^nc_r = n!/r!*(n-r)! \quad ^np_r = n!/(n-r)!$$

20. Write a program to display the first n Fibonacci numbers using function.

21. Write a program to display the prime numbers within a given range. Write a function to check whether a given integer is prime or not and use it.

22. Write a program to Multiply two matrices using function

23. Write a program to display the upper Triangle and lower Triangle of a given square matrix using function.

24. Write a function to check if a given square matrix is symmetric or not. Write a main function to implement it.

25. Write a program to read a m X n matrix and calculate the Row sum and Column Sum of the matrix

26. Write a function to read in an integer and print the representation of the number using the sign and magnitude representation scheme using 8 bits. The program should check for overflow/under flow conditions. The left most bit is to be used as the sign bit.

27. Write a program to merge two sorted arrays.

28. Write a program to implement selection sort using function.

29. Write a program to count the number of vowels in a string.

30. Write a program to concatenate two strings using function (without using library function).

31. Write a program to convert a string from upper case to lower case and vice versa.

32. Write a program to swap two numbers using function (pass the pointers).

33. Write a program to sort n number of strings in ascending order using pointer.

34. Write a program using pointers to copy a string to another string variable (without using library function).

35. Declare a structure of a student with details like roll number, student name and total marks. Using this, declare an array with 50 elements. Write a program to read details of n students and print the list of students who have scored 75 marks and above.

36. Create a structure to store the following information of employees.
    a. Employee's number, name, pay and date of joining.
    It has been decided to increase the pay as per the following rules:

    Pay $<=$ Rs.3000   : 20% increase

    Pay $<=$ Rs.6000 but $>$ Rs.3000   :15%   increase

    Pay $>$ Rs.6000   : no increase

    Write a program to implement the above structure.

37. Write a program to read a text file and count the number of vowels in the text file.

38. Write a program to copy a text file to another file.

Part 2 - Basic Electronics: 20 marks (Internal 4 Marks)

Each student should do at least 10 assignments from the following list. This should have assignments from each of the following units.

BASIC ELECTRICAL CIRCUITS:

1. Verification of Voltage Division Rule
2. Verification of Current Division Rule.
3. Verification of the Thevenin's Theorem and determines the equivalent Circuit.
4. Verification of the Norton's Theorem and determines the equivalent Circuit.

SEMICONDUCTOR DEVICES:

5. Determination of V-I characteristics of Semiconductor Diode and draw it's Load Line and determine knee voltage.
6. Study of the reverse bias characteristics of a Zener Diode.
7. Design a Half Wave rectifier using semiconductor Diode. Use filtering to reduce Ripple.
8. Design a Full Wave rectifier using semiconductor Diode. Use filtering to reduce Ripple.
9. Design a Full Wave Bridge rectifier using semiconductor Diode. Use filtering to reduce Ripple.
10. Study of the static characteristics of the BJT in C-E mode and to determine h parameters.
11. Study of the static characteristics of the BJT in C-B mode and to determine h parameters.
12. Design a single stage RC coupled amplifier using BJT in C-E mode and to determine its voltage gain
13. Design a amplifier using BJT in C-B mode and to determine its voltage gain
14. Design of a emitter follower or CC amplifier and measure voltage gain.

DIGITAL CIRCUIT AND DESIGN:

15. List and verify the truth table of common Digital IC of the TTL series and display. Common logic gates are AND gate, OR gate, NOT gate, NAND gate, NOR gate, EXOR gate.
16. Verification of DeMorgan's Theorems.
17. Design a Half adder using digital logic gates. Verify its truth table.
18. Design a Full adder using digital logic gates. Verify its truth table.
19. Design of R-S Flip Flop; modify it to D Flip Flop. Verify the truth tables.
20. Design of a J-K Flip flop, verify the truth table.

OP AMP and IC555:

21. Study of the OP AMP as inverting and non inverting amplifier using IC741.
22. Study of the OP AMP as adder and subtractor.

M201 ICT HARDWARE

Full marks: 75 marks (Internal 15)

UNIT I: Evolution of computer system, Modern computer, Classification of computer, Personal Computer hardware: Monitor, Keyboard, Mouse, Scanner, printer, speaker   (**12**)

UNIT II: Hard Disk Drive: logical structure and file system, FAT, NTFS. Hard disk tools: Disk cleanup, error checking, de fragmentation, scanning for virus, formatting, installing additional HDD. New trends in HDD. Floppy Disk Drive   (**12**)

UNIT III: Optical Media, CDROM, theory of operation, drive speed, buffer, cache, CD-r, CD-RW, DVD ROM, DVD technology, preventive maintenance for DVD and CD drives, New Technologies. Driver installation, Writing and cleaning CD and DVD.   (**12**)

UNIT IV: Processor: Intel processor family. Latest trends in processor, Motherboard, Sockets and slots, power connectors. Peripheral connectors. Bus slots, USB, pin connectors. Different kinds of motherboards. RAM, different kinds of RAM. RAM up gradation**.** Cache and Virtual Memory concept.

(**12**)

UNIT V: SMPS. BIOS. Network Interface Card, network cabling, I/O Box, Switches, RJ 45 connectors, Patch panel, Patch cord, racks, IP address.   (**12**)

BOOKS RECOMMENDED :

1. Comdex; Hardware and Networking Course Kit; Dream Tech press
2. PC hardware : A beginners Guide; Ron Gilster; Tata Mc Graw Hill.

M 202 DISCRETE MATHEMATICS

Full Marks : 75 (Internal 15)

Sets, relations and functions:
Sets, relations, properties of binary relations, closures of relation, equivalence relations, equivalence classes and partitions. Partial ordering relations and lattices. Functions, one-to-one and onto, principles of mathematical induction.

(12)

Graph theory:
Basic Definition of graph. connectivity of graph, cut points cycles, Hamiltonian graphs, trees, different characterisation of trees, bipartite graph,
Algorithms on graph, Breadth first search, Depth first search.

(12)

Combinatorics:
Basic of counting principles, principle of inclusion-exclusion, application of inclusion and exclusion. Pigeonhole principle, generalized Pigeonhole principle and its application, permutations and combinations, permutations with repetitions, combinations with repetitions, permutations of sets with indistinguishable objects.

(12)

Matrices :
Row and column operations, vectors and matrices, partitioning of matrices, representing relations using matrices, Determinant of a square matrix, minor, cofactor, the Cayley-Hamilton theorem, inverse of a matrix, product form of inverse. Rank of a matrix. Solutions of simultaneous linear equations, existence of solutions, solution by Gaussian elimination, Eigen values and Eigen vectors.

