HEMCHAND YADAV VISHWAVIDYALAYA, DURG (C.G.)

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SCHEME OF EXAMINATION
&
SYLLABUS
of
M.Sc. (Computer Science)

Semester Examination

For

Session 2023-2024

(Approved by Board of Studies)
Effective from June 202

SCHEME OF TEACHING AND EXAMINATIONS
MASTER OF SCIENCE IN COMPUTER SCIENCE

Program Outcome

After the completion of the course students will be able to:

- The Masters programme aims to impart a sound understanding of the advanced principles of Computer Science.
- It provides sufficient depth and breadth of experience in up-to-date methodologies.
- An exhaustive treatment of selected research-based topics, to significantly advance a student's career prospects within the IT industry, and/or equip the student to undertake research in Computer Science.
- The programme provides theory, elective, practical, research paper, Industrial Plant Training and software project courses as a core courses.

FIRST SEMESTER

Subject Code	SUBJECTS	Teaching Load Per Week			Credit L+ (T+P)/2	Examination Marks							
						Max. Marks				Min. Marks			
		L	T	P		Th	Ses	Pr	Total	Th	Ses	Pr	Tot
Paper 1	Mathematical Foundation of Computer Science	3	2	-	4	100	50	-	150	40	30		70
Paper II	Advance Operating System	3	2	-	4	100	50	-	150	40	30		70
Paper III	Data Structure through algorithms using 'C'	3	2	-	4	100	50	-	150	40	30		70
Paper IV	Object Oriented Programming using 'C++'	3	2	-	4	100	50	-	150	40	30		70
Paper V	Computer System Architecture	3	2	-	4	100	50	-	150	40	30		70
Practical I	Programming Lab Based on Paper III			3x2	3		25	100	125		15	50	65
Practical II	Programming Lab Based on Paper- IV	-	-	3x2	3	-	25	100	125	-	15	50	65
TOTAL		15	10	12	26	500	300	200	**1000**	200	180	100	480

FIRST SEMESTER: M.Sc. (CS)

Paper I : Mathematical Foundation of Computer Science

Max Marks:100 **Min Marks:40**

NOTE: - The Question Paper setter is advised to prepare unit-wise question with the provision of internal choice.

Course Outcome:

Student will be able to-

- Understand the concepts of Digital Electronics.
- Apply the concept of Automata Theory
- Solve the problems with Optimization Methods
- Use the hypothetical testing
- Familiar with the graph theory and its applications

UNIT – I: Mathematical Logic, Sets Relations and functions

Mathematical Logic : Notations, Algebra of Propositions & Propositional functions, logical connectives, Truth values & Truth table Tautologies & Contradictions, Normal Forms, Predicate Calculus, Quantifiers. **Set Theory**: Sets, Subsets, Power sets, Complement, Union and Intersection, De-Morgan's law Cardinality, relations: Cartesian Products, relational Matrices, properties of relations equivalence relation functions: Injection, Surjection, Bijection, Composition, of Functions, Permutations, Cardinality, the characteristic functions recursive definitions, finite induction.

UNIT – II: Lattices & Boolean Algebra

Lattices: Lattices as Algebraic System, Sub lattices, some special Lattices (Complement, Distributive, Modular).

Boolean Algebra: Axiomatic definitions of Boolean algebra as algebraic structures with two operations, Switching Circuits.

UNIT – III: Groups Fields & Ring

Groups: Groups, axioms, permutation groups, subgroups, co-sets, normal subgroups, free subgroups, grammars, language).

Fields &Rings: Definition, Structure, Minimal Polynomials, Irreducible Polynomials, Polynomial roots & its Applications.

UNIT - IV: Graphs

Graphs: Simple Graph, Multigraph &Psuedograph, Degree of a Vertex, Types of Graphs, Sub Graphs and Isomorphic Graphs, Operations of Graphs, Path, Cycles and Connectivity, Euler and Hamilton Graph, Shortest Path Problems BFS(Breadth First Search, Dijkastra's Algorithm, Representation of Graphs, Planar Graphs, Applications of Graph Theory.

UNIT - V:Trees

Trees: Trees, Properties of trees, pendant vertices in a tree, center of tree, Spanning tree, Binary tree, Tree Traversal, Applications of trees in computer science.

BOOKS RECOMMENDED:

1. A text book of Discrete Mathematics – By Swapan Kumar Sarkar.(S.Chand& company Ltd.).
2. Discrete Mathematical structure with Applications to computerscience - By J.P Trembly & R.P. Manohar.
3. DiscreteMathematics -By K.A Ross and C.R.Bwritht.
4. DiscreteMathematicsStructures for computerscience -By Bernard Kohman& RobertC.Bushy.
5. DiscreteMathematics -By Seymour Lipschutz Mare Lipson. Tata McGraw-Hill Edition.

Suggested Digital Platforms Web Links:

https://onlinecourses.nptel.ac.in/noc22_cs123/preview
https://onlinecourses.nptel.ac.in/noc22_cs85/preview

Paper II: Advance Operating Systems

Max Marks:100 **Min Marks :40**

NOTE :- The Question Paper setter is advised to prepare unit-wise question with the provision of internal choice.

Course Outcome:

Student will be able to-

- Design and understand the following OS components: System calls, Schedulers, Memory management systems, Virtual Memory and Paging systems.
- Evaluate, and compare OS components through instrumentation for performance analysis.
- Analyze the various device and resource management techniques for timesharing and distributed systems.
- Develop and analyze simple concurrent programs using transactional memory and message passing, and to understand the trade-offs and implementation decision.

UNIT-I

Introduction

What is operating system, basic concept, terminology, batch processing, spooling, multiprogramming, time sharing, real time systems, protection, multiprocessor system, operating system as resource manager, process view point, memory management, process management, device management and information management, other views of operating system, historical, functional job control language and supervisor service control.

UNIT-II

Advanced Processor Management Features

Multi- threaded operating system architecture micro-kernels operating system architecture multiple operating system- subsystem and environments, client-server architecture, protected mode software architecture ,visual machine- JAVA virtual machine and virtual 8086 mode, hard and soft real time operating system, pre-emptive and non-pre-emptive multitasking and scheduling inter process communication shared memory semaphore message queues, signals sessions management, multiprocessor and distributed process synchronization, symmetric multiprocessing systems.

UNIT-III

Advanced Memory Management

Virtual address space, description of user process and kernal, virtual memory architecture of Pentium group of processor. Translation Lookaside Buffers, implementation of file mapping, shared memory through virtual memory virtual swap space.

UNIT - IV

Advanced Device Management Feature

Device driver framework classifying devices and driver, invoking driver code, devices switch table and driver entry points, dynamic loading and unloading of device drivers

UNIT V

Advanced File Management Features

Virtual file systems and v-node architecture, distributed file system, network file system, remote procedure call

RECOMMENDED BOOKS

1. Principles of Operating System -Peterson.
2. Operating System - Mandinick & Donovan.

Suggested Digital Platforms Web Links:

https://onlinecourses.nptel.ac.in/noc22_cs78/preview
https://onlinecourses.nptel.ac.in/noc22_cs100/preview

Paper III: Data Structure through algorithms using 'C'

Max Marks:100 **Min Marks:40**

NOTE: - The Question Paper setter is advised to prepare unit-wise question with the provision of internalchoice.

Course Outcome:

Students will be able to:

- Develop efficient algorithms for solving a problem.
- Use the various construct of programming language viz., conditional,iteration and recursion.
- Implement the algorithm in programming language.
- Use simple data structure like array, stacks and linked list in solving problems.

UNIT – I: Introduction and Preliminaries -

Introduction, Basic terminology, Elementary data organization, Data structure, Data structure operation, Algorithms:complexity, time-space Tradeoff.. Mathematical Notation and functions, Algorithmic Notation, Control Structures, Complexity of Algorithms, Sub algorithms, Variables, Data Type.

UNIT - II:String Processing, Arrays, Records and Pointers –

Basic Terminology, Storing String, Character Data Type, String Operations, Word Processing, Pattern Matching Algorithms. Linear Array, Representation of linear Array in Memory, Traversing Linear Arrays, Inserting And Deleting, Sorting; Bubble Sort, Searching; Liner Search, Binary Search, Multidimensional Array, Pointers; Pointer Array, Records; Record Structures, Representation of Records in Memory; Parallel Arrays, Matrices, SparseMatrices.

UNIT - III: Linked Lists, Stacks, Queues, Recursion -

Linked list, Representation of linked lists in memory, Traversing a linked list, Searching a linked list, Memory Allocation; Garbage Collection, Insertion into a linked List, Deletion from a Linked List, Header Linked List, Two- Way Linked Lists. Stacks, Array Representation of Stack, Arithmetic Expressions; Polish Notation, Quick sort, an application of Stacks, Recursion, Tower of Hanoi, Implementation of Recursive Procedures by Stacks, Queues, Dequeues, Priority Queues.

UNIT - IV : Trees & Graphs -

Binary Trees, Representing Binary Trees in Memory, Traversing binary tree, Traversal Algorithms using stacks, header nodes; threads, Binary Search Tree, Searching and Inserting in Binary Search Tree, Deleting in Binary Search tree, Heap; Heap sort, Path Lengths; Huffmans Algorithms, General Tree. Graph Theory Terminology, Sequential Representation of Graph; Adjacency Matrix, Path Matrix, Linked Representation of Graph.

UNIT - V : Sorting And Searching –

Sorting, Insertion Sort, Selection Sort, Merging, Merge Sort, Radix Sort, Searching and data modification,hashing.

BOOKS RECOMMENDED :

1. *DataStructure* **- Seymour Lipschutz (Schaum'sSeries).**

2. *Data Structure &ProgramDesign* **- Robert L. Kruse, 3rd Ed., PrenticeHall.**

Suggested Digital Platforms Web Links:

https://onlinecourses.nptel.ac.in/noc22_cs92/preview
https://onlinecourses.swayam2.ac.in/cec22_cs19/preview
https://onlinecourses.nptel.ac.in/noc22_cs70/preview

Paper IV : Object Oriented Programming using 'C++'

Max Marks:100 **Min Marks:40**

NOTE: - The Question Paper setter is advised to prepare unit-wise question with the provision of internalchoice.

Course Outcome:
Students will be able to:

- Understand object oriented programming, difference between object oriented programming and procedural programming.
- Able to build program using C++ features such as Class, objects, operator overloads, dynamic memory allocation, inheritance and polymorphism, file I/O, exception handling, etc.
- Able to build C++classes using appropriate encapsulation and design principles.
- Improve problem solving skills by applying object oriented or non-object oriented techniques

UNIT - I : Language Fundamental
Advantages of OOP, The Object Oriented Approach, and Characteristics of object oriented languages- Object, Classes, Inheritance, Reusability, and Polymorphism.
Overview of C++: History of C++, Data Types, Constants and Variables, Operators and Expression. Control structures : if , if-else, nested if-else, while(), do-while() , for(;;), break, continue, switch, goto, String, Storage class.

UNIT - II : Structure, Function & Array
Structures : A Simple structures ,specify the structures, Defining a structure variable, Accessing structures member, Enumeration data type.
Function: Function Declaration, Calling Function, Function Defines, Passing Argument to function, Passing Constant, Passing Value, Reference Argument, Passing struct variable, Overloaded Function, Inline Function, Default Argument, return statement, returning by reference.
Array: Defining array, array element, initiation array, multi dimensional array, passing array to function.

UNIT - III : Object Classes and Inheritance
Object and Class, Using the class, class construct, class destructors, object as function argument, struct andclasses, array as class member, operator overloading. Type of inheritance, Derive class, Base class. Access specifier: protected. Overriding, memberfunction.

UNIT - IV : Pointers
Pointers : & and * operator pointer variables, pointer to void ,pointer and array, pointer and function, pointer and string, memory management, new and delete, pointer to object, pointer to pointer.

UNIT - V : Virtual Function and File & Stream
Virtual Function : Virtual Function, Virtual member function, accesses with pointer, Late binding, pure virtual function, Friend function, Friend class, static function, this pointer, Templates.

File and Stream: C++ streams, Stream class, string I/O, char I/O, Object I/O, I/O with multiple object, File pointer, Disk I/O.

