

PAPER NO-10: STATISTICAL COMPUTATIONS USING C

1. Overview of C
 - 1.1 History of C
 - 1.2 Importance of C
 - 1.3 Basic Structure of C programs
 - 1.4 Programming Style
 - 1.5 Executing a C Program
2. Constants, Variables and Data Types
 - 2.1 Introduction
 - 2.2 Character Set
 - 2.3 C Tokens
 - 2.4 Keywords and Identifiers
 - 2.5 Constants
 - 2.6 Variables
 - 2.7 Data Types
 - 2.8 Declaration of Variables
 - 2.9 Assigning Values to Variables
 - 2.10 Defining Symbolic Constants
 - 2.11 Overflow and Underflow of Data
3. Operators and Expressions
 - 3.1 Introduction
 - 3.2 Arithmetic Operators
 - 3.3 Relational Operators
 - 3.4 Logical Operators
 - 3.5 Assignment Operators
 - 3.6 Increment and Decrement Operators
 - 3.7 Condition Operator
 - 3.8 Special Operators
 - 3.9 Arithmetic Expressions
 - 3.10 Evaluation of Expressions
 - 3.11 Precedence of Arithmetic Operators
 - 3.12 Some Computational Problems
 - 3.13 Type Conversions in Expressions
 - 3.14 Operator Precedence and Associativity
 - 3.15 Mathematical Functions
4. Managing Input and Output Operations
 - 4.1 Introduction
 - 4.2 Reading a Character
 - 4.3 Writing a Character
 - 4.4 Formatted Input
 - 4.5 Formatted Output
5. Decision Making and Branching
 - 5.1 Introduction
 - 5.2 Decision Making with If Statement
 - 5.3 Simple If Statement
 - 5.4 The If.....Else Statement
 - 5.5 Nesting of If.....Else Statement
 - 5.6 The Else If Ladder
 - 5.7 The Switch Statement

- 5.8 The? Operator
- 5.9 The Goto Statement
- 6. Decision Making and Looping
 - 6.1 Introduction
 - 6.2 The While Statement
 - 6.3 The Do Statement
 - 6.4 The For Statement
 - 6.5 Jumps in Loops
- 7. Arrays
 - 7.1 Introduction
 - 7.2 One-Dimensional Arrays
 - 7.3 Declaration of One-Dimensional Arrays
 - 7.4 Initialization of One-Dimensional Arrays
 - 7.5 Two-Dimensional Arrays
 - 7.6 Initialization of Two-Dimensional Arrays
 - 7.7 Multi-Dimensional Arrays
- 8. Character Arrays and Strings
 - 8.1 Introduction
 - 8.2 Declaring and Initializing String Variables
 - 8.3 Reading Strings from Terminal (using scanf only)
 - 8.4 Writing Strings to Screen (using printf only)
- 9. File Management in C
 - 9.1 Introduction
 - 9.2 Defining and Opening a File (only r, w and a modes)
 - 9.3 Closing a File
 - 9.4 I/O Operations on Files (only using fscanf and fprintf)
- 10. User- defined Functions
 - 10.1 Introduction
 - 10.2 Need for User-Defined Functions
 - 10.3 A Multi-Function Program
 - 10.4 Elements of User-Defined Functions
 - 10.5 Definition of Functions
 - 10.6 Return Values and Their Types
 - 10.7 Function Calls
 - 10.8 Function Declarations
 - 10.9 Category of Functions
 - 10.10 No Arguments and No Return Values
 - 10.11 Arguments but No Return Values
 - 10.12 Arguments with Return Values
 - 10.13 No Arguments but Returns a Value
 - 10.14 Functions that Return multiple Values
 - 10.15 Nesting of Functions
 - 10.16 Recursion
 - 10.17 Passing Arrays to Functions
 - 10.19 The Scope, Visibility and Lifetime of Variables
- 11. Structure
 - 11.1 Introduction
 - 11.2 Defining a Structure
 - 11.3 Declaring Structure Variables
 - 11.4 Accessing Structure Members
 - 11.5 Structure Initialization
 - 11.6 Copying and Comparing Structure variables
 - 11.7 Operations on Individual Members