(12)

Logic:
Connectives, truth tables, Normal forms- CNF, DNF, Converting expressions to CNF and DNF, Theory of inference, Propositional calculus. Boolean Algebra. Predicate calculus (only introduction), predicates and quantifiers.

(12)

Suggested readings:

1. Elements of Discrete Mathematics, C. L. Liu, Mc-Graw Hill International Ed.
2. Discrete Mathematics and its Applications, K. H. Rosen, Mc-Graw Hill International Ed.
3. Discrete Mathematics structures with applications to Computer Science, J. P. Tremblay and R. Manohar, Mc-Graw Hill
4. Discrete Mathematics, N. Ch.SN Iyengar, K.A. Venkatesh, V. M. Chandrasekaran, P. S. Arunachalam, Vikash Publishing House Pvt Ltd.
5. Logic for Computer Science, J. H. Gallier, J. Wiley and sons.

M203 PRACTICAL

Full Marks: 50 (Internal 10)
ICT Hardware
Objectives:
The Practical introduces the students to a personal computer and its basic peripherals, the process of assembling a personal computer, installation of system software like Windows OS, LINUX OS, device drivers. Basic system administration in Linux which includes: Basic Linux commands in bash, Create hard and symbolic links, Text processing, Using wildcards In addition hardware and software level troubleshooting process, tips and tricks would be covered.

Different ways of hooking the PC on to the network and internet from home and workplace and effectively usage of the internet. Configuring the TCP/IP setting. Usage of web browsers, email, newsgroups and discussion forums would be covered. In addition, awareness of cyber hygiene, i.e., protecting the personal computer from getting infected with the viruses, worms and other cyber attacks would be introduced. The students should perform the following tasks.

Task 1: Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor.

Task 2: Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva.

Task 3: Every student should individually install MS windows on the personal computer. They should learn how to format and partition a hard disk. Lab instructor should verify the installation and follow it up with a Viva.

Task 4: Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot with both windows and Linux. Lab instructors should verify the installation and follow it up with a Viva

Task 5: Basic commands in Linux

Task 6: Hardware Troubleshooting: Students have to be given a PC which does not boot due to improper assembly or defective peripherals. They should identify the problem and fix it to get the computer back to working condition. The work done should be verified by the instructor and followed up with a Viva

Task 7: Software Troubleshooting: Students have to be given a malfunctioning CPU due to system software problems. They should identify the problem and fix it to get the computer back to working condition. The work done should be verified by the instructor and followed up with a Viva.

Task 8: The test consists of various systems with Hardware / Software related troubles, Formatted disks without operating systems. Installation of antivirus software, configure their personal firewall and windows update on their computer. Then they need to customize their browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

M301 DATA STRUCTURE AND ALGORITHM

Full marks: 75 (Internal 15)

Definition :   **Marks : 5**
Concept of Data Types, elementary structure, words and their interpretations, packed words
Arrays :
Types, memory representation, address translation functions for one & two dimensional arrays, different examples.

Linked Structure: **Marks : 15**
Singly and doubly linked list, circular and non circular, list manipulation with pointers , example involving insertion and deletion of elements and their comparative studies with implementations using array structure

Stacks and Queues
Definitions, representation using array and linked list structure, application of stack and queues in simulation, postfix conversion and evolution of arithmetic expressions

Binary trees: **Marks:12**
Definition, quantitative properties, memory representation, Trees traversal algorithms (recursive and non-recursive), threaded trees, BFS, DFS

Searching :   **Marks : 18**
Linear and binary search algorithms, performance and complexity, binary search trees (construction ,insertion , deletion and search) Concept of optimal binary search trees.

Sorting:
        Terminology, performance evaluation, sorting algorithms (non recursive, recursive description, Complexity, advantages and disadvantage, implementation)
Bubble sort, insertion sort, selection sort, Tree sort, heap sort, quick sort, merge sort & radix sort. External Sorting.

Analysis of Algorithm
                                                                     Marks: 10
Time and Space complexity of algorithms, average case and worst case analysis, asymptotic notation as a measure of algorithm complexity, Ɵ and O notation. Analysis of sorting algorithms- Selection sort, Bubble sort, Insertion sort, Heap sort, Quick sort and analysis of searching algorithms – linear search and binary search.

Suggested readings:

1. Data Structure , Horowitz and Sahani, Narosa
2. Introduction to Data Structures in C, A.N.Kamthane, Pearson, 2007.
3. Data Structure using C and C++, Langsam, Augentein & Tanenbaum
4. Data Structures using C, S.K.Bandyopadhyay, K.N.Dey, Pearson.

M302 COMPUTER ORGANIZATION AND ARCHITECTURE

Full marks: 75 (Internal 15)

Introduction: **Marks:10**

Functional units of a computer, basic instructions (zero, one, two, three addresso, interconnection of functional units, bus structure, memory locations, memory addresses, memory operations, instruction and instruction sequencing (straight line sequencing and branching).

Fixed and floating point representation of numbers. Normalized floating point representation and arithmetic operations using normalized floating point numbers. IEEE standard for binary floating point representation
Addressing modes, stack, subroutine, I/O instructions.

Register Transfer Logic: **Marks: 8**

Introduction, interregister transfer, arithmetic microoperation, logic microoperation, shift microoperation, Conditional control statements, fixed point binary data, instruction code, design of a simple computer.

Processor logic design: **Marks: 12**

Processor organization, design of arithmetic and logic circuit, status register, design of accumulator.

Control logic design: **Marks 12**

Hardware control, microprogrammed control block disgram, symbolic microprogram, microprogrammed CPU organization.

I/O Subsystem: **Marks: 8**

Program controlled I/O, Interrupts: enabling and disabling interrupts, handling interrupts from multiple sources (priority control), DMA.

Memory subsystem: **Marks: 10**

Semiconductor memory, SRAM, DRAM, ROM, speed size and cost, Cache memory, mapping functions.

Suggested Reading:

1. Digital logic and Computer Design, M.Morris Mano, PHI publication
2. Computer Architecture, Hamachar, Vranesic and Zaky.
3. Computer Organization and Architecture; William Stallings, Pearson.

M303 PRACTICAL

Full Marks: 50 (Internal 10)
Each student should do at least 15 assignments from the following list.

1. Implement binary search and linear search algorithms on arrays.
2. Implement following sorting algorithms :
   - i) Bubble sorting
   - ii) Insertion sort
   - iii) Heap sort
   - iv) Quick sort
   - v) Merge sort
3. Write a program to create a singly linked list and insert an element at the beginning, end, and at a given position of the linked list.

4. Write a program to create a singly linked list and delete an element from any position of the linked list.

5. Write a program to create a singly linked list. Write functions for
   - i. counting the number of elements in a list
   - ii. to search for a given element in a list. If the item has been found then it should return the position at which the item was found; otherwise it should return -1 to indicate not found.
6. Write a function to concatenate two linked lists.