RECOMMENDED BOOKS :

1. ObjectOrientedProgramming : McGregor and Sykes S A, 1992 VanNostrand.
2. The C++ProgrammingLanguage : StrustrpB,AddisionWasley.
3. Object Oriented ProgramminginC++ : Lafore R, GalgotiaPublications.
4. Introduction to Object Oriented Programming : Witt KV, GalgotiaPublications.
5. ObjectOrientedProgramming : Blaschek G, SpringerVerlag
6. ObjectDataManagement : Cattel R, AddisonWasley.

Suggested Digital Platforms Web Links:

https://onlinecourses.swayam2.ac.in/aic20_sp01/preview

Paper V: Computer System Architecture

MaxMarks:100 **Min Marks:40**

NOTE:- The Question Paper setter is advised to prepare unit-wise question with the provision of internalchoice.

Course Outcome:

Students will be able to:

- Get concepts of the basics organizational and architectural issues of a digital computer.
- Analyze performance issues in processor and memory design of a digital computer.
- Understand various data transfer techniques in digital computer.
- Explain block diagram of CPU, Memory and types of I/O transfers

UNIT - I : Representation of Information

Number system, Integer & Floating point representation Character code (ASCII, EBCDIC), Error Detect and Correct code, Basic Building Blocks, Boolean Algebra, MAP Simplification, Combination Blocks, Gates, Multiplexers, Decoders, etc Sequential building block, flip-flop, registers, counters, ALU, RAM etc.

UNIT - II : Register transfer language and micro operations

Concepts of bus, data movement along registers, a language to represent conditional data transfer, data movement from its memory, arithmetic and logical operations along with register transfer timing in register transfer

UNIT - III : Basic Computer Organization and Design

Instruction code, Computer Instructions, Timing and Control, Execution of Instruction, Input and Output Interrupt, Design of Computer.

UNIT - IV : Computer Software

Programming Language, Assembly Language, Assembler, Program Loops, Input /Output Programming, System Software. Central Processor Organization: - Processor Bus Organization, Arithmetic Logic Unit, Stack Organization, Instruction Formats, Addressing modes, Data transfer and Manipulation, Program Control, Microprocessor Organization, Parallel Processing,.

UNIT - V : Input –Output & Memory Organization

Input –Output Organization : Peripheral Devices, Input/Output Interface, Asynchronous Data Transfer, Direct Memory Access (DMA), Priority Interrupt, Input-Output Processor, Multiprocessor System Organization, and Data Communication Processor**.**

Memory Organization : Auxiliary Memory, Micro Computer Memory, Memory Hierarchy, Associative Memory, Virtual Memory, Cache Memory, Memory Management Hardware.

BOOKS RECOMMENDED:

1. Computer SystemArchitecture - M. Morris Mano(PHI).
2. DigitalComputerElectronics -Malvino.
3. Digital Computers andLogicDesign - M.Morris Mano(PHI).
4. StructuredComputerOrganization - Andrew M. Tanenbanm(PHI).

Suggested Digital Platforms Web Links:

https://onlinecourses.nptel.ac.in/noc22_cs88/preview
https://onlinecourses.nptel.ac.in/noc22_cs110/preview

Practical

M.Sc. (CS) - I: Practical Based on Paper III (Data Structure through Algorithms using 'C')

Course Outcome:

Students will be able to:

- Implement efficient algorithms and identity the appropriate data structure for solving a problem using C.
- Implement simple data structure like array and stacks using C.
- Be able to design and analyze the time and space efficiency of the data structure ·
- Have practical knowledge on the applications of data structures.
- Implement abstract data types using arrays and linked list.
- Implement different types of trees and apply them to problem solutions.
- Discuss graph structure and understand various operations on graphs and their applicability.
- Analyze the various sorting and searching algorithms.

SchemeofExamination: -

Practicalexaminationwillbetwoprogramsandaprojectdemonstration.Itwillbeofthreehours duration.Allprogrammewithflowchartandalgorithms.Thedistributionofpracticalmarks willbeasfollows

Programme1	-	20
Programme2	-	20
Programme3	-	20
Viva	-	25
[PracticalCopy+ InternalRecord]	-	15
Total	-	**100**

Practical List

Note: This is tentative list; the teachers concern can add more program as per requirement.

1. Write an algorithm and program to demonstrate the concept of one-dimensional array to finding the sum of array elements.
2. Write an algorithm and program to insert an element in an array.
3. Write an algorithm and program to delete an element from an array.
4. Write an algorithm and program to add two matrix A and B.
5. Write an algorithm and program to multiply two matrix A and B.
6. Write an algorithm and program to demonstrate pointer and an array.
7. Write an algorithm and program to Implementation of linked list using array.
8. Write an algorithm and program to insert an item into double linked list.
9. Write an algorithm and program to delete an item from double linked list.
10. Write an algorithm and program to Implementation of stack using array.
11. Write an algorithm and program to Implementation of queue using array.
12. Write an algorithm and program to Implementation of circular queue using array.
13. Write an algorithm and program to Implementation of binary search tree using array.
14. Write an algorithm and program to search an element using sequential search.
15. Write an algorithm and program to search an element using binary search.

16. Write an algorithm and program to arrange the list of numbers in ascending order using Bubble Sort.
17. Write an algorithm and program to arrange the list of numbers in ascending order using Insertion Sort.
18. Write an algorithm and program to arrange the list of numbers in ascending order using Selection Sort.
19. Write an algorithm and program to arrange the list of numbers in ascending order using Merge Sort.
20. Write an algorithm and program to arrange the list of numbers in ascending order using Quick Sort.
21. Write an algorithm and program to arrange the list of numbers in ascending order using Radix Sort.
22. Write an algorithm and program to arrange the list of numbers in ascending order using Heap Sort.
23. Write an algorithm and program to demonstrate DFS.
24. Write an algorithm and program to demonstrate BFS.
25. Write an algorithm and program to demonstrate string manipulation functions.
26. Write an algorithm and program to covert infix expression to prefix expression.
27. Write an algorithm and program to covert infix expression to postfix expression.
28. Write an algorithm and program to demonstrate In-order Traversal in tree.
29. Write an algorithm and program to demonstrate Pre-order Traversal in tree.
30. Write an algorithm and program to demonstrate Post-order Traversalin tree.

M.Sc. (CS) - I : Practical Based on Paper IV(Object Oriented Programming Using 'C++ ')

Course Outcome:

Students will be able to:

- Able to build program using C++ features such as Class, objects, operator overloads, dynamic memory allocation, inheritance and polymorphism, file I/O, exception handling, etc.
- Able to build C++classes using appropriate encapsulation and design principles.

SchemeofExamination:-

Practicalexaminationwillbetwoprogramsandaprojectdemonstration.Itwillbeof3hours duration.Allprogrammewithflowchart&algorithms.Thedistributionofpracticalmarks willbeasfollows

Programme1	-	20
Programme2	-	20
Programme3	-	20
Viva	-	25
[PracticalCopy+ InternalRecord]	-	15
Total	-	**100**

Practical List

Note: This is tentative list; the teachers concern can add more program as per requirement.

1. Create a class student having data members to store roll number, name of student, name of three subjects, max marks, min marks, obtained marks. Declare array of object to hold data of 3 students. Provide facilities to display result of all students. Provide also facility to display result of specific student whose roll number is given.

2. Write a Program using class to process Shopping List for a Departmental Store. The list includes details such as the Code No and Price of each item and perform the operations like Adding, Deleting Items to the list and Printing the Total value of an Order.

3. WAP in C++ to reverse the string without using library functions.

4. WAP in C++ to count the number of characters in string passed as argument in form of character array.

5. Write a Program to design a class having static member function named showcount() which has the property of displaying the number of objects created of the class

6. Create a class Simple with static member functions to find factorial by recursive member function

7. Write a Program which creates & uses array of object of a class. (for e.g. implementing the list of Managers of a Company having details such as Name, Age, etc.)

8. Write a program to create class Mother having data member to store salary of Mother, create

another class Father having data member to store salary of Father. Write a friend function, which accepts objects of class Mother, and Father and prints Sum of Salary of Mother and Father objects.

9. Write a Program to find Maximum out of Two Numbers using friend function.

10. Write a Program to swap private data members of classes named as class_1, class_2 using friend function.

11. Write a program using inline function to find minimum of two functions. The inline function should take two arguments and should return the minimum value

12. Write a Program to design a class complex to represent complex numbers, the complex class should use an external function (use it as a friend function) to add two complex numbers. The function should return an object of type complex representing the sum of two complex numbers.

13. Write a Program using copy constructor to copy data of an object to another object

14. Write a Program to allocate memory dynamically for an object of a given class using class's constructor.

15. Write a Program to design a class to represent a matrix. The class should have the functionality to insert and retrieve the elements of the matrix

16. Write a program to design a class representing complex numbers and having the functionality of performing addition & multiplication of two complex numbers using operator overloading.

17. Write a program for developing a matrix class which can handle integer matrices of different dimensions. Also overload the operator for addition, multiplication & comparison ofmatrices

18. Write a program to overload new/delete operators in a class.

19. Write a program in C++ to highlight the difference between overloaded assignment operator and copy constructor.

20. write program to create a class Polar which has data member radius and angle, define overloaded constructor to initialize object and copy constructor to initialize one object by another existing object keep name of parameter of parameterized constructor same as data members. Test function of the program in main function.

21. write program to create a class Polar which has data member radius and angle, use constructor with default arguments to avoid constructor overloading and copy constructor to initialize one object by another existing object keep name of parameter of parameterized constructor same as data members. Test functioning of the program in main function

22. Write a program to create a class Employee having data members to store name of employee, employee id, salary. Provide member function for data input, output. Use Pointer to object to simulate array of object to store information of 3 employees and test the program in function main.

23. Write a Program illustrating how the constructors are implemented and the order in which they are called when the classes are inherited. Use three classes named alpha, beta, gamma such that alpha, beta are base class and gamma is derived class inheriting alpha & beta

24. Write a Program to design a student class representing student roll no. and a test class (derived

class of student) representing the scores of the student in various subjects and sports class representing the score in sports. The sports and test class should be inherited by a result class having the functionality to add the scores and display the final result for a student

25. Write a program to maintain the records of person with details (Name and Age) and find the eldest among them. The program must use this pointer to return the result.

26. Write a Program to illustrate the use of pointers to objects which are related by inheritance.

27. Write a program illustrating the use of virtual functions in class.

28. Create a base class shape having two data members with two member function getdata (pure virtual function) and printarea (not pure virtual function). Derive classes triangle and rectangle from class shape and redefine member functioning of classes using pointer to base class objects and normal objects.

29. Write a program to design a class representing the information regarding digital library (books, tape, book & tape should be separate classes having the base class as media). The class should have the functionality for adding new item, issuing, deposit etc. the program should use the runtime polymorphism

30. Write a program implementing basic operation of class ios i.e. setf, unsetf, precision etc.

31. Write a program to implement I/O operations on characters. VO operations includes inputting a string. Calculating length of the string, Storing the string in a file, fetching the stored characters from it, etc.

32. Write a program to copy the contents of one file to another.

33. Write a program to perform read/write binary I/O operation on a file (i.e. write the object of a structure/class to file).

34. Write a program for reading and writing data to and from the file using command line arguments.

35. Write swapping program to demonstrate call by value, call by address and call by reference in a single program

MASTER OF SCIENCE IN COMPUTER SCIENCE

SECOND SEMESTER

Subject Code	SUBJECTS	Teaching Load Per			Credit L+(T+P)/2	Examination Marks							
						Max. Marks				Min. Marks			
		L	T	P		Th	Ses	Pr	Total	Th	Ses	Pr	Total
Paper 1	RDBMS (SQL Programming with Oracle)	3	2	-	4	100	50	-	150	40	30		70
Paper II	Advanced Computer Networks	3	2	-	4	100	50	-	150	40	30		70
Paper III	Python Programming	3	2	-	4	100	50	-	150	40	30		70
Paper IV	Principles of Compiler Design	3	2	-	4	100	50	-	150	40	30		70
Paper V	Numerical Analysis	3	2	-	4	100	50	-	150	40	30		70
Practical I	Practical Based on Paper I			3x2	3		25	100	125		15	50	65
Practical II	Practical Based on Paper III	-	-	3x2	3	-	25	100	125	-	15	50	65
TOTAL		1	10	12	2	500	30	20	1000	20	18	10	480

Paper I: RDBMS (SQL Programming with Oracle)

Max Marks:100 **Min Marks :40**

NOTE :- The Question Paper setter is advised to prepare unit-wise question with the provision of internalchoice.