12. Pointers
 - 12.1 Introduction
 - 12.2 Understanding Pointers
 - 12.3 Accessing the Address of a Variable
 - 12.4 Declaring Pointer Variables
 - 12.5 Initialization of a Pointer Variable
 - 12.6 Accessing a Variable through its Pointer
 - 12.8 Pointer Expressions
 - 12.9 Pointer Increments and Scale Factor
 - 12.10 Pointers and Arrays
 - 12.11 Arrays of Pointers
 - 12.12 Pointers as Function Arguments
 - 12.13 Functions Returning Pointers
 - 12.14 Pointers and Structures
13. Dynamic Memory Allocation
 - 13.1 Introduction
 - 13.2 Dynamic Memory Allocation
 - 13.3 Allocating a Block of Memory: Malloc
 - 13.4 Releasing the Used Space
14. The Preprocessor
 - 14.1 Introduction
 - 14.2 Macro Substitution
 - 14.3 File Inclusion

WEEK-WISE DETAILS

Week 1-2: Overview of C, Constants, Variables and Data Types

- Balagurusamy, E. (2011): *Programming in ANSI C*, 6th Edition, Tata McGraw Hill. pp. 1-3, 12-14, 22-36, 38-44, Sec. 2.14 pp. 45

Week 2-3: Operators and Expressions

- Balagurusamy, E. (2011): *Programming in ANSI C*, 6th Edition, Tata McGraw Hill. pp. 52-60, till Sec. 3.7, 61-73

Week 4: Managing Input and Output Operations

- Balagurusamy, E. (2011): *Programming in ANSI C*, 6th Edition, Tata McGraw Hill. pp. 83-84, 87-103

Week 5: Decision Making and Branching

- Balagurusamy, E. (2011): *Programming in ANSI C*, 6th Edition, Tata McGraw Hill. pp. 112-137

Week 6: Decision Making and Looping

- Balagurusamy, E. (2011): *Programming in ANSI C*, 6th Edition, Tata McGraw Hill. pp. 151-176

Week 7: Arrays

- Balagurusamy, E. (2011): *Programming in ANSI C*, 6th Edition, Tata McGraw Hill. pp. 192-215

Week 8: Character Arrays, Strings and File Management in C

- Balagurusamy, E. (2011): *Programming in ANSI C*, 6th Edition, Tata McGraw Hill. pp. 237-240, 245-246, 395-397, 402-403

Week 9-10: User- defined Functions

- Balagurusamy, E. (2011): *Programming in ANSI C*, 6th Edition, Tata McGraw Hill. pp.270-300, 302-311

Week 11: Structure and Pointers

- Balagurusamy, E. (2011): *Programming in ANSI C*, 6th Edition, Tata McGraw Hill. pp. 324-333, 357-371, 374-378

Week 12: Dynamic Memory Allocation and the Preprocessor

- Balagurusamy, E. (2011): *Programming in ANSI C*, 6th Edition, Tata McGraw Hill pp. 419-423, 452-455,457

REFERENCES

- Forouzan, B.A. and Gilberg, R.F. (2007): *Computer Science – A Structured Programming Approach Using C*. (3rd Edition). Thompson Course Technology
- Gottfried, B.S. (1996): *Schaum's Outline of Programming with C*, 2nd Edition, McGraw Hill.
- Kanetakar, Y. (2008): *Let us C*, BPB Publications.

Practical/ Lab work

(Using C Language)

LIST OF PRACTICALS

1. Plot of a Graph of $y = f(x)$; $f(x) = x$, $f(x) = \exp(-x^2/2)$
2. Roots of a quadratic equation (with imaginary roots also)
3. Sorting of an array
4. Mean, Median and Mode of a Grouped Frequency Data
5. Variance and coefficient of variation of a Grouped Frequency Data
6. Preparing a frequency table
7. Value of $n!$ using recursion
8. Random number generation from Uniform distribution
9. Random number generation from Exponential distribution
10. Random number generation from Normal distribution (using Central Limit theorem)
11. Random number generation from Beta distribution
12. Random number generation from Gamma distribution
13. Matrix Addition, Subtraction, Transpose and Trace
14. Matrix multiplication
15. fitting of binomial and Poisson distribution, goodness of fit
16. Chi-square test goodness of fit
17. chi-square contingency table
18. t-test for two means
19. Paired t-test
20. F-ratio test
21. Multiple and Partial correlation.
22. Rank Correlation (find Ranks also) without ties
23. Fitting line of regression