7. Write a function to merge two sorted linked lists.

8. Write a program to   create a doubly linked list and insert an element at any position.

9. Write a program to create a doubly linked list and delete an element from a given position.

10. Write a program to   create a circular linked list and insert / delete an element at any position.

11. Write a program to implement a stack using
    - i) array structure
    - ii) linked list structure
12. Write a program to implement two stacks using a single array.

13. Write a program to evaluate a postfix expression using stack.

14. Write a program to convert an infix expression into a postfix expression.

15. Write a program to implement a queue using array.

16. Write a program to implement a queue using linked list.

17. Write a program to implement a circular queue using array.

18. Write a program to implement a circular queue using linked list.

19. Write a program to create a binary search tree using link representation and display the elements in preorder, in order and post order using recursive function.

20. Write a program to create a binary search tree using link representation and
                i) search
                ii) delete an item from the binary search tree.

M401 OPERATING SYSTEM

Full marks: 75 (Internal 15)

Introduction: **Marks:8**

What is an operating system, batch systems, multiprogrammed, time-sharing systems, personal-computer systems, parallel systems, distributed systems, real-time systems.

Processes: **Marks:8**

Process Concept, Thread, design issues of thread, user space thread and kernel space thread. Usage of thread. Process states, Operation on Processes:- creation and termination. Implementation of process:- process table.

Process Synchronization: **Marks:8**

Race condition, Critical-Section, mutual exclusion. Solution to race condition and synchronization: - disabling interrupt, test-and-set-lock, Peterson's solution, semaphore, mutex, monitor, message passing. Classical problems:- The Dining philosopher, sleeping barber and readers-and-writers (bounded buffer) problems and their solution.

Scheduling: **Marks:8**

Basic Concepts, preemptive and non preemptive scheduling. Scheduling Algorithms. Types of scheduling: - batch, interactive and real-time. Goals of scheduling algorithms. FCFS, SJF, RR, priority, multiple queues, three-level scheduling.

Deadlocks: **Marks:8**

System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock. Banker's algorithm.

Memory management: **Marks:8**

Multiprogramming. Address binding (relocation), and protection. Swapping. Virtual memory: - logical versus physical address space, paging, page fault, page table and its entries, demand paging, multi level page table, TLB, its entries and working. Page replacement algorithms: - LRU, optimal, NRU, FIFO, second chance, clock, NFU. Working set. What is segmentation, what are its benefits and drawbacks.

File system: **Marks:8**

What is file, file naming, file types(directory, regular, device), sequential access and random access files, file attributes, operations on file, hierarchical directory structure, path name(relative and absolute), operation on directories, disk layout, disk partition, file system layout, disk block allocation:-contiguous allocation linked list allocation, FAT, i-nodes, directories in UNIX, file system security

I/O management: **Marks: 4**

Basic principles and overall structure of I/O management subsystem, Device controllers, layers of the I/O subsystem:- interrupt handlers device driver, device independent I/O software and user space I/O software.

Suggested reading:

1. Modern Operating System, Tanenbaum, PHI Publication.
2. Operating System by Galvin

402 DATABASE MANAGEMENT SYSTEM

Full marks: 75 (Internal 15)

File structure: Marks: 5

Record storage and primary file organization: memory hierarchies and storage devices, Storage of Data Bases, Placing file records on disks: Records and its Types, Files, Fixed length records and variable length records, Record Blocking, allocating file blocks on disks, operation on files.

Issues in Physical Design : Concept of indexes

Overview of Database Management System: Marks : 15

Definition of DataBase, Traditional File Approach vs. DBMS approach, Characteristics of the Data Base Approach, DBMS user, Role of a DBA, Advantage of using DBMS, DBMS architecture,   Data independence

ANSI/SPARC 3 level architecture.

Relational Models: Marks: 20

Fundamental integrity rules: entity integrity, referential integrity, Relational algebra(Select , Project, Cross ,Product , theta join, equi join, natural join, outer join),Set Operation

ANSI SQL –92 Standard : DDL, DML, SQL constructs(Select .. From… Where… Group by ….. Having… Order by….), Insert, Delete, Update, View, Definition and use, nested quires, Constraints considers(NOT NULL , UNIQUE, Check Primary key. Foreign key)

Database design: Marks : 20

Conceptual model, logical model, physical model.

ER model as a tool for conceptual design-entities, attributes and relationships, weak and strong entities, conversion of ER model into relational schema. DFD.

Normalization: informal design guidelines for relational schemas (overview level), functional dependencies, different types of keys. Normal forms (first, second, third, BCNF).

Functional dependency diagram and relational database design from it.

Suggested reading:

1. Introduction to database management system, C.J. Date
2. Fundamentals of Database Systems, Elmasri & Navathe; Pearson Education.
3. An introduction to Database systems; Bipin C. Desai; Galgotia publications.
4. Database Systems - Concept, Design and Applications; S.K.Singh; Pearson Education.

M403 PRACTICAL

Full marks 50 (Internal 10)

Part 1-Operating System: 25 marks (Internal 5)

Each student should do at least 12 assignments from the following list.

1. Write a program to create a child process that starts looping and then terminates.

2. Write a program to show that the child can be set up to ignore a signal from its parent.

3. Write a program to show that a process can ignore a signal.

4. Write a program to create a thread which prints "We are proud to be Indians" and terminates.

5. Write a program to demonstrate how to "wait" for thread completions by using the Pthread join routine. Threads are explicitly created in a joinable state.

6. Write a program to create a thread in which print "We are proud to be Indians" and pass multiple arguments using structure during its creation.

7. Write a program to compute the dot product of two vectors.

8. Write a program to compute the dot product of two vectors and also show the use of mutex variables.

9. Write a program to create threads, the main thread creates three threads. Two of these threads increment a counter variable while third thread watches the value of the counter variable. When the counter variable reaches a predefined limit, the waiting thread is signaled by one of the incrementing threads. The waiting thread "awakens" and then modifies the counter. The program continues until the incrementing threads reach a final value and also print the final value.

10.Write a program to fork() a child process so that we have two processes running. Each process communicates via a semaphore. The respective process can only do its work (not much here) When it notices that the semaphore track is free when it returns to 0. Each process must modify the semaphore accordingly.

11.Write a program to show how 2 processes can talk to each other using kill() and signal(). We will fork() 2 process and let the parent send a few signals to it's child.