Course Outcome

Students will be able to:

- Establish a basic understanding of the process of Database Development and Administration using MySQL.
- Student will implement the concepts of both Operating Systems & Database Administration skills.
- Understand fundamental concepts of RDBMS (SQL/PLSQL)
- Understand functioning of database management systems as well as associated tools and techniques
- Develop a good database design and normalization techniques to normalize a database.
- Able to write Procedure, Function, Cursor and Trigger using SQL/PLSQL.

UNIT - I : Overview of Database Management -

Data, Information and knowledge, Increasing use of data as a corporate resource, data processing verses data management, file oriented approach verses database oriented approach to data management; data independence, database administration roles, DBMS architecture, different kinds of DBMS users, importance of data dictionary, contents of data dictionary, types of database languages. Data models: network, hierarchical, relational. Introduction to distributed databases, Client/Server databases, Object-oriented databases, Object-relational databases, Introduction to ODBC concept.

UNIT - II : Relational Model & Relational Algebra -

Entity - Relationship model as a tool for conceptual design-entities, attributes and relationships. ER diagrams; Concept of keys; Case studies of ER modeling Generalization; specialization and aggregation. Converting an ER model into relational Schema. Extended ER features, Introduction to UML, Representation in UML diagram (Class Diagram etc.).

Relational Algebra: select, project, cross product different types of joins (inner join, outer joins, self join); set operations, Tuple relational calculus, Domain relational calculus, Simple and complex queries using relational algebra, stand alone and embedded query languages.

UNIT - III :SQL

Introduction to SQL constructs (SELECT…FROM, WHERE… GROUP BY… HAVING… ORDERBY….), INSERT, DELETE, UPDATE, DROP, VIEW definition and use, Temporary tables, Nested queries, and correlated nested queries, Integrity constraints: Not null, unique, check, primary key, foreign key, references, Triggers. Embedded SQL and Application Programming Interfaces.

Introduction to PL/SQL variables – literals – data types – advantages of PL/SQL; Control statements:if ; iterative control – loop, while, for , goto ; exit when; Cursors : Types – implicit, explicit – parameterized cursors – cursor attributes; Exceptions: Types – internal , user-defined , handling exceptions – raise statement.

UNIT - IV :PL/SQL

PL/SQL tables and records: Declaring PL/SQL tables - referring PL/SQL tables, inserting and fetching rows using PL/SQL table, deleting rows; records - declaration of records - deleting records; Sub programs: Functions - procedures – input-output parameters; purity functions - packages - package specification - advantages of packages - private and public items - cursors in packages.

UNIT - V : Relational Database Design-

Normalization concept in logical model; Pitfalls in database design, update anomalies: Functional dependencies, Join dependencies, Normal forms (1NF, 2NF, 3NF). Boyce Codd Normal form, Decomposition, Multi-Valued Dependencies, 4NF, 5NF. Issues in physical design; Concepts of De-normalization, Indexing, Clustering indexes. Data Organization - Fixed length records, variable length records, Organization of records in files, Indexing: - indexed files -B-tree, B+-tree, and Hashing Techniques.

BOOKS RECOMMENDED :

1. Databasesystemconcept - **H. Korth and A. Silberschatz,TMH**
2. Data BaseManagementSystem - **IvanBayross**
3. Data BaseManagementSystem - **JamesMatin**
4. DatabaseManagementSystem - **Leon & Leon, VikasPublication**
5. An Introduction todatabasesystems - **Bipin Desai, GalgotiaPublication.**
6. DatabaseManagementSystem - **A. K. Majumdar &P.Bhattacharya,TMH**

Suggested Digital Platforms Web Links:

https://onlinecourses.swayam2.ac.in/aic20_sp36/preview

Paper II: Advanced Computer Networks

Max Marks:100 **Min Marks :40**

NOTE :- The Question Paper setter is advised to prepare unit-wise question with the provision of internalchoice.

Course Outcome

Students will be able to:

- Understand basic computer network technology.
- Understand Data Communications System and its components.
- Enumerate the layers of the OSI model and TCP/IP reference model.
- Able to identify the different types of network devices, their functions within a network and their applications.

UNIT - I

Introduction to Computer Networking : The Concept of Networking, Data Communication, Required network elements, The role of Standards Organization. Line Configuration, Various Topologies, Transmission Mode, Categories of Networks- LAN, MAN, WAN. The benefits of a Computer Networks.

The OSI and TCP/IP Reference Model : The Concept of Layered Architecture, Design Issues for the Layers. Interfaces and services, Detailed Functions of the Layers. Comparison between OSI and TCP/IP Reference model.

UNIT - II

Transmission of Digital Data : Shannon's and Nyquist theorems for maximum data rate of a channel. Transmission media- Co-axial, UTP, Fiber optic and wireless. Analog and digital data Transmission- parallel and serial transmission. DTE-DCE interface using RS-232C. Study of modems- 56k and Cable Modem. Modem standards.

Multiplexing and Switching : The Concept of Multiplexing- FDM, TDM, WDM. The Concept of Switching- Circuiting, Message switching, Packet switching.

UNIT - III

Data Link Layer and Routing Algorithms : Line Discipline, Flow Control- stop and wait, sliding window, Go back N, Error Control- ARQ stop and wait, sliding window ARQ. HDLC, SLIP, PPP. Multiple access protocols- ALOHA, Slotted ALOHA, CSMA/CD. IEEE standards for LAN's and MAN's. The IP protocol, and its header. IP address classes and subnetmask.

The concept of ICMP, ARP, RARP, RSVP, CIDR and Ipv6. : Routing algorithms- shorted path first, Distance Vector, Link State. Congestion Control-The leaky bucket and Token bucket Algorithms.

UNIT - IV

Transport Layer : The Concept of client and Server in terms of Socket addressing in Transport layer. Two way and three-way handshaking. TCP header.

Network Performance Issues. The Concept of Domain Name System, Various Resource Records. Architecture and services of E-mail (RFC-822 and MIME). The Concept of World Wide Web- server side and client side.

ATM : The concept of ATM, ATM Adoption layers- AAL1, AAL2, AAL3/4, AAL5, Comparison of AAL protocols. Cell formats for UNI and NNI. Service Categories, Quality of service, Congestion Control in ATM.

UNIT - V

Comparative study of Networking Technologies: X.25, Frame Relay, ATM, SONET, SMDS, ISDN.
Network Security: The importance of Security in Networking, traditional cryptography, Data Encryption standards, RSA Algorithm.

BOOKS RECOMMENDED :

ComputerNetworks	- A S Tanenbaum
Data CommunicationandNetworking	-Forouzan

Suggested Digital Platforms Web Links:

https://onlinecourses.nptel.ac.in/noc22_cs90/preview
https://onlinecourses.nptel.ac.in/noc22_cs112/preview
https://onlinecourses.nptel.ac.in/noc22_cs114/preview

Paper III: Python Programming

Max Marks:100 Min Marks :40

NOTE :- The Question Paper setter is advised to prepare unit-wise question with the provision of internal choice.

Course Outcome

Students will be able to:

- Knowledge about the Python programming.
- Define the Structure and Components of a Python Program.
- Demonstrate proficiency in handling of loops and creation of functions. Identify the methods to create and manipulate lists, tuples and dictionaries.
- Discover the commonly used operations involving regular expressions and file systems.
- Determine the need of scrapping website and working with CSV, JSON and other file formats.
- Discover the commonly used of data science in Python.
- Demonstrate proficiency in handling of NumPY & Pandas Library.
- Demonstrate proficiency in handling of GUI programming using Tkinter.

Unit I

Introduction to Python :- Structure of a Python Program, Elements of Python. Python Interpreter ,Installing Python, basic syntax, interactive shell, editing saving and running a script; The concept of data types, variables, assignments; immutable variables; numerical types, operators(Arithmetic Operator, Relational Operator, Logical or Boolean Operator, Assignment Operator, Ternary Operator, Bitwise Operator, Increment or Decrement Operator) and expressions; comments in the program,

Unit II

Creating Python Programs: Input and Output Statements, Control Statements (Branching, Looping, Conditional Statement, Exit function, Difference between break, continue and pass). Function : Defining a function, calling a function, types of function, Function Arguments, Anonymous Functions, global and local variables, Recursion , Strings and Text Files: - Manipulating files and directories, os and sys modules, text files: reading/writing text and numbers from/to a file, creating and deleting a formatted file (csv or tab-separated).

Unit III

Lists, Tuples and Dictionaries :Basic list operators, replacing, inserting and removing an element, searching and sorting lists, Accessing tuples, Operations, Working Functions and Methods, dictionary literals, Adding and Removing keys, accessing and replacing values, traversing dictionaries. Package-Introduction, importing from package, json, Exception handling - try,else, finally, raise keyword.

Unit IV

Data science using python, Data Frame-Creating Data Frame from an Excel Spreadsheet, Creating Data Frame from .csv file, Creating Data Frame from python Dictionary, Creating Data Frame from python List of Tuples, Operations on Data Frames. Data visualization-Bar Graph ,Histogram ,Creating a pie chart ,creating line graph

Unit V

NumPY Introduction, creating NumPY arrays, indexing and slicing in NumPy. Pandas Introduction, installation of panda, data frame, series, range data, slice data,drop a column, concatenation. GUI Programming: Introduction to GUI library, Advantages, Layout management, Events and binding Drawing on canvas(line, oval, rectangle etc) widget such as Frame, Label, Button, Checkbutton, Entry, Listbox, Radiobutton, Text, Spinbox Tkinter introduction, Tkinter and Python Programming, Tk Widgets widget such as Frame, Label, Button, Checkbutton, Entry, Listbox, Radiobutton, Text, Spinbox

BOOKS RECOMMENDED:

1. T. Budd, Exploring Python, TMH, 1st Ed, 2011
2. Allen Downey, Jeffrey Elkner, Chris Meyers, How to think like a computer scientist: Learning with Python, Freely available online, 2012
3. Luca Massaron John Paul Mueller, Python for Data science For Dummies, Wiley,2ed,2019
4. Introduction to computation and programming using python: with application to understanding data, John V. Guttag
5. Problem Solving using Python – E. Balagurusamy, Mc Graw Hill Education Ltd., 2017
6. Practical Programming An Introduction to Computer Science Using Python - Jennifer Campbell
7. https://docs.python.org/3/tutorial/index.html
8. http://interactivepython.org/courselib/static/pythonds
9. https://wiki.python.org/moin/TkInter

Paper IV: Principles of Compiler Design

Max Marks:100 **Min Marks :40**

NOTE :- The Question Paper setter is advised to prepare unit-wise question with the provision of internalchoice.

Course Outcome

Students will be able to:

- Specify and analyze the lexical, syntactic and semantic structures of advanced language features
- Separate the lexical, syntactic and semantic analysis into meaningful phases for a compiler to undertake language translation
- Write a scanner, parser, and semantic analyzer without the aid of automatic generators
- Turn fully processed source code for a novel language into machine code for a novel computer
- Describe techniques for intermediate code and machine code optimization
- Design the structures and support required for compiling advanced language features.

UNIT-I

Introduction to Compilers: Overview, Structure, implementation. Programming Language Grammars: Inter Language grammars, derivation, reduction, syntax tree, ambiguity, regular grammars & expressions.

UNIT-II

Scanning and Parsing Techniques : The Scanner, parser, translation, elementary symbol table organization,structures.

UNIT-III

Memory Allocation: Static and dynamic memory allocation, array allocation and access, allocation for strings, structure allocation, common & equivalence allocation. Introduction to Compilation ofexpressions.

UNIT-IV

Compilation of Control Structures : Control transfers, procedural calls, conditional execution, interation control constructs. Error detection, indication &recovery.

Compilation of I/O Statements: Compilation of I/O list, compilation of FORMAT list, IOSUB, filecontrol.

UNIT-V

Code Optimization: Major issues, optimizing transformations, local optimizations, program flow analysis, Global Optimization, writingcompilers.

BOOKS RECOMMENDED:

1. Compiler Construction -D.M.Dhandhere(M)
2. Compiler Writing -Tremble-Sorenson(TMH)
3. Computers : Princ, Techniques cools by Aho-Person.
4. The Essence of Compilers by Hanter-Pearson.