12. Write a program to show attaching and detaching shared memory.

13. Write a program to show the communication between two processes through shared memory.

14. Write a program to implement Banker's Algorithm.

15. Write a program to simulate synchronization of Sleeping Barber problem.

16. Write a program to simulate Dining Philosophers Algorithm.

Part - 2 Database Management System
Full marks : 25 (Internal 5 marks)

1. Create a table *Employee* with the following columns:
   Emp_no (numeric) primary key
   Emp_name (string)
   Join_date (Date)
   Basic_pay_fixed_at (numeric)
   Date_of_birth (Date)

Insert the following data into the table.

Emp_no.	Emp_name	Join_date	Basic_pay_fixed_at	Date_of_birth
1001	Charles Babbage	01-Jun-2000	8000.00	03-10-1973
1002	George Boole	01-Jul-2001	5000.00	04-12-1972
1003	E.F. Codd	01-Jun-2001	8000.00	06-03-1969
1004	Bill Gates	01-Jul-2003	5000.00	09-10-1995
1005	Tony Greig	01-Aug-2004	8000.00	04-05-1985

2. Create the following two tables and insert data into the tables.
 Player (Roll no.→Primary Key)

Roll no.	Name
10	Vijay Amrithraj
20	Leander Paes
30	Mahesh Bhupathi
40	Sania Mirza

Match (Match_no→Primary key,Roll no→Foreign key)

Match_no	Roll_no.	Match_Date	Opponent
1	20	10-Jul-2008	Washington

2	30	12-Jan-2008	Sampras
3	20	12-Aug-2008	Borg
4	30	20-Mar-2008	Vijay

Perform the following two operations:

(i) Perform EQUIJOIN operation to retrieve data from both the files.

(ii) Perform OUTERJOIN operation to retrieve the unmatched records.

3. Design an ER diagram for a **BANK** database schema. To consider that each Bank can have multiple branches, and each branch can have multiple Accounts and Loans for customer. Also to specify the non weak & weak entity types, key attributes & key types, relationship types, instances, constraints and participations.

3. Create a table **Student** taking the attributes given bellow

                     Roll_no, Student_name, Address, Date_of_addmission, Class

                     Section and Contact_no.

Write appropriate queries to perform the following operations:

       a) To insert values in the Student table.

       b) To delete values from Student table

       c) To list the names of all students which roll_no > 20.

       d) To search for students who got admitted before 01-01-2006.

       e) To change the name of the student whose roll number is 10 to Amar.

4. Create tables **Department** and **Employee** with the attributes given bellow.
          Employee (EmpNo , Empname, Address, Dno)
          Department (Dno, Dname, Location)

Dno in Employee is a foreign key.

Write appropriate queries to perform the following operations:

      a) To insert values in the tables.
      b) To retrieve the names and addresses of all Employees working in the Finance
        department.
      c) To print the location where Administration department is located.

d) to delete all information regarding a particular employee.

5. Create table *Student* and *Course* taking the attributes given bellow.

        Student (Roll_no, Name, Semester, Course_no(Foreign key))

        Course (Course_no, Course_name)

Write appropriate queries for the following operations:

    a) To retrieve names of all students who are admitted to the course 'BCA'.

    b) To retrieve the names of all students whose course name is 'BCA' and who are in the 3rd semester.

    c) To display details of all courses in which more than 100 students got admitted.

    d) For course being offered, display the course name and number of students admitted to the course.

6. Create tables *Employee*, *Department*, *Location*, *Works_on*, and *Project* taking the attributes given bellow.

    Employee (Fname, Lname, Empno, Bdate, Address, Salary, Dnumber)

    Department (Dname,Dnumber,Mgrno)

    Locations(Dnumber, DLocation)

    Works_on(Empno, Pnumber, Hours_per_day)

    Project(Pname, Pnumber, Location,Dnumber (Foreign))

    Dependent(Empno, Dependent_name, Sex, DOB, Relationship)

Write appropriate queries for the following operations:

a)   Retrieve the names and addresses of all employees who work in the Finance department.
b) To retrieve the names of all employees who works on all the projects controlled by department number 6
c) For each department, print the name of the department and the name of the manager of the department.
d) Retrieve the location where the Administration department is located.
e) For every project located in Mumbai, list the project number, the controlling department and department manager's name and address.
f) Find out how many employees are there in each department.

g) Find the total salary of all employees of the "Research" department, as well as the maximum, minimum and average salary in this department

h) Retrieve the name of all employees who have no dependent.

i) Alter the "Employee" table by deleting the coloumn Bdate.

j) Retrieve the Fname, Lname of all employees whose salary is higher than average salary.

k) For each department retrieve the department number, the number of employee in the department and their average salary.

l) Retrieve the name of all employees who have two or more dependent

m) Retrieve the details of all employees who works on project number 1,2,3

7. Create Table

Client_master (Client_no, name, address, Bdue)

Product_master(P_number,Description,saleprice,costprice)

Sales_master(Salesmno,Sname,Addres,Salamnt,Remarks)

Sales_order(O_no,Client_no,Odate,Delyaddr,Salesmno)

Sales_order_detail(Order_no,Product_no, Qtyorder, product_rate,Qty_dispatched)

Write appropriate queries to perform the following operations:

i) List name of all clients having 'a' as the second letter in their names.

ii) Retrieve the description and total Qty sold for each product.

iii) Find product no. and description of non moving products (i.e product not being sold).

iv) For each product being sold, list the product number and the total amount (in Rs.) sold.

v) List all client who stay in 'Bangalore' or 'Mumbai'

vi) List the clients who stay in a city whose First letter is 'M'

vii) Find the names of clients who had purchased the item 'Trouser'.

viii) Find out if T-Shirt' has been ordered by any client and if so print the details of the client.

ix) List details of all products whose unit price is more than Rs. 5000.00.

x) Calculate the total amount (in Rs.) purchased by each client that has purchased items amounting more than Rs. 20000.

8. Create table

Author(Author_id, Name, City, Country)

Catalog (Book_id, Title, Author1_id, Author2_id, Publisher_id, Category_id, Year, Price)

Publisher(Publisher_id, Name, City, Country)

Order_details(Order_no, Book_id, Quantity)

Category(Category_id, Description)

Order_summary(Order_no,Member_id,Odate,Amount,Ostatus)

Member(Member_id, Name, Address, Contact)

Assume that all books have at most two authors.

Write appropriate queries to perform the following operations:

a) Retrieve the title, author, and publisher names of all books published in 1999 and 2006.
b) Retrieve the title of all books whose one author is 'A Tanenbum'.
c) Get the details of all books whose price is greater than the average price of the books.
d) Get the names of all the books for which an order has been placed.
e) Get the names of all authors who have more than ten books in the catalog.
f) Get the details of the authors whose books are being sold from the book club.
g) Get the title and price of all books whose price is greater than the maximum of the category average.

M501 OBJECT ORIENTED PROGRAMMING

Full marks: 75 (Internal 15 marks)

Programming language C++ is to be used with this paper.

Introduction: **Marks: 5**

What is OOP .Introducing Object-Oriented Approach, Relating to other paradigms. Benefits of OOP and methods.

Basic terms and ideas: **Marks: 8**

Abstraction, Encapsulation, Inheritance, Polymorphism, Review of C, Difference between C and C++ - cin, cout, new, delete operators. Functions in C++: main function, function prototyping, call by reference, return by reference, functions- inline, friend, virtual, library.

Classes and Objects: **Marks: 20**

Encapsulation, information hiding, abstract data types, Object & classes, attributes, functions, C++ class declaration, member functions, State identity and behavior of an object, static data members and member functions, friend functions, constant member functions. Constructors and destructors, instantiation of objects, Default parameter value, object types, C++ garbage collection, Metaclass/abstract classes.

Operator overloading: Overload unary, binary operators, overloading binary operators using friends, manipulation of strings using operators.

Inheritance: **Marks: 10**

Inheritance-multilevel, multiple, hierarchical, hybrid, virtual base class, abstract class, Class hierarchy, derivation – public, private & protected, Aggregation, composition vs classification hierarchies.

Polymorphism: **Marks: 10**

Polymorphism, Categorization of polymorphism techniques: compile time polymorphism, Polymorphism by parameter, run time polymorphism- pointers to derived class, virtual; function, pure virtual function.

Files and Exception Handling: **Marks: 7**

Persistant objects, Streams and files, Namespaces,

Exception handling, Generic Classes.

Suggested readings:

1. Herbert Schild, " The complete reference to C++", Osborn McGraw Hill
2. R. Lafore, "Object Oriented Programming using C++", Galgotia Publications
3. Ian Graham, "Object Oriented Methods", Addison Wesley.

M502 COMPUTER ORIENTED NUMERICAL METHODS AND STATISTICAL TECHNIQUES

Full marks: 75 (Internal 15 marks)

Representation of numbers: **Marks: 8**
        Floating point representation, single and double precision, round off errors and truncation errors.

Solution of non-linear equation: **Marks: 8**
        Bisection method, Newtons method, Regula Falsi method, secant method, fixed point algorithm.

Solution of simultaneous linear equation: **Marks: 8**
        Basic elimination method, Gaussian elimination method, Gauss Jordan method, method of successive approximation.

Ordinary differential equation: **Marks: 8**
        Euler's method, Runge Kutta method, Milnes method.

Interpolation: **Marks: 7**
        Newton's interpolation, Lagrange's interpolation, Newton's divided difference method.

Numerical integration: **Marks: 7**
        Trapezoidal rule, Simpson rule, Newton's Cotes method.

Statistical methods: **Marks: 14**

Measure of central tendency: Mean, Median and Mode.

Probability, probability distribution, Binomial, Poison and normal distribution.
Mathematical expectations, moments, correlation, regression.

Suggested Reading:

1.M.K.Jain, S.R.K.Iyenger, R.K.Jain, " Numerical methods for Scientific and Engineering Computation", Wiley Easterns.
2. K.E. Atkinson, "An introduction to numerical analysis", J.Willey and Sons.

503 COMPUTER NETWORKS

Full marks: 75 (Internal 15 marks)

INTRODUCTION   **Marks:8**
Usage of Computer Network, study of topology, concept of protocol, Connection less and connection Oriented Service, Layered architecture, study of OSI and TCP model.

PHYSICAL LAYER   **Marks:8**
Introduction to Guided and Unguided media, physical description of twisted pair, coaxial cable, and fiber optic cable, Maximum data rate of a channel (Nyquist and shannons law), Basic concepts of Modulation and demodulation, Data encoding techniques (Manchester and Differential Mancestar encoding)

Network connecting devices hub, repeater, bridge, switch, router, and gateway

LOGICAL LINK CONTROL   **Marks: 8**
Functions and services of DLL, Framing and Framing Methods, Concept of Error Control, Error Correcting code(Hamming code), Error detecting code(CRC), Concept of Flow Control, Piggybacking, Stop-and-Wait sliding window protocol, Pipelining techniques(Go backN, Selective Repeat).

MEDIUM ACCESS CONTROL   **Marks: 8**
What is MAC? Static Channel Allocation, Dynamic Channel Allocation, Pure ALOHA, Slotted ALOHA, Carrier Sense Protocol, 1-persistent CSMA, Non-PersistentCSMA, CSMA/CD, Ethernet(IEEE 802.3) and Ethernet Frame Format, Basic concept of Wireless LAN(IEEE 802.11), Binary Exponential Backoff Algorithm.

NETWORK LAYER]   **Marks:12**
Services and Functions of Network Layer, Virtual Circuit and Datagram Subnet, Routing, Distance Vector Routing, the Count-to-Infinity problem, Link State Routing, Congestion (definition and factors of congestion only), Definition of Quality of Service, Traffic shaping, Leaky Bucket and token Bucket Algorithm, Concept of IP Address.

TRANSPORT LAYER   **Marks: 8**
Functionality of transport Layer, Establishment and release of connection, TCP and UDP(Overview), Introduction to Sockets, port numbers.

APPLICATION LAYER   **Marks: 8**
Concept of E-mail, Telnet, WWW, DNS, HTTP, FTP, URL, SMTP, MIME.

 Suggested Reading:

1. Computer Networks, Andrew S. Tanenbum, PHI Publication.

2. Data and Computer Communication, Stalling W, 5ed, PHI (EEE).

M504 MICROPROCESSOR AND ASSEMBLY LANGUAGE PROGRAMMING

Full marks: 75 (Internal 15 marks)

Internal Organization of 8085A microprocessor: **Marks: 4**

User Programmable registers, PC, SP, accumulator, flags, data bus, address bus, control bus, instruction word size, opcode format, data format, memory addressing, I/O addressing, address decoding for memory and I/O.

8085A microprocessor architecture: **Marks: 12**

Pinout of 8085A microprocessor, multiplexed address/data bus, control and status signal, demultiplexing of control signals, other signals, bus timings, fetch decode and execute cycle, timing diagram for opcode fetch memory read and memory write, interfacing memory and I/O.

Assembly language programming in 8085A microprocessor:

                                                                                    Marks: 20

Complete instruction set in detail, programming examples, logic operation, counters and time delays, stack and subroutine, processing arrays, bit manipulation.

Interfacing: **Marks: 12**

In and OUT instruction, decoding addresses, Interfacing LED, relay, seven segment display, switch, keyboard,.

Interrupts: **Marks: 12**

Vectored interrupts, interrupt priorities, general purpose programmable peripheral devices, 8255A control and status registers, programming 8255A, introduction to 8279, 8254 and 8237 (block diagrams and basic functions).