Paper V: Numerical Analysis

Max Marks:100 **Min Marks :40**

NOTE :- The Question Paper setter is advised to prepare unit-wise question with the provision of internalchoice.

Course Outcome

Students will be able to:

- Root finding for nonlinear equations,
- Interpolation and approximation of functions by simpler computational building blocks (for example - polynomials and splines).
- Numerical differentiation and divided differences.
- Numerical quadrature and integration,
- numerical solutions of ordinary differential equations and boundary value problems;

UNIT – I : Solution of Polynomial and Transcendental Algebraic Equations

Bisection method, Regulafalsi method & Newton's method, Solution of Cubic & Biquadrate Equation, Complex roots of polynomial equations.

UNIT – II : Simultaneous Equations and Matrix

Gauss-Jordan method, Cholesky's method, Reduction to lower or upper Triangular forms, Inversion of matrix, method of partitioning, Characteristics equation of matrix, Power methods, Eigen values of matrix, Transformation to diagonalforms.

UNIT - III : Curve-Fitting from Observed Data

Divided difference table for evenly or unevenly spaced data, polynomial curve-fitting - Newton's, Gauss and Langranges form of interpolation and Divided Differences, method of least square for polynomials,.

UNIT - IV : Numerical Differentiation and Integration

Forward and Backward differential operators, Newton - cotes integration formula: Trapezoidal Rule, Simpson's Rule, Boole's Rule, Weddle Rule, Legendre's rule, method of weighted coefficients.

UNIT - V : Solution of Differential Equations

Numerical Solution of ordinary differential equations, one step method, Taylor's Series, Predictor-Corrector Method, Euler's Method, Runga-Kutta Method, Milne's method.

BOOKS RECOMMENDED

1. Garewal : Numericalmethods
2. Gupta &Mallic : NumericalMethods
3. Hamming R.W. : Numerical methods for scientist & Engineers. (McGrawHill)
4. ConleS.D. CarlDeBoor : Elementary numericalanalysis (International Book CompanyLondon)
5. Jain M.K. IyengarS.R.K : Numerical methods for ScienceandEngineering Calculations (John Willey &Sons)

M.Sc. (CS) - II: Practical Based on Paper I (SQL Programming with Oracle)

Course Outcome

Students will be able to:

- Establish a basic understanding of the process of Database Development and Administration using MySQL.
- Master the basic concepts and appreciate the applications of database systems.
- Master the basics of SQL and construct queries using SQL.
- Student will implement the concepts of both Operating Systems & Database Administration skills.
- Understand functioning of database management systems as well as associated tools and techniques
- Develop a good database design and normalization techniques to normalize a database.
- Able to write Procedure, Function, Cursor and Trigger using SQL/PLSQL.

SchemeofExamination: -

Practicalexaminationwillbetwoprogramsandaprojectdemonstration.Itwillbeof3hours duration.Allprogrammewithflowchart&algorithms.Thedistributionofpracticalmarks willbeasfollows

Programme1	-	20
Programme2	-	20
Programme3	-	20
Viva	-	25
[PracticalCopy+ InternalRecord]	-	15
Total	-	**100**

Practical List

Note: This is tentative list; the teachers concern can add more program as per requirement.

SQL

1. Using the following database,
   Colleges (cname, city, address, phone, afdate) Staffs (sid, sname, saddress, contacts)
   StaffJoins (sid, cname, dept, DOJ, post, salary)
   Teachings (sid, class, paperid, fsession, tsession)
   Subjects (paperid, subject, paperno, papername)

   Write SQL statements for the following –

a. Create the above tables with the given specifications and constraints.
b. Insert about 10 rows as are appropriate to solve the following queries.
c. List the names of the teachers teaching computer subjects.
d. List the names and cities of all staff working in your college.
e. List the names and cities of all staff working in your college who earn more than15,000
f. Find the staffs whose names start with ‘M’ or ‘R’ and ends with ‘A’ and/or 7 characters long.
g. Find the staffs whose date of joining is2005.
h. Modify the database so that staff N1 now works in C2College.
i. List the names of subjects, which T1 teaches in this session or all sessions.
j. Find the classes that T1 do not teach at present session.
k. Find the colleges who have most number of staffs.

l. Find the staffs that earn a higher salary who earn greater than average salary of their college
m. Find the colleges whose average salary is more than average salary ofC2
n. Find the college that has the smallest payroll.

o. Find the colleges where the total salary is greater than the average salary of all colleges.
p. List maximum, average, minimum salary of each college
q. List the names of the teachers, departments teaching in more than one department.
r. Acquire details of staffs by name in a college or each college.
s. Find the names of staff that earn more than each staff of C2College.
t. Give all principals a 10% rise in salary unless their salary becomes greater than 20,000 in such case give 5%rise.
u. Find all staff that do not work in same cities as the colleges they work.
v. List names of employees in ascending order according to salary who are working in your college or all colleges.
w. Create a view having fields sname, cname, dept, DOJ, andpost
x. Create a view consisting of cname, average salary and total salary of all staff in that college.
y. Select the colleges having highest and lowest average salary using above views.
z. List the staff names of a department using above views.

2. Create the following database,
Enrollment (enrollno, name, gender, DOB, address, phone)
Admission (admno, enrollno, course, yearsem, date, cname)
Colleges (cname, city, address, phone, afdate)
FeeStructure (course, yearsem, fee)
Payment (billno, admno, amount, pdate, purpose)

a. Create the above tables with the given specifications and constraints.
b. Insert about 10 rows as are appropriate to solve the following queries.
c. Get full detail of all students who took admission this year class wise
d. Get detail of students who took admission in Bhilai colleges.
e. Calculate the total amount of fees collected in this session
i) By your college
ii) by each college
iii) by all colleges
f. List the students who have not payed full fee
a. in your college ii) in all colleges.
List the number of admissions in your class in every year.
g. List the students in the session who are not in the colleges in the same city as they live in.
h. List the students in colleges in your city and also live in your city.

3. Create the following database,
Subjects (paperid, subject, paper, papername)
Test (paperid, date, time, max, min)
Score (rollno, paperid, marks, attendence)
Students (admno, rollno, class, yearsem)

a. Create the above tables with the given specifications and constraints.
b. Insert about 10 rows as are appropriate to solve the following queries.
c. List the students who were present in a paper of a subject.
d. List all roll numbers who have passed in first division.
e. List all students in BCA-II who have scored higher than average

i) in your college ii) in every college

f. List the highest score, average and minimum score in BCA-II
   i) in your college ii)in every college

4. Using the following database
   Colleges (cname, city, address, phone,afdate)
   Staffs (sid, sname, saddress, contacts)
   StaffJoins (sid, cname, dept, DOJ, post, salary)
   Teachings (sid, class, paperid, fsession, tsession)
   Subjects (paperid, subject, paperno, papername)

Write SQL statements for the following –

a. Create the above tables with the given specifications and constraints.
b. Insert about 10 rows as are appropriate to solve the following queries.
c. List the names of the teachers teaching computer subjects.
d. List the names and cities of all staff working in your college.
e. List the names and cities of all staff working in your college who earn more than15,000

5. Using the following database
   Colleges (cname, city, address, phone, afdate)
   Staffs (sid, sname, saddress, contacts)
   StaffJoins (sid, cname, dept, DOJ, post, salary)
   Teachings (sid, class, paperid, fsession, tsession)
   Subjects (paperid, subject, paperno, papername)

a. Find the staffs whose names start with ‘M’ or ‘R’ and ends with ‘A’ and/or 7 characters long.
b. Find the staffs whose date of joining is2005.
c. Modify the database so that staff N1 now works in C2college.
d. List the names of subjects which T1 teaches in this session or all sessions.

6. Using the following database

Colleges (cname, city, address, phone, afdate) Staffs (sid, sname, saddress, contacts)
StaffJoins (sid, cname, dept, DOJ, post, salary)
Teachings (sid, class, paperid, fsession, tsession) Subjects (paperid, subject, paperno, papername)

a. Find the classes that T1 do not teach at present session.
b. Find the college who have most number of staffs.
c. Find the staffs who earn a higher salary who earn greater than average salary of their college.
d. Find the colleges whose average salary is more than average salary ofC2
e. Find the college that has the smallest payroll.
f. Find the colleges where the total salary is greater than the average salary of all colleges.
g. List maximum, average, minimum salary of each college

7. Using the following database
   Colleges (cname, city, address, phone, afdate)
   Staffs (sid, sname, saddress, contacts)
   StaffJoins (sid, cname, dept, DOJ, post, salary)
   Teachings (sid, class, paperid, fsession, tsession)
   Subjects (paperid, subject, paperno, papername)

a. List the names of the teachers, departments teaching in more than one departments.
b. Acquire details of staffs by name in a college or each college.
c. Find the names of staff who earn more than each staff of C2college.
d. Give all principals a 10% rise in salary unless their salary becomes greater than 20,000 in such case give 5%rise.
e. Find all staff who do not work in same cities as the colleges they work.
f. List names of employees in ascending order according to salary who are working in your college or all colleges.

8. Using the following database

   Colleges (cname, city, address, phone, afdate)

   Staffs (sid, sname, saddress, contacts)

   StaffJoins (sid, cname, dept, DOJ, post, salary)
   Teachings (sid, class, paperid, fsession, tsession)
   Subjects (paperid, subject, paperno, papername)

a. Find the classes that T1 do not teach at present session.
b. Create a view having fields sname, cname, dept, DOJ, and post
c. Create a view consisting of cname, average salary and total salary of all staff in that college.
d. Select the colleges having highest and lowest average salary using above views.
e. List the staff names of a department using above views.

9. **Enrollment** (enrollno, name, gender, DOB, address, phone)
   Admission (admno, enrollno, course, yearsem, date, cname)
   Colleges (cname, city, address, phone,afdate)
   FeeStructure (course, yearsem, fee)

Payment (billno, admno, amount, pdate, purpose)

a. Create the above tables with the given specifications and constraints.
b. Insert about 10 rows as are appropriate to solve the following queries.
c. Get full detail of all students who took admission this year classwise
d. Get detail of students who took admission in Bhilai colleges.
e. Calculate the total amount of fees collected in this session

i) by your college ii) by each college iii) by all colleges

10 Enrollment (enrollno, name, gender, DOB, address, phone)
Admission (admno, enrollno, course, yearsem, date, cname)
Colleges (cname, city, address, phone,afdate)
FeeStructure (course, yearsem, fee)
Payment (billno, admno, amount, pdate, purpose)

a. List the students who have not payed full fee

i) in your college ii) in all colleges

b. List the number of admissions in your class in every year.
c. List the students in the session who are not in the colleges in the same city as they live in.
d. List the students in colleges in your city and also live in your city.

11. PL/SQL program to add two numbers.
12. PL/SQL program to find simple interest.
13. PL/SQL program to swap two number.
14. PL/SQL program to find prime no.
15. PL/SQL program to check no is odd or even.
16. PL/SQL program to calculate factorial number.
17. PL/SQL program for reverse of a number.
18. WAP in PL/SQL to demonstrate cursor.
19. Create a package in PL/SQL to delete all records in a table.

Practical II : Practical Based on Paper III (Python Programming)

Course Outcome
Students will be able to:

- Learn the Numbers, Math functions, Strings, List in Python.
- Learn the tuples and dictionaries in Python.
- Demonstrate proficiency in handling of loops and creation of functions.
- Identify the methods to create and manipulate lists, tuples and dictionaries.
- Express different decision making statements and functions.
- Demonstrate proficiency in handling of NumPY & Pandas Library.
- Demonstrate proficiency in handling of GUI programming using tkinter.

Scheme of Examination:-
Practical examination will be three programs and viva. It will be of three hours duration. The distribution of practical marks will be as follows

Programme1	-	20
Programme2	-	20
Programme3	-	20
Viva	-	25
[PracticalCopy+ InternalRecord]-		15
Total	-	100

Practical List
Note: This is tentative list , the teachers concern can add more program as per requirement.

1. Write a program that reads an integer value and prints leap year or not a leap year.
2. Write a program to create the following Pattern . For example enter a size: 5 -

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

3. Write a function that takes an integer n as input and calculates the value of 1 + 1/1! + 1/2! + 1/n!
4. Write a function that takes an integer input and calculates the factorial of that number,
5. Write a function that takes a string input and checks if it is a palindrome or not.
6. Write a list function to convert a string into a list, as in list (-abc) gives [a, b, c].
7. Write a program to generate Fibonacci series.
8. Write a program to check whether the input number is even or odd.