Suggested Reading :

1. Microprocessor Architecture, Programming and Application with the 8085 by Ramesh S.Gaonkar
2. Microprocessor and Microcomputer by B.Ram.

M505 PRACTICAL

Total Marks: 75 (Internal 15)

Practical Assignments based on M501 (OOP): 45 marks (Internal 9)
Each student should do at least 10 assignments from this list. The assignments are to be chosen in such a way that all the features of OOP are covered.

1. Define a class named *triangle* to represent a triangle using the lengths of the three sides. Write a constructor to initialize objects of this class, given the lengths of the sides. Write member functions to check
   (a) if a triangle is isosceles
   (b) if a triangle is equilateral.
   Write a main function to test your functions.

2. Define a structure **employee** with the following specifications.
   Empno: Integer
   Ename:20 character
   Basic, hra, da: float

   Calculate()   : a function to compute net pay as basic+hra+da with float return type.
   Getdata():   a function to read values for empno, ename, basic, hra, da.
   Dispdata():   a function to display all the data on the screen

Write a main program to test the program.

3. Define a class *complex* with two data members *real* and *imag* to represent real and imaginary part of a complex number.

   Write member functions

   rpart(): to return the real part of a complex number

   ipart() : to return the imaginary part of a complex number

   Add() : to add two complex numbers.

   Mul() : to multiply two complex numbers.

   Write constructors with zero, one and two arguments to initialize objects.

   // This is an example of polymorphism.

4. Define a class *point* with two data members *xordinate* and *yordinate* to represent all points in the two dimensional plane by storing their x co-ordinate and y co-ordinate values.

   Write member functions

   dist(): to return the distance of the point from the origin.

slope(): to return the slope of the line obtained by joining this point with the origin.

Write constructors with zero, one and two arguments to initialize objects.

Write a friend function to compute the distance between two points.

5. Define a class *String* with the following data members
   char *p;
   int size

and write member functions to do the following (without using library function) and using dynamic memory allocation.
   - Length of the string
   - Compare two string
   - Copy one string to another.
   - Reverse the string.
   - Write suitable constructors and destructors. Write a copy constructor for the class.

6. For the class *complex* defined in 3 above, overload the <<, >>, + and * operators in the usual sense. Also overload the unary – operator.
7. For the class *string* defined in 5 above, overload the <<, >> and + operators where + is to be used for concatenating two strings.
8. Define a class *time* to store time as hour, minute and second, all being integer values. Write member functions to display time in standard formats. Also overload the ++ and -- operators to increase and decrease a given time by one second where the minute and hour values will have to be updated whenever necessary.
9. Define a class to store matrices. Write suitable friend functions to add and multiply two matrices
10. Define a class *student* with the following specification:
    rollno   :integer
    sname   :20 characters

Derive two classes *artsst* and *scst*. The class astst will represent students belonging to Arts stream and the class scst will represent students belonging to science stream. The artsst class will have additional data members *ph, hs, en* and **as** to store marks obtained by a student in three subjects Philosophy, History, English and Assamese. The class scst will have additional data members *ph, ch, ma and eg* to store marks obtained in Physics, Chemistry, Mathematics and English.

Write the following member functions in the classes artst and scst

    ctotal()   : A function to calculate the total marks obtained by a student

    takedata()   : function to accept values of the data members

    Showdata()   :   function to display the mark sheet of a student .

11. Define a abstract base class *figure* and add to it pure virtual functions

    display() to display a figure

> ***get()*** to input parameters of the figure
> ***area()*** to compute the area of a figure
> ***perimeter()*** to compute the perimeter of a figure.
>
> Derive three classes ***circle, rectangle*** and t***riangle*** from it. A circle is to be represented by its radius, rectangle by its length and breadth and triangle by the lengths of its sides. Write a main function and write necessary statements to achieve run time polymorphism.

12. Write an interactive program to compute square root of a number. The input value must be tested for validity. If it is negative, the user defined function ***my_sqrt()*** should raise an exception.
13. Write a class template for storing an array of elements. Overload the << and >> operators. Write a member function to sort the array in descending order.

Practical Assignments based on M 503: 30 marks (Internal 6)

Avoid using Loopback Communication for the assignments,1-4:

1. Write a server socket program using TCP/IP in java where the client side will send a request for an existing file to the server side and if the file exists in the server then send the contents of that particular file to the client in reply, otherwise display a message "file does not exist on the server", if exists displays the contents on the client side.

2. Develop a chat application using TCP/IP in java.

3. Develop a client-server application using TCP/IP in java to input user's information and finally send them to the server and store there in a file.

4. Develop a server socket program where the client takes principal, rate of interest and number of years and send them to the server. In the server receive this information and find the simple interest and finally send the result to the client again and display it on the client's VDU.

5. Configure a Local Area Network (Wired/Ethernet) in Linux environment. Configure the network interface card using ifconfig command and also explore ping, ifdown and ifup commands.

M506 PRACTICAL

Total Marks: 75 (Internal 15)

Practical Assignments based on M502 (CONMST): 30 marks (Internal 6 marks)

Each student should do at least 10 assignments from this list. The assignments are to be chosen in such a way that all the topics are covered.

1. Write a program to find the positive root of the equation $2x - \log_{10} x - 7 = 0$, correct to 4 places of decimals using N-R method.

2. Write a program to find $3x - \cos x - 1 = 0$ that lies between 0 and 1, correct to 4 places of decimal by using Bisection method.

3. 3. Write a program to find the root of the equation $x e^x - 3 = 0$ that lies between 1 and 2 correct to 4 places of decimal by using Regula-Falsi method.

4. Implement Euler's method.

5. Implement R-K method.

6. Implement Simpson's method.

7. Write a program to find mean for direct series.

8. Write a program to find mean for continuous distribution.

9. Write a program to find median for individual series.

10. Write a program to find median for direct series.

11. Write a program to find median for continuous series.

12. Write a program to calculate lower quartile.

13. Write a program to calculate upper quartile.

14. Write a program to calculate different deciles.

15. Write a program to calculate different percentiles.

16. Write a program to calculate mode for discrete distribution.

17. Write a program to calculate mode for continuous distribution.

18. Write a program to calculate harmonic and geometric means for any distribution.

19. Write a program to calculate probability using binomial distribution.

20. Write a program to calculate probability using Poisson distribution.

Practical Assignments based on M503 (MALP): 45 marks (Internal 9 marks)

1. Write a program to add two 8 bit numbers & store it in a memory location 8820h.

2. Write a program to copy a block of memory from one location 8820h to another location 8840h.

3. Write a program to perform the addition of two 16 bit numbers.

4. Write a program to add two numbers & store it in a register **e**.

5. Write a program to load two unsigned numbers in register b & c. Subtract b from c. If the result is in 2's complement, convert the result in absolute magnitude & display it.