9 . Write a program to compare three numbers and print the largest one.

10. Write a program to print factorial value of a given number.

11. Write a program to to determine whether the number is prime or not.

12. Write a program to create Stack Class and implement all its methods, (Use Lists).

13. Write a program to create Queue Class and implement all its methods, (Use Lists)

14. Write a program to implement linear and binary search on lists,

15. Write a program to sort a list using insertion sort .

16. Write a program to sort a list using selection sort.

17. Write a program which will find all such numbers which are divisible by 7.

18. Write a program that prints out all the elements of the list that are less than 10.

19. Write a program that returns a list that contains only the elements that are common between the lists (without duplicates). Make sure your program works on two lists of different sizes.

20 Write a program to check whether a number is palindrome or not. (using recursion)

21. Write a program (using functions) that asks the user for a long string containing multiple words. Print back to the user the same string, except with the words in backwards order. E.g " I am Msc student" is :"student Msc am I"

22. Given a .txt file that has a list of a bunch of names, count how many of each name there are in the file, and print out the results to the screen.

23. Write a program that takes a list of numbers (for example, a = [5, 10, 15, 20, 25])and makes a new list of only the first and last elements of the given list.

24. Write a programb that accepts sequence of lines as input and prints the lines after making all characters in the sentence capitalized.

25. Write a program that accepts a sentence and calculate the number of letters and digits.

27 Write a program that accepts a sentence and calculate the number of upper case letters and lower case letters.

26. Write a Python program to find the greatest common divisor (gcd) of two integers

27. Write a Python function that takes a list and returns a new list with unique elements of the first list.

28. Write a Python program to read a file line by line store it into an array.

29. Write a Python program to count the number of lines in a text file.

30. Write a Python program to count the frequency of words in a file.

31. Write a Python program to copy the contents of a file to another file

32. Write a Python program to read a random line from a file

33. Write a Python class to reverse a string word by word. Input string : 'hello.py' Expected Output : '.py hello'

34. Write a Python class named Rectangle constructed by a length and width and a method which will compute the area and perimeter of a rectangle.

35. Write a Python program 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
    GradeB: Percentage>=70 and <80
    Grade C: Percentage>=60 and <70
    Grade D: Percentage>=40 and <60
    Grade E: Percentage<40

36. Write a Python program to calculate the sum and product of two compatible matrices.

37. Write a program to create mathematical 3D objects : i. curve ii. sphere iii. ring iv. arrow

38. Write a Python program to read n integers and display them as a histogram.

39. Write a Python program 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.

39. Write a program to check the validity of password input by users.
    Following are the criteria for checking the password:
    1. At least 1 letter between [a-z]

2. At least 1 number between [0-9]
3. At least 1 letter between [A-Z]
4. At least 1 character from [$#@]
5. Minimum length of transaction password: 6
6. Maximum length of transaction password: 12

40. Write a program to find sum and average of List in Pythonum and average List in Python – Ways to remove multiple empty spaces from string List.
41. Write a program to capitalize first letter of a column in Pandas dataframe.
42 Write a program to access the elements of a Series in Pandas. Split a text column into two columns in Pandas DataFrame.
43. Write a program to how to Remove rows in Numpy array that contains non-numeric values.
44. Write a program to how to check whether specified values are present in NumPy array.
45. Write a program to calculate the sum of the diagonal elements of a NumPy array.
47. Write a program to calculate inner, outer, and cross products of matrices and vectors using NumPy.
48. Write a program to calculate average values of two given NumPy arrays.
49. Write a program to calculate the average, variance and standard deviation in Python using NumPy.
50. Write a program to convert a NumPy array into a csv file.
51. Write a program to how to Convert an image to NumPy array and save it to CSV file using Python.
52. Write a program to Python GUI program to create a Combobox with three options using tkinter module.
53. Write a Python GUI program to create a Text widget using tkinter module. Insert a string at the beginning then
insert a string into the current text. Delete the first and last character of the text.
54. Write a Python GUI program to create three single line text-box to accept a value from the user using tkinter module.
55. Write a Python GUI program to create a Listbox bar widgets using tkinter module. Create button for insert item and delete selected items.

SCHEME OF TEACHING AND EXAMINATIONS
MASTER OF SCIENCE IN COMPUTER SCIENCE

THIRD SEMESTER

Subject Code	SUBJECTS	Teaching Load Per Week			Credit L+ (T+P)/2	Examination Marks							
						Max. Marks				Min. Marks			
		L	T	P		Th	Ses	Pr	Total	Th	Ses	Pr	Tot
Paper 1	Programming in Java	3	2	-	4	100	50	-	150	40	30		70
PaperII	Computer Graphics	3	2	-	4	100	50	-	150	40	30		70
PaperIII	LINUX	3	2	-	4	100	50	-	150	40	30		70
Paper IV	Image processing	3	2	-	4	100	50	-	150	40	30		70
Paper V	Object Oriented Analysis and Design	3	2	-	4	100	50	-	150	40	30		70
Pretical I	Practical Based on Paper I			3x2	3		25	100	125		15	50	65
Prectical II	Practical Based on Paper III	-	-	3x2	3	-	25	100	125	-	15	50	65
TOTAL		15	10	12	26	500	300	200	**1000**	200	180	100	480

8/6/23 08/06/23 08/06/23 8/6/23

THIRD SEMESTER: M.Sc. (CS)
Paper I: Programming in Java

Max Marks: 100 **Min Marks: 40**

NOTE: - The Question Paper setter is advised to prepare unit-wise question with the provision of internal choice.

Course Outcome:

Students will be able to:

- Develop Applet Programming with various techniques.
- Develop applications using AWT.
- Working with Graphics ,Color and Font
- Working with JDBC Classes(Database Operations- Create, Insert, Delete, Update, Select)
- Handling Result Set and Statements.
- Working with Servlet and JDBC
- Handling Client/Server Networking
- Working with Java Collections.

UNIT-I

Introduction: History and features of Java, Difference between C, C++ & JAVA. JAVA and Internet, WWW, Web Browsers, java supports system, Java Environment. JDK, JVM, Byte code Java

Programming Basics: Structure of Java program, JAVA tokens and Statements, Constants & Variables, Data types, Operators, Command line arguments. Java Statements & Arrays: if and switch statement. while, do-while and , for. Introduction to arrays, types of arrays, new operator, Strings. String class & its methods, Vectors. Classes & Objects: Specifying classes, Methods and fields, creating objects. Passing objects to methods, returning objects, static fields & methods. Constructors, Garbage collection, Overloading methods & constructors, this keyword.

UNIT-II

Inheritances: Specifying sub class, types of inheritance, visibility control: public, private, protected, package. super keyword, Overriding methods, Dynamic method dispatch, Abstract methods and classes, final methods & classes,

Packages & Interfaces : Introduction to packages, naming conventions, package statement, creating packages, import statement, accessing package, use of CLASSPATH, adding class to package, hiding classes. Interface, implementing interfaces, multiple interfaces.

Multithreading: Creation threads, Extending Thread class, implements Runnable interface, stopping and blocking thread, Thread life cycle, thread priorities & Thread synchronization, using Thread methods.

UNIT-III:

Exception Handling: Managing errors, types of errors, exceptions, syntax of exception handling code. try, catch, throw, throws and finally statements, multiple catch & nested try statements.

Java Input Output: Java I/O package, Byte/Character Stream, Buffered reader / writer, File reader / writer, File Sequential / Random. Reading numeric, character & strings data from keyboard.

Applet programming: Applet Vs. Application, Creating applets, life cycle, local & remote applets. <APPLET> tag & its attributes, adding applet to HTML file, Running applet.

UNIT-IV:

Abstract Windows Toolkit (AWT): Components and Graphics, Containers, Frames and Panels, Layout Managers, Border layout, Flow layout, Grid layout, Card layout, AWT components. Event delegation Model, Event source and handler, Event categories, Listeners, Interfaces, Controls such as text box, radio buttons, checkboxes, lists, choice, command buttons, text area etc.

JDBC: Java database connectivity, Types of JDBC drivers, Writing JDBC applications, Types of statement objects(Statement, PreparedStatement and CallableStatement), Types of resultset, Inserting and updating , records, JDBC and AWT,

UNIT-V:

Networking with Java : Networking basics, Sockets, port., Internet addressing, java.net – networking classes and interfaces, Implementing TCP/IP based Server and Client

Servlets: Introduction Servlet API Overview, Writing and running Simple Servlet, Servlet Life cycle, Generic Servlet, HTTPServlet, ServletConfig, ServletContest, Writing Servlet to handle Get and Post methods.

BOOKS RECOMMENDED

1. Horstman Cay, Cornell Gary, Core JavaTM2, Vol.1&2, 7edition, Pearson Education.
2. Herbert Schildt, The Complete Reference, seventh edition, [TMH]
3. Programming with JAVA – A Primer by E. Balguruswamy (TMH)
4. Steven Holzner, JAVA 2 Programming Black Book, Wiley India.
5. Ivor Horton, Beginning Java 2, JDK 5 Ed, Wiley India.
6. Java 2 from scratch by Steven Haines the – PHI
7. Java database Programming – Maithew Siple – THM

Suggested Digital Platforms Web Links:

https://onlinecourses.swayam2.ac.in/aic20_sp13/preview
https://onlinecourses.swayam2.ac.in/aic20_sp13/preview
https://onlinecourses.swayam2.ac.in/aic20_sp56/preview

THIRD SEMESTER: M.Sc. (CS)

Paper II: Computer Graphics

Max Marks : 100 **Min Marks : 40**

NOTE: - The Question Paper setter is advised to prepare unit-wise question with the provision of internal choice.

Course Outcome:
Students will be able to:

- Students will have an appreciation of the history and evolution of computer graphics, both hardware and software. Assessed by written homework assignment.
- Students will have an understanding of 2D graphics and algorithms including: line drawing, polygon filling, clipping, and transformations. They will be able to implement these. Assessed by tests and programming assignments.
- Students will understand the concepts of and techniques used in 3D computer graphics, including viewing transformations, hierarchical modeling, color, lighting and texture mapping. Students will be exposed to current computer graphics research areas. Assessed by tests, homework and programming assignments.
- Students will be able to use a current graphics API (OpenGL). Assessed by programming assignments.
- Students will be introduced to algorithms and techniques fundamental to 3D computer graphics and will understand the relationship between the 2D and 3D versions of such algorithms. Students will be able to reason about and apply these algorithms and techniques in new situations. Assessed by tests and programming assignments.

Unit-I

Introduction of computer Graphics and its applications, Overview of Graphics systems, Video display devices, Raster scan display, Raster scan systems, video controller, Raster scan display processor, Random scan display, random scan systems, color CRT monitor, Flat panel display, Interactive input devices, Logical classification of input devices, Keyboard, mouse, Trackball and spaceball, Joysticks, Image scanner, Light pens, Graphics software, Coordinates representations, Graphics functions.

Unit-II

Line drawing algorithms, DDA, Bresenham's, Circle generating, Mid-point circle algorithm, Ellipse generating, Polynomials, Scan-line polygon fill, Boundary fill.

Unit-III

Basic transformation's, Translation, Rotation, Scaling, Matrix representation's & homogeneous co-ordinates, Composite transformation's, Reflection, Two dimensional viewing, Two dimensional clipping, Line, Polygon, Curve, Text. 3D-transformation, Projection, Viewing, Clipping.

Unit-IV

Spline representation, Cubic spline, Bezier curve, Bezier surfaces, Beta spline, B-spline surfaces, B-spline curve, Hidden surfaces, Hidden lines, Z-buffer.

Unit-V

Fractal's geometry Fractal generation procedure, Classification of Fractal, Fractal dimension, Fractal construction methods. Color models, XYZ, RGB, YIQ, CMY & HSV, Shading algorithms, Shading model, Illumination model, Gouraud shading, Phong shading**.**

BOOKS RECOMMENDED

1. Computer Graphics by M. Pauline Baker, Donald Hearn PHI.
2. Mathematical Element for Computer Graphics By. David F. Roger., J. Alan Adams$_{nd}$
3. Principles of Interactive Computer Graphics By. William. M. Newmann.
4. Procedural Element for Computer Graphics By. David F. Roger. Mc. Graw Hill.
5. Computer Graphics By A.P. Godse, TPPublication,
6. Computer Graphics By V.K. Pachghare, Laxmi Publication

Suggested Digital Platforms Web Links:

https://onlinecourses.nptel.ac.in/noc22_cs111/preview
https://onlinecourses.nptel.ac.in/noc22_me105/preview

THIRD SEMESTER: M.Sc. (CS)
Paper III: LINUX

Max Marks : 100 **Min Marks : 40**

NOTE :- The Question Paper setter is advised to prepare unit-wise question with the provision of internal

Course Outcome:

Students will be able to:

- Find the latest version of a distribution of Linux
- Install, configure and use Linux to run as a server or a desktop
- Use CLI to perform many administrative functions on Linux either server or desktop
- Find, install, configure and update software on a Linux server or desktop
- Manage users' accounts, permissions and authorization on a Linux server or a desktop
- Manage file systems on a Linux server or desktop
- Run desktop virtualization on a wide variety of operating systems including Windows and Linux Setup Linux to provide a service depending on what the needs are ie., DNS, DHCP, WWW, email, file and print

UNIT - I

Introduction : Introduction to Multi-user System, Emergency and history of Unix, Feature and benefits, Versions of Unix. System Structure:-Hardware requirements, Kernel and its function, introduction to System calls and Shell.

File System : Feature of Unix File System, Concept of i-node table, links, commonly used commands like who, pwd, cd, mkdir, rm, ls, mv, lp, chmod, cp, grep, sed, awk, pr, lex, yacc, make, etc. Getting started (login / logout), File system management, file operation, system calls, buffer cache .Vi Editor:- Intro to text processing, command and edit mode, invoking vi, command structure, deleting and inserting line, deleting and replacing character, searching strings, yanking, running shell command, command macros, set windows, set auto indent, set number, intro to exrc file.

UNIT - II

Shell Programming : Introduction to shell feature, wild card characters, i/out redirections, standard error redirection, system and user created shell variables, profile files, pipes/tee, background processing, command line arguments, command substitution, read statement, conditional execution of commands, special shell variables $ #, #?, $* etc. Shift commands, loops and decision making- for, while and until, choice making using case…esac, decision making if ….fi, using test, string comparison, numerical comparison, logical operation, using expr.

UNIT - III

Introduction to Shell : Features, changing the login shell, cshrc, login, logout files, setting environment, variables, history and alias mechanism, command line arguments, redirection/appending safely, noclobber, noglob, ignore eof, directory stacks (pushd, popd), feature of other shell (rsh, vsh).

Process Control : Process management, process states and transition, regions and control of process, sleep and waking, process creation, process killing, signals, system boot and init process, traps, sitting process priorities.

UNIT - IV

Inter-process Communication :I/O Sub system, terminal drives, disk drives, messages, shared memory, semaphores, memory management, swapping, demand paging.

System Calls and Unix -C Interface : File handling calls like - access (), open(), create(), read(), write(), close(), fseek(), process control system calls like kill(), exec(), fork(), wait(), signal(), exit(), comparing stdio library and calls.

UNIT - V

System Administration : Process and Scheduling, Security, Basic System Administration:- Adding a User, User Passwords, Delete of a User, Adding a Group, Deleting a Group, Super User, Startup and Shutdown. Advanced System Administration:-Managing Disk Space, Backup and Restore, Managing System Services. Xwindows:- Introduction to Xwindows concept

RECOMMENDED BOOKS:

1. Arnold Robbins, "Linux Programming by Examples The Fundamentals", Pearson Education, 2Ed., 2008.
2. Cox K, "Red Hat Linux Administrator's Guide", PHI, 2009.
3. R. Stevens, "UNIX Network Programming", PHI, 3Ed., 2008.
4. Sumitabha Das, "Unix Concepts and Applications", TMH, 4Ed., 2009.

Suggested Digital Platforms Web Links:

https://onlinecourses.swayam2.ac.in/aic20_sp05/preview
https://onlinecourses.swayam2.ac.in/aic20_sp24/preview
https://onlinecourses.swayam2.ac.in/aic20_sp45/preview

THIRD SEMESTER: M.Sc. (CS)

Paper IV: Image Processing

Max Marks : 100 **Min Marks : 40**

NOTE :- The Question Paper setter is advised to prepare unit-wise question with the provision of internal choice.

Course Outcome:

Students will be able to:

- To study the image fundamentals and mathematical transforms necessary for image processing.
- To study the image enhancement techniques
- To study image restoration procedures.
- Review the fundamental concepts of a digital image processing system.
- Analyze images in the frequency domain using various transforms.
- Evaluate the techniques for image enhancement and image restoration.
- Categorize various compression techniques.
- Interpret Image compression standards.
- Interpret image segmentation and representation techniques.

UNIT - I

Digital Image fundaments: Introduction, An image model, sampling & quantization, basic relationships between Pixels, imaging geometry.

UNIT - II

Image Transforms: Properties of 2 – D Fourier transform, FFT algorithm and other separable image transforms. Walsh transforms. Hadamard, Cosine, Haar, Slant transforms, KL transforms and their properties.

UNIT - III

Image Enhancement: Background, enhancement by point processing, histogram processing, spatial filtering and enhancement in frequency domain, color image processing.

Image filtering and restoration : degradation model, diagnolisation of circulant and block circulate matrices, Algebraic approach to restoration, inverse filtering, least mean squares and interactive restoration, geometric transformations.

UNIT - IV

Image compression: Fundamentals, image compression modes, error free compression, lossy compression, image compression standards.

Image segmentation: Detection of discontinuities, edge linking and boundary detection thresholding, region – oriented segmentation, use of motion in segmentation.

UNIT - V

Representation and description: Various schemes for representation, boundary descriptors, and regional descrip

Image reconstruction from Projections, Radon Transforms; Convolution/Filter back – Project Algorithms.

Reference:

1. Fundamentals of Digital Image Processing - A. K. Jain, Prentice Hall
2. Digital Image Processing - Rafael C. Gonzalez, Richard E. Woods

Suggested Digital Platforms Web Links:
https://onlinecourses.nptel.ac.in/noc22_ee116/preview

THIRD SEMESTER: M.Sc. (CS)

Paper V: Object Oriented Analysis And Design

Max Marks : 100 **Min Marks : 40**

NOTE :- The Question Paper setter is advised to prepare unit-wise question with the provision of internal choice.

Course Outcome:

Students will be able to:

- be able to use an object-oriented method for analysis and design
- be able to analyze information systems in real-world settings and to conduct methods such as interviews and observations
- have a general understanding of a variety of approaches and perspectives of systems development, and to evaluate other IS development methods and techniques
- know techniques aimed to achieve the objective and expected results of a systems development process
- know different types of prototyping
- know how to use UML for notation.

Unit-I

Introduction: Two views of software Developments: SSAD and OOAD, Why Object –Orientation? Object and classes, Abstraction and encapsulation, Methods and Message, Interfaces, Inheritance and Polymorphism, Access Control, The Business case for OO Developments.

Object Or iented Methodologies: Object Oriented Design –Booch, Object Modeling Techniques-Rumbaugh, Object – Oriented Analysis – Coad-Yourdan, Object – Oriented Software Engineering – Ivar Jacbson,

Unit-II

Unified Approach: Diagramming and Notational Techniques using the UML, UML Notation, {Analysis Diagramming Techniques.} == Introduction to all (ten) Diagram, {Design Diagramming Techniques}, Generalization/Specialization, Aggregation and composition, Association, Cardinality, Navigability, Icons, relationships and adornments.

Object-Or iented Systems Development Pr ocess:

Rational Unified Process, Four Major phases: Inception, Elaboration, Construction, Transition, Requirements Engineering:

Problem analysis, Understanding Stockholders need, Type of requirements, Use-case Model: Writing Requirements

Unit-III

Analysis: Behavioral Analysis, Domain Analysis or Business Object Analysis, Use-case Driven Object Oriented analysis : The UML approach., Develop use-case Model, Use-case Description, Documentation, Activity Diagram, Identify the classes.,

Introduction to different approaches for identifying classes, “Noun Phrase” approach OR ,“Conman Class Pattern” approach Or , “CRC” approach Or, Use case Driven Approach. Containment and Composition, Aggregation, Inheritance, SubTypes and IS-A Hierarchies, Association and Link Relationships, Diagramming System Events.

8/6/23 08/06/23 08/06/23 8/6/23

Unit IV

Design Phases: Translating Analysis Concept into Design, Optimizing classes and Objects: The Multi- tiered Architecture View, ,Mapping System functions to objects., Object to Object Visibility, Collaboration Diagram, Sequential Diagram, Specification Class Diagram, Specifying Object Interfaces, Designing the Data Access layer, Design User Interface layer, Designing System Interfaces, Controls and Security.

Unit V

Design Refinement : Designing for Extensibility, Design for reusability, Portioning class space, Checking Completeness and correctness.

Per sistent Object and Database Issues: The Cood Data Management Domain, Object Persistence, Object-oriented Database Management System, Object-Oriented verses Relational Database, Mapping object to Relational Data structure. **Testing:** Introduction to Testing Strategies, Impact of Object Orientation on Testing. Testing Business Process, Design Matrix, Discovering reusable pattern.

RECOMMENDED BOOKS

1. Object Oriented Analysis and Design with Applications - Grady Booch, Benjamin/Cummings.
2. Object Oriented Modeling and Design. – J Rumbaugh, M Blaha, W .Premerlani 3.Principles of Object-Oriented Software Development - Anton Eliens, Addison Wesley.
4. Object Oriented System Development - Ali Bahrami McGRAW-HILL.
5. Object Oriented Software Engineering – Ivar Jacobson Pearson Education INC
6. Design Object-Oriented Software - Rebecea Wrifs-Brock. Brian Wilkerson, Lauren Wiener,

Suggested Digital Platforms Web Links:

https://onlinecourses.nptel.ac.in/noc22_cs99/preview

M.Sc.(CS) - III : Practical Based on Paper I (Java)

Scheme of Examination:-
Practical examination will be two programs and a project demonstration. It will be of 3 hours duration. All programme with flow chart & algorithms. The distribution of practical marks will be as follows

Programme1	-	20
Programme2	-	20
Programme3	-	20
Viva	-	25
[PracticalCopy+ InternalRecord]	-	15
Total	-	**100**

Note: This is tentative list; the teachers concern can add more program as per requirement.

1. WAP to print Fibbonaci Series .
2. WAP to Check that the given string is a Palindrome .
3. WAP to add the elements of Vector as arguments of main method (Run time) and rearrange them, and copy it into an Array.
4. WAP to to arrange the string in alphabetical order. WAP for StringBuffer class which perform the all methods of that class.
5. WAP to calculate Simple Interest using the Wrapper Class.
6. WAP to calculate Area of various geometrical figures using the abstract class.
7. WAP to design a class using abstract Methods and Classes.
8. WAP to create a Simple class to demonstrate Inheritance using super and this keywords.
9. WAP to to demonstrate overriding methods in Inheritance .
10. WAP to create a package using command & one package will import another package.
11. WAP where Single class implements more than one interfaces and with the help of interface reference variable user call the methods.
12. WAP for multithread using the Alive(),Join() & Synchronized() methods of thread class.
13. WAP that use the multiple catch statements within the try-catch and finally mechanism.
14. WAP where user will create a self-Exception using the "throw" keyword.
15. WAP to create a file and to store data into the file(using FileWriterIOStream).
16. WAP to illustrate the use of all methods of URL class.
17. Write a Program for Matrix Multiplication and Transpose using Input/Output Stream.
18. WAP to demonstrate the Border Layout using applet.
19. WAP in java for applet that handle the KeyBoard Events.
20. WAP to create an Applet using HTML file, where Parameter passes for font size & font type and Applet message will change to corresponding parameters .
21. WAP for displaying the Checkboxes,Labels and TextFields on an AWT.
22. WAP for AWT to create Menu and Popup Menu for Frame.
23. WAP for Applet which generate the MouseMotionListener Event.