6. Write a program to find the difference of two numbers & store the result in a memory location 8830h.

7. Write a program to find the larger / smaller of two given numbers.

8. Write a program to subtract two numbers and add it to a given memory location.

9. Write a program to perform x+y−5, where x and y are 16−bit numbers.

10. Write a program to find 2's complement of a number.

M601 AUTOMATA THEORY AND LANGUAGES

Full marks: 75   (Internal 15)

Finite Automata   **Marks: 12**
DFA, NFA, NFA with ε-moves. Equivalence of DFA and NFA. Reduction of the number of states in a finite automata.

Regular Languages and Regular Grammar   **Marks: 12**

Concept of languages and grammar. Regular expressions. Connection between regular expressions and regular languages. Regular grammars, Right and Left-Linear Grammars. Equivalence between Regular languages and Regular grammars.

Properties of Regular Languages   **Marks: 8**

Closure under simple set operations- union, intersection, concatenation, complementation and star-closure. Decision algorithms for emptiness, finiteness and infiniteness, equality. Proof of non-regularity using Pigeonhole principle and using pumping lemma for regular languages.

Context free languages   **Marks: 12**

Context-free grammars, leftmost and rightmost derivations, derivation trees. Parsing and Ambiguity in grammars and languages. Simplification of Context free Grammars- removing useless productions, empty-productions and unit-productions. Normal forms- Chomsky and Greibach normal forms.

Pushdown Automata   **Marks: 8**
Definition and language accepted (acceptance by empty stack and final state and their equivalence). Pushdown Automata and Context free languages. Deterministic PDA and Deterministic Context free Languages.

Properties of Context free Languages   **Marks: 8**

Pumping Lemma for CFL. Using Pumping Lemma to show certain languages not to be Context free. Closure properties of CFL – closure under union, concatenation and star-closure. and showing that CFLs are not closed under intersection and complementation. Decision algorithms for emptiness, finiteness and infiniteness.

Suggested Reading

1. An introduction to Formal Languages and Automata, Peter Linz, Narosa.
2. Introduction to Automata Theory, Languages and Computation, Hopcroft and Ullman, Addison Wesley.
3. K. L. P. Mishra, N. Chandrasekaran; Theory of Computer Science (Automata, Languages and Computation), P. H. I.
4. T. H. Cormen, C. E. Leiserson and R. L. Rivest, Introduction to Algorithms, Tata-Mcgraw Hill Publishers.

M602 WEB TECHNOLOGIES

Full marks: 75 (Internal 15)

Overview of the World Wide Web and the internet: **Marks: 5**

A brief history of TCP/IP and the Internet, Internet services-email, telnet, ftp , Internet components, the birth of web, web page, home page, web site, types of Internet connection- dial up, DSL, Broadband, VSAT, WiFi

Web Servers and Browsers: **Marks: 5**

Web browsers-Netscape navigator and IE, Web browser helper applications, Web servers, Web server architecture

Internet architecture: **Marks: 5**
IP addresses and its working, domain name system, URL

Inside the firewall: **Marks: 8**
Firewall, proxy server, overview of intranet security, web server security, username/password authentication. COM, DCOM, CORBA.

Linking database to the web   **Marks: 7**
JDBC, ODBC- CGI and ASP, Dynamic page creation and advantages

HTML editors and tools   **Marks: 10**
Basic HTML, HTML tags, creating list in HTML, hyperlinks, multimedia, HTML forms, tables in HTML, frames in HTML, image maps, style sheets in HTML. DHTML, XML-Introduction, Need for XML, Advantages, simple XML programs, DTD.

Java Script   **Marks: 10**
Client side Scripting languages, history of JavaScript, Java vs. Java Script, Creating interactive documents using JavaScript.

Using Visual Basic Script   **Marks: 10**
The benefits of VBScript, Interacting VBScript with HTML forms, VBScript variables and operators, VBScript flow of control statements, Server Side scripting languages Introduction.

Suggested Readings:

1. The Internet –Complete M.L Young ; Tata McGraw Hill
2. Using CGI by J.Dwight , M.Erwin, R. Niles: Prentice Hill
3. Mastering JavaScript and Jscript by J.Jaworski ;BPB Publication
4. Dynamic HTML –the definitive references by D.Godman: Shroff Publishers
5. Understanding XHTML by D.P Nagpal: Wheeler Publishing.

M603 SYSTEM ADMINISTRATION USING LINUX

Full marks: 75 (Internal 15)

Unit I :   **Marks:12**
What is System Administration? Duties of a System Administrator. Basic features of the Linux operating system. Installation requirements,Partioning the Hard drive in Linux,Installing the Linux syatem, installing and configuring softwares in linux,Linux kernel program, system Startup and Shutdown. Standard I/O,Standard error,redirection and piping.

Unit II :   **Marks: 12**
 Basics of Linux file system: hierarchy and types. absolute and relative path names.Basic commands for files and directories- ls,cp,mv,rm,mkdir,rmdir,more,creating and viewing files, mounting and unmounting file systems and partitions. Structure of /etc/fstab file and its purpose. I-node, directories, hard link, symbolic link. setting user and group ownership of files and access permissions, study of different linux shells (sh, bash, csh, zsh). Environment variable. Bash variables, login vs non-login shells. Shell script basics. Introduction to grep, awk, perl

Unit III :   **Marks: 12**
Basic commands for starting and stopping processes, basic process attributes and their role in access control. Examining the list of running processes on the system and understand the data presented there. Background process,Sending signals to processes and modifying process priorities. Job control. Crontab file format, Backup and Restore procedure, configuring the print queue, selecting the printer driver, editing the printer configuration, deleting printer setting default printer.

Unit IV :   **Marks: 12**
Managing user accounts: Adding a user,password,Creating Groups,adding and deleting groups,viewing user account information,understanding the 'root' account, implementing sudo. What is file ownership and access permission,,System monitoring and logging,Monotoring memory usage, disk space usage and I/O activity. Logging and its necessity, Customizing ststem Log information.

Unit V: **Marks: 12**
 The rules governing IP address classes and netmasks, Network Address,Netmask and Gateway.configuring Interface with ifconfig,adding routes, ping,netstat,traceroute,telnet,Understanding the significance of the /etc/services file and well known port numbers. Basics of configuring NFS, NIS, DNS, FTP, Squid Proxy,DHCP server,iptables and firewall.Basic Network Security Issues.

Suggested Readings
1.Red Hat Linux:Proffitt:PHI

2.Introduction to system Administration:IBM series:PHI

3.Essential System Administration:Frisch:O'REILLY

M604 PRACTICAL

Total Marks: 75 (Internal 15)

Practical Assignments based on M602 : 40 marks (Internal 8 marks)

<u>**HTML**</u>

(At least 17 assignments has to be done from this group)

1. Create a HTML document consisting of HTML heading, paragraphs and images.

2. Create a HTML document and insert comments in the HTML source code and insert horizontal lines.

3. Construct HTML document to set the font of a text , size of the font, style of the font.

4. Create a HTML document to show how to create hyperlinks.

5. Create a HTML document to use an image as a link.

6. Create a HTML document to open link in a new browser window.

7. Create a HTML document to jump to another part of a document (on the same page).

8. Create a HTML document to insert images from another folder or another server.

9. Create an image-map, with clickable regions.

10. Create a HTML document with all table elements (Table, Caption, Table Row, Table Data element, Table Heading Element, THEAD, TFOOT, TBODY)

11. Create HTML document to make an unordered list, an ordered list, different types of ordered lists, different types of unordered lists, Nested list, Definition list.

12. Create HTML form with the all FORM elements (text fields, password field, Checkboxes, Radio buttons, Select elements, Drop-down list with a pre-selected value, Textarea (a multi-line text input field) and buttons.

13. Create HTML document with all Frame elements (FRAMESET, FRAME, NOFRAMES, and INLINE FRAME).

14. Create a HTML document to add AUDIO and VIDEO.
15. Create a HTML document to aligning images
   (Let the image float to the left/right of a paragraph)

16. Create a HTML document to jump to a specified section within a frame

17. Construct a HTML document with CSS to Set the background colour of a page.
18. Construct a HTML document with CSS to set an image as the background of a page
19. Construct HTML document with CSS to Set the text color of different elements and align the text.

20. Construct HTML document to set different colours to visited/unvisited links, Specify a background colour for links

XML

21. Construct an XML document that contain information about products of an organization.
22. Construct an XML document that contain information of 5 students (such as roll no., name , address, class).
23. Construct an XML document that contain details of 10 books.

JAVAScript

(At least 10 assignments has to be done from this group)

24. Write a program in javasrcript to accept a name from the user and display the same name in an alert box.
25. Write a program in javasrcript to display a message in a confirm box.
26. Write a program in javasrcript to display the message 'time is running out' in the status bar.
27. Write a program in JavaScript to enter marks of a student and find his/her grade according to the following:
    if marks>=90 then grade A
    if marks>=80 then grade B
    if marks>=70 then grade C
    if marks>=60 then grade D
    else fail.
28. Write a program in JavaScript to create a button and when the button is clicked the message 'Hello World' is displayed on an alert box..
29. Write a program in JavaScript to accept 2 nos from the user and show the working of all arithmetic operators.
30. Write a program in JavaScript to accept 2 strings and concatenate them.
31. Write a program in JavaScript to display the current date and time.
32. Write a program in JavaScript to find the length of an array.
33. Write a program in JavaScript to check whether a string is palindrome or not.
34. Write a program in JavaScript that responds to a mouse click anywhere on the page (using mouse click).
35. Write a program in JavaScript to display the contents of a check box in a alert box.

36. Write a program to validate a form in the user id and password forms.

37. Write a program in JavaScript to crate a welcome cookie, Button animation, Image map with added JavaScript
Simple timing, Timing event in an infinite loop

VBScript

(At least 6 assignments has to be done from this group)

38. Write a program in VBScript to create a variable.
39. Write a program in VBScript to uppercase to lowercase.
40. Write a program in VBScript to Create an array
41. Write a program in VBScript using conditional statements loop
42. Write a program in VBScript using loop.
43. Write a program in VBScript to display Date and Time
44. Write a program in VBScript to display the current month and day.

ASP

45. Write a program in ASP to interact with a user in a form that uses the "get" method.
46. Write a program in ASP to interact with a user in a form that uses the "post" method.
47. Write a program in ASP to interact with a user in a form with radio buttons.
48. Write a program in ASP to create a welcome cookie.

Practical Assignments based on M603 : 35 marks (Internal 7 marks)

Each student should do at least 12 assignments from the following list.

1. Develop an application with a form and two buttons such that on clicking the button "Enlarge' a bigger circle will be displayed on the form and on clicking the button 'Shrink' a smaller circle will be displayed on the same form.

2. Develop an interactive Interest calculator application that takes Principal amount (P), Rate of Interest (R), and Number of years (N) through textbox input and displays Simple Interest, Compound Interest and Difference between Simple and Compound Interest.

3. Create a digital calendar to display date in the format DD::MM::YYYY and time in the 12-hour format HH:MM:SS AM/PM.

4. Develop an application using pop-up menus where there will be five menus with each menu item having two sub-menus, and on clicking each sub-menu item a different form will be displayed.

5. Develop a simple audio player application.

6. Develop a simple video player application.

7. Develop an application showing the use of a slider such that integers 1,2,---10 will be displayed as the slider is moved.

8. Develop a simple text editor application.

9. Develop an application showing the use of all possible GUI components (textbox, list, drop-down menu, radio, etc.) for new bank account creation, and on submit display the entered data.

10. Develop the Tic-Tac-Toe game in GUI environment.

11. develop an application showing five different animations in five separate forms on the statement "Welcome to GUI Programming".

12. Develop an application using database connectivity (any convenient DBMS) to store and display complete student information of the department.

13. Develop an application using database connectivity (any convenient DBMS) to store and display complete book information for the departmental library.

14. Develop an application using database connectivity (any convenient DBMS) to store and display complete member information for a club.

15. Develop an application using database connectivity (any convenient DBMS) to manage and display complete accounts for the Freshmen Welcome Meet.

M605 PROJECT

Total Marks: 150 (Internal 30)

Each student will be assigned some project work at the starting of the sixth semester. The objective of the project is to train the student to independently search, identify and study real-life important topics in CS/IT; to develop skills among students in a particular field of CS/IT; and to expose students to the world of technology, innovation, and research. Each student (or group of at most 2 students) is expected to take a unique problem under the guidance/supervision of a faculty member of the department. The problem should be such that the students get a chance to explore one or two technologies in depth and grab good command over those technologies after successful completion of the project. Repetition of the problems already attempted by students of the previous years should not be encouraged unless the problem has exceptionally great research importance and scope. Application problems, if found interesting and arisen at the demand of a particular situation, may also be assigned; but typical information management systems with just two or three simple database tables and/or data-entry forms are to be discouraged. The project may be done in other Institutes/Organizations with prior permission from the concerned department of the College and in this case also one project supervisor should have to be from the concerned department in the College. The work will have to be submitted in the form of a dissertation. Project presentation and evaluation will have to be done as per the regulation of TDC for semester system of G.U. with choice based credit and grading system.