24. WAP to create a table using JDBC.
25. WAP for JDBC to insert the values into the existing table by using prepared Statement.
26. WAP for JDBC to display the records from the existing table.
27. WAP using JDBC to delete a record from an existing Table .
28. WAP which support the TCP/IP protocol, where client gives the message and server will be, receives the message.
29. WAP to illustrate the use of all methods of URL class.
30. WAP for Writing and running a Simple Servlet to handle Get and Post Methods

M.Sc.(CS) - III : Practical Based on Paper III (Linux)

Scheme of Examination

Practical examination will be two programs and a project demonstration. It will be of 3 hours duration. All programme with flow chart & algorithms. The distribution of practical marks will be as follows

Programme1	-	20
Programme2	-	20
Programme3	-	20
Viva	-	25
[PracticalCopy+ InternalRecord]	-	15
Total	-	**100**

Q. 1 Add a user and password, change the password
Add & remove a group

Q. 2. ***Using vi editor do the following exercises***
In a file

1. replace the words 'has' with 'has not '.
2. Locate n^{th} character
3. Sort lines 21 to 40

Q. 3 In a file copy/cut and paste following text-
i At i^{th} line, n lines to j^{th} line .
ii Yank a few words
iii Cut and paste n words to i^{th} position in l^{th} line

Q. 4 Open two files 'txtfile' and 'newfile' and copy/cut 5 lines from txtfile and paste them in newfile using vi editor.
Open 'txtfile' and copy/cut following and paste to the 'newfile'
i^{th} to the last line in it

Q. 5 Create macro

1. to paste your name at any position in the file.
2. to map the 1^{st} function key to search for "loop" and copy into the buffer 'a' all text following it up to but not including the string "end".
3. to remove all leading spaces in a file
4. to save and quit vi editor in input mode

Q. 6 ***Write commands***

i. List all files that match a class.
ii. List all files that do not match a class.
iii. Change the file permissions

Q. 7 ***Write commands***

i. Display the lines in a file that contain a particular word.
ii. Append the contents of two files in a file JABC.
iii. Count the number of files in a directory.

Q. 8 ***Write shell programs***

List all files in current directory and save the list in a file ABC. Also save the contents of the files in ABC and display the contents in ABC in sorted order.

Q. 9 ***Write shell programs***

Sort the contents of a file ABC and save it in OABC.

Q. 10 ***Write shell programs***

To save current date & time, number of files & directories in the current directory and contents of all the files to a single file NFL.

Q. 11 ***Write shell programs***

To input a number and test whether it is +ve, -ve or zero.

Q. 12 ***Write shell programs***

To test whether a filename is a regular file or a directory or of other type.
To list only the directories in current path.

Q. 13 ***Write shell programs***

To print the greatest of three numbers.

Q. 14 ***Write shell programs***

To print 12 terms of Fibonacci series.

Q. 15 ***Write shell programs***

To display particular messages depending on the weekday.

Q. 16 ***Write shell programs***

To display common messages for following group of days-Monday & Wednesday, Tuesday & Thursday and Friday & Saturday and other day.

Q. 17 ***Write shell programs***

To accept a string from the terminal and echo a suitable message if it doesn't have at least 9 characters.

Q. 18 ***Write shell programs***

Write a Shell Script to find the factorial of a number.

Q. 19 ***Write shell programs***

Write a Shell Script to swap two numbers using third variable.

Q. 20 ***Write shell programs***

Write a Shell Script to print prime numbers between 1 to 20.

Q. 21 ***Write shell programs***

Write a Shell Script to greatest of three numbers.

Q. 22 ***Write shell programs***

Write a Shell Script to display mathematical table of any number in the format E x :- 3*1=3.

Q. 23 Perform the disk partition and formatting for Linux file system.

Q. 24 Perform the BOSS Linux Installation .

Q. 25 Install the latest version of Mozilla Firefox web browser in LINUX.

Q. 26 Install the printer driver and print text page in Linux.

Q. 27 Compile and run a “C” Language program for find out compound interest in Linux .

Q. 28. Compile and run a “C++” Language program for factorial Number in Linux.

Q 29. Compile and run a “JAVA” Language program for print prime number up to 50.

SCHEME OF TEACHING AND EXAMINATIONS
MASTER OF SCIENCE IN COMPUTER SCIENCE

FORTH SEMESTER

Subject Code	SUBJECTS	Teaching Load Per Week			Credit	Examination Marks							
						Max. Marks				Min. Marks			
		L	T	P	L+ (T+P)/2	Th	Ses	Pr	Total	Th	Ses	Pr	Total
Paper 1	Software Engineering	3	2	-	4	100	50	-	150	40	30		70
Paper II	Research Methodology	3	2	-	4	100	50	-	150	40	30		70
Paper III	Elective : 1. Data Mining & Data Warehousing 2. Artificial intelligence and Expert System 3. Advanced Computer Architecture	3	2	-	4	100	50	-	150	40	30		70
Project	Major Project/DissertationPaper Publication(At least 1 publication is mandatory during the course)	-	-	6x2	6	-	50	300	350		30	150	180
TOTAL		09	06	15	18	300	200	300	**800**	120	120	150	390

FOURTH SEMESTER: M.Sc. (CS)

Paper I: Software Engineering

Max Marks : 100 **Min Marks : 40**

NOTE :-The Question Paper setter is advised to prepare unit-wise question with the provision of internal choice.

Course Outcome:

Students will be able to:

- Research the state-of-the-art, and apply their findings to software testing and quality assurance;
- Analyze different approaches to software testing and quality assurance, and select optimal solutions for different situations and projects;
- Conduct independent research in software testing and quality assurance and apply that knowledge in their future research and practice;
- Evaluate the work of peers constructively by following proven methods of peer-review, and by using the principles of research ethics.

UNIT-I Fundamentals of Software Engineering and Process models

Software myths, Software engineering- A layered technology, Software Development Life cycle, Capability Maturity Model (CMM), Process models: waterfall model, incremental process models, Evolutionary process models, Software requirements: Functional and non-functional requirements, User requirements, System requirements, Interface specification, software requirements document.

UNIT-II S/W Requirements and Design Engineering

Feasibility studies, Requirements elicitation and analysis, Requirements validation, Requirements management, System models: Context Models, Behavioral models, Data models, Object models, Design process and Design quality, Design concepts, the design model, software architecture, Fundamental issues in software design: Goodness of design, cohesions, coupling. Functionoriented design: structured analysis and design.

UNIT-III Testing Strategies and Product metrics

A strategic approach to software testing, test strategies for conventional software, Black-Box and White-Box testing, Validation testing, System testing, the art of Debugging, Software Quality, Metrics for Analysis Model, Metrics for Design Model, Metrics for source code, Metrics for testing, Metrics for maintenance.

UNIT-IV Testing Plan and Maintenance

Snooping for information, coping with complexity through teaming, Testing plan focus areas, Testing for recoverability, planning for troubles, Preparing for the tests: Software Reuse, Developing good test programs, Data corruption, Tools, Test Execution,Testing with a virtual computer, Simulation and.Prototypes, Managing the Test, Customer's role in testing, Software maintenance issues and techniques, Software reuse, Client-Server software development.

UNIT-V Software Reengineering and Project Management

Software Reengineering, Evolution of Software Economics, Life Cycle Phases and Process artifacts, Model based software architectures, Software process workflows, Iteration workflows, Major milestones, Minor milestones, Periodic status assessments, Process Planning, Project Control and process instrumentation: Seven core metrics, management indicators, quality indicators, life-cycle expectations

RECOMMENDED BOOKS

1. K. K. Aggarwal and Yogesh Singh, “Software Engineering”, New AgeInternational,
2. R. S. Pressman, “Software Engineering – A Practitioner’s Approach”, McGraw Hill Int.,
3. Pankaj Jalote, “An Integrated Approach to Software Engineering”,Narosa,

REFERENCES:

1. Stephen R. Schach, “Classical & Object Oriented Software Engineering”,IRWIN,
2. James Peter, W. Pedrycz, “Software Engineering: An EngineeringApproach
3. I. Sommerville, “Software Engineering”, Addison Wesley,8Ed.,2009.
4. Frank Tsui and Orlando Karan, “Essentials of Software Engineering”, Joes and Bartlett, 2 Ed.,2010.
5. Kassem A. Saleh, “Software Engineering”, Cengage Learning,2009.
6. Rajib Mall, “Fundamrntal of Software Engineering”, PHI, 3Ed.,2009.
7. Carlo Ghizzi , Mehdi Jazayeri and Dino Mandrioli, “ Fundamental of SoftwareEngineering”,

Suggested Digital Platforms Web Links:

https://onlinecourses.swayam2.ac.in/cec22_cs24/preview
https://onlinecourses.nptel.ac.in/noc22_cs106/preview
https://nptel.ac.in/courses/106105182
https://nptel.ac.in/courses/106105087
https://nptel.ac.in/courses/106101061

FOURTH SEMESTER: M.Sc. (CS)
Paper II: Research Methodology

Max Marks : 100 **Min Marks : 40**

NOTE: - The Question Paper setter is advised to prepare unit-wise question with the provision of internal choice.

Course Outcome:
Students will be able to:

- Identify and discuss the role and importance of research in the field of sciences.
- Identify and discuss the issues and concepts salient to the research process.
- Identify and discuss the complex issues inherent in selecting a research problem, selecting an appropriate research design, and implementing a research project.
- Identify and discuss the concepts and procedures of sampling, data collection, analysis and reporting.
- Use of software tools based on research.

UNIT I – RESEARCH FORMULATION AND DESIGN:
Motivation and objectives – Research methods vs. Methodology. Types of research – Descriptive. Analytical, Applied vs. Fundamental, Quantitative vs. Qualitative, Conceptual vs. Empirical, concept of applied and basic research process, criteria of good research. Defining and formulating the research problem, selecting the problem, necessity of defining the problem, importance of literature review in defining a problem, literature review-primary and secondary sources, reviews, monograph, patents, research databases, web as a source, searching the web, critical literature review, identifying gap areas from literature and research database, development of working hypothesis.

UNIT II – DATA COLLECTION AND ANALYSIS:
Accepts of method validation, observation and collection of data, methods of data collection, sampling methods, **MATLAB**- Basics of MATLAB, creating variable, MATLAB function, Data types, Arrays, plotting graph, Input and output statements, conditional statement, Exploring tools: NN tools, optimization tool, statistical tool, Machine learning, Simulink etc., **WEKA:** What is?, launching explorer, loading data, data preprocessing, classifier, clustering, association and feature selection etc. data processing and analysis strategies and tools, data analysis with statically package (Sigma STAT, SPSS for student t-test, ANOVA, etc.), hypothesis testing.

UNIT III –RESEARCH ETHICS, IPR AND SCHOLARY PUBLISHING:
Ethics-ethical issues, ethical committees (human & animal); IPR- intellectual property rights and patent law, commercialization, copy right, royalty, trade related aspects of intellectual property rights (TRIPS); scholarly publishing- IMRAD concept and design of research paper, citation and acknowledgement, Indexing databases, Citation databases: Web of Science, Scopus etc., Use of plagiarism software like Turnitin, Urkund/ Ouriginal and other open source software, reproducibility and accountability.

UNIT IV –INTERPRETATION AND REPORT WRITING:
Meaning of Interpretation, Technique of Interpretation, Precaution in Interpretation, Significance of Report Writing, Different Steps in Writing Report, Layout of the Research Report, Types of reports, Oral Presentation, Mechanics of Writing a Research Report, Precautions for Writing Research Reports, Conclusions.

UNIT V – RESEARCH MATRICS AND SOFTWARE TOOLS

Research Matrics:

Impact Factor of journal as per Journal Citation Report (JCR), pear review process, h-index, g-index, i10-index. **Journal and thesis**: Referred journal, Indexed journal, open access journal, Open access policy, SCIE and ESCI journals, Science direct, Journal finder/journal suggestion tools viz. JANE, Elsevier Journal Finder, Springer Journal Suggester, etc., UGC care journal, Peer review process. Sodhganga, E-Sodh Sindhu.

Software Tools:

Google scholar, online paper submission system like Easy chair, Citation and referencing styles: APA, MLA. IEEE etc., Reference management tool: MS-Word, Mendeley, Zotero etc., Research gate, ORCID Id, google Scholler profile, Scopus profile etc.

References:

1. Research methodology: Methods and techniques: C.K. Kothari (2008), New Age International, New Delhi, Third edition.
2. Research Methodology: R. Panneerselvam, PHI learning publication, India, second edition.
3. Research methodology in Behavior Sciences (English and Hindi), S.K. Mangal, S. Mangal, PHR learning publication, India.
4. An introduction to Research Methodology, RBSA Publishers, Garg, B.L., Karadia, R., Agarwal, F. and Agarwal, U.K., 2002.
5. Research Methodology, Sinha, S.C. and Dhiman, A.K., 2002, EssEss publications.
6. Plagiarism: Why it happens, how to prevent it? -B. Gilmore.
7. Research Methods: the concise knowledge base, Trochim, W.M.K., 2005, Atomic Dog Publishing.

Suggested Digital Platforms Web Links:

https://onlinecourses.swayam2.ac.in/cec22_mg23/preview
https://onlinecourses.swayam2.ac.in/ntr22_ed50/preview
https://onlinecourses.nptel.ac.in/noc22_ge23/preview
https://onlinecourses.nptel.ac.in/noc22_hs127/preview
https://onlinecourses.swayam2.ac.in/nou22_cm14/preview

FOURTH SEMESTER: M.Sc. (CS)

Paper III: Elective 1. Data Mining & Data Warehouse

Max Marks : 100 **Min Marks : 40**

NOTE :- The Question Paper setter is advised to prepare unit -wise question with the provision of internal choice.

Course Outcome:

Students will be able to:

- Shift through all the chaotic and repetitive noise in your data.
- Understand what is relevant and then make good use of that information to assess likely outcomes.
- Accelerate the pace of making informed decisions.

UNIT – I : Introduction & Data Warehousing and OLAP Technology for Data Mining –

What is data mining?, Data Mining: On what kind of data?, Data mining functionality, Are all the patterns interesting?, Classification of data mining systems, What is a data warehouse?, A multi-dimensional data model, Data warehouse architecture, Data warehouse implementation, Further development of data cube technology, From data warehousing to data mining. Concept of Transaction, Transactional database, Distributed Database, Commit Protocols.

UNIT - II : Data Preprocessing, Data Mining Primitive, Languages and System Architecture –

Why preprocess the data?, Data cleaning ,Data integration and transformation, Data reduction, Discrimination and concept hierarchy generation, Data Mining Primitive, Data Mining Query Language, Architecture of data mining system.

UNIT - III : Mining Association Rules in Large Databases-

Association rule mining, Mining single-dimensional Boolean association rules from transactional databases, Mining multilevel association rules from transactional databases, Mining multidimensional association rules from transactional databases and data warehouse, From association mining to correlation analysis, Constraint-based association mining.

UNIT - IV : Classification and Prediction & Cluster Analysis –

What is classification? What is prediction? Issues regarding classification and prediction, Classification by decision tree induction, Bayesian Classification, Classification by back propagation, Classification based on concepts from association rule mining, Other Classification Methods ,Prediction, Classification accuracy, What is Cluster Analysis?, Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid-Based Methods, Model-Based Clustering Methods, Outlier Analysis.

UNIT - V : Mining Complex Types of Data & Applications and Trends in Data Mining -

Multidimensional analysis and descriptive mining of complex data objects, Mining spatial databases, Mining multimedia databases, Mining time-series and sequence data, Mining text databases, Mining the World-Wide Web, Data mining applications, Data mining system products and research prototypes, Additional themes on data mining, Social impact of data mining, Trends in data mining.

BOOKS RECOMMENDED

1. Data Mining: Concepts and Techniques - Jiawei Han and Micheline Kamber
2. Data Mining Concepts - H. Marget

Suggested Digital Platforms Web Links:
https://onlinecourses.nptel.ac.in/noc22_mg67/preview

FOURTH SEMESTER: M.Sc. (CS)

Paper III: Elective 2. Artificial Intelligence and Expert System

Max Marks : 100 **Min Marks : 40**

NOTE :- The Question Paper setter is advised to prepare unit -wise question with the provision of internal choice.

Course Outcome:

Students will be able to:

- To analyze and formalize the problem as a state space, graph, design heuristics.
- Ability to represent solutions for various real-life problem domains using logic based techniques.
- Understand the numerous applications and huge possibilities in the field of AI.
- Ability to express the ideas in AI research and programming language related to emerging technology.

UNIT - I

General Issues and overview of AI : The AI problems; what is an AI technique; Characteristics of AI applications

Problem solving, search and control strategies : General problem solving; production systems; control strategies: forward and backward and backward chaining Exhaustive searches: Depth first Breadth first search

UNIT - II

Heuristic Search techniques : Hill climbing; Branch and Bound technique; Best first search and A* algorithm; AND/Or Graphs; problem reduction and AO* algorithm; constraint satisfaction problems.

Game playing : Minimax search procedure; Alpha-Beta cutoffs; Additional Refinements.

UNIT - III

Knowledge Representation : First order predicate calculus; Skolemization Resolution principle and unification; Inference Mechanisms; Horn's clauses; semantic Networks; frame systems and value inheritance. Scripts; conceptual dependency;

AI Programming Languages : Introduction to Lisp, Syntax and Numeric functions; List manipulation functions; Iteration and Recursion; Property list and Arrays, Introduction to PROLOG.

UNIT - IV

Natural language processing : Parsing technique; context—context- free grammar; Recursive Transition Nets (RTN); Augmented Transition Nets ((ATN); case and logic grammars; semantic analysis.

Planning : Overview- An example Domain: The Blocks Word; Component of planning systems: Goal Stack Planning (linear planning); Non-linear planning using goal sets; probabilistic reasoning and Uncertainty; probability theory; Bayes Theorem and Bayesian networks; certainty factor.

UNIT - V

Expert Systems : Introduction to expert systems and Applications of expert systems; various expert system shells: vidwan; frame work; knowledge acquisition; case studies; MYCIN.

Learning : Role learning; learning by induction; Explanation based learning.

BOOKS RECOMMENDED :

1. Artificial Intelligence - Elaine Rich and Kevin knight, Tata McGraw hill.
2. Introduction to Artificial Intelligence and Expert Systems - Dan W. Patterson, Prentice hall of India.
3. Principles of Artificial Intelligence - Nills j. Nilson, Narosa publishing house.
4. Programming in PROLOG - Clocksin & C.S. Melish, Narosa publishing house.
5. Rule based expert system (A practical Introduction) - M.sasikumar, S.Ramani, narosa publishing house.

Suggested Digital Platforms Web Links:

https://onlinecourses.nptel.ac.in/noc22_cs83/preview
https://onlinecourses.nptel.ac.in/noc22_cs67/preview
https://onlinecourses.nptel.ac.in/noc22_ge29/preview

FOURTH SEMESTER: M.Sc. (CS)

Paper III: Elective 3. Advanced Computer Architecture

Max Marks: 100 **Min Marks : 40**

NOTE:- The Question Paper setter is advised to prepare unit-wise question with the provision of internal choice.

Course Outcome:

Students will be able to:

- To make students know about the Parallelism concepts in Programming.
- To make the students know about the importance of multiprocessor and multicomputer.
- To introduce the Interconnection network to the students.
- To study about data flow computer architectures.
- To study Linear and non-Linear pipelining.
- To understand the Advance processor Technology.
- To know about the Parallel Algorithm.

UNIT I

Introduction:-Feng's and Flynn's classification schemes, multiprocessor and multicomputer, UMA, NUMA, COMA, NORMA, memory models, parallel computers and its type. Application of ParallelComputers.

UNIT II

System Interconnect Architecture-Static & dynamic, Hypercube interconnection network, multistage interconnection networks-architecture & routing, design consideration, throughput, delay, blocking and non-blocking properties. Performance Metrics and Benchmarks.

UNIT III

Principle of Pipelining-overlapped parallelism, Linear and non-Linear pipelining, reservation table, calculation of MAL. Types of instruction pipeline. Arithmetic pipeline designs example-Floating point adder, pipelined multiplier.

UNIT IV

Advance processor Technology-RISC, CISC,VLIW architectures. Hazard detection and resolution, functional organization of instruction in IBM 360/91.

UNIT V

Exploring parallelism in program- multidimensional arrays, Parallel Algorithm- Matrix addition, subtraction, multiplication-block and SIMD. Bitonic sort, sorting on linear array processors. Bernstein's condition, Iso efficiency Concept.

TEXT BOOKS:.

1. Computer Architecture & Parallel Processing by Kai Hwang and F.A. Briggs-Mc Graw Hill.
2. Advanced Computer Architecture By Kai Hwang –Mc Graw Hill.
3. Parallel Computer Architecture & Programming by- V Raja Raman and C. Shiarammuty-PHI

REFERENCE BOOKS:

Parallel Computing Theory and practice by Michael J. Quinn –Tata McGraw Hill

Suggested Digital Platforms Web Links:
https://onlinecourses.nptel.ac.in/noc22_cs88/preview
https://onlinecourses.nptel.ac.in/noc22_cs110/preview

FOURTH SEMESTER: M.Sc. (CS)
Major Project

Students will be able to

Course Outcome:

- Demonstrate a sound technical knowledge of their selected project/Dissertation topic.
- Undertake problem identification, formulation and solution.
- Design engineering solutions to complex problems utilizing a systems approach.
- Conduct an engineering project/Dissertation.
- Communicate with engineers and the community at large in written or oral forms.
- Demonstrate the knowledge, skills and attitudes of a professional engineer.
- Project-based learning connects students to the real world.
- Understand the concept of research, writing and publish the research paper.
- Prepares students to accept and meet challenges in the real world, mirroring what professionals do every day.

1. Scheme of Examination: - The Project should be done by individual student.

Practical examination will be of 3 hours duration. The distribution of practical marks will be as follows

Software Demonstration	-	120
Project Report (Hard Copy + Soft Copy)	-	60
Project Demonstration/Presentation	-	60
Project Viva	-	60
Total	-	**300**

2. Format of the student project report on completion of the project

- Cover page as per format
- Certificate of Approval
- Certificate of project guide/Center Manager
- Certificate of the company/Organization if needed
- Certificate of Evaluation
- Declaration / Self Certificate
- Acknowledgement

In the "Acknowledgement" page, the writer recognizes his /her indebtedness for guidance and assistance of the thesis/report adviser and other members of the faculty. Courtesy demands that he/she also recognize specific contributions by other persons or institutions such as libraries and research foundations. Acknowledgements should be expressed simply, tastefully, and tactfully.

- Synopsis of the project
- Main Report
  - ✓ Objectives & Scope of the project
  - ✓ Theoretical Background of Project
  - ✓ Definition of problem
  - ✓ System Analysis & Design
  - ✓ System Planning (PERT Chart)
  - ✓ Methodology adopted, system Implementation & Detail of Hardware & Software used
  - ✓ System maintenance & Evaluation
  - ✓ Cost and benefit Analysis
  - ✓ Detailed Life Cycle of the project

- ERD,DFD
- Input and Output Screen Design o
  Process involved o
  Methodology used for testing o
  Test Report, Printout of the code sheet

✓ User/Operational Manual- including security aspects, access rights, back up, Controls etc.

✓ Conclusion

✓ References

✓ Soft copy of the project on CD

Paper Publication can be recommended

TITLE OF THE DISSERTATION
(Front Page)

Dissertation submitted to the

Hemchand Yadav Vishwavidyalaya, Durg (C.G.)
For the partial fulfilment for the award of the degree of

Master of Science inComputer Science

By

Name of the Student
(Roll No.: --------)
Under the Supervision of
Name of Supervisor (s)

Name of the Department
Name of the College

Year

Certificate

This is to certify that the dissertation entitled ----------, submitted to (Name of University), in partial fulfillment for the award of the degree of **Master of Science in Computer Science**, is a record of bona fide work carried out by (Name of Student), Roll No. ----------, under my supervision and guidance.

All help received by his/her from various sources have been duly acknowledged.

No part of this dissertation has been submitted elsewhere for award of any other degree.

Signature of Supervisor(s) and Designation:
Name(s):
Department(s):

Place: ------
Date: ------

Declaration/Self Certificate

I certify that

a. The work contained in the dissertation is original and has been done by myself under the supervision of my supervisor.

b. The work has not been submitted to any other Institute for any degree or diploma.

c. I have conformed to the norms and guidelines given in the Ethical Code of Conduct of the Institute.

d. Whenever I have used materials (data, theoretical analysis, and text) from other sources, I have given due credit to them by citing them in the text of the dissertation and giving their details in the references.

e. Whenever I have quoted written materials from other sources and due credit is given to the sources by citing them.

Date:
Place:

Name of the Student
Roll. No.:

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