HOPT 62: OP 1

Computer programming in C & Computer Oriented Numerical Analysis
(Theory)

Note: This paper consists of 2 parts A, B. Part A is theory paper consisting of 60 Marks & Part B is Practical Paper consisting of 40 Marks.

Part : A (Theory)

(Number of Teaching hours: 48;   Time : 3 hrs;   Marks: 60)
(To answer five questions, choosing one out of two questions from each unit)

UNIT I. C fundamentals: The C character set, identifiers and keywords, Data types, constants, variables and arrays, declarations, symbolic constants, Operators (Arithmetic, unary, relational, logical, bitwise, assignment), expressions, statements, C program structure, Need of header files, Process of compiling and running a C program; I/O functions: Header files (stdio.h, conio.h) getch(), getche(), getchar(), putch(), putchar(), scanf(), printf(), gets(), puts(), clrscr(), window(); Control statements: Decision making and branching (if..else, switch), Decision making and looping (while, do .. while, for), Jumping (break, continue, goto), Nested loops.

UNIT II. Functions: Overview (definition, declaration), defining a function, accessing a function, function prototypes, call by value, call by reference, recursion, iteration, Advantages and disadvantages of recursion over iteration, Storage classes (Automatic, Register, External, Static), String functions (strcmp (), strlen (), strrev (), strcat (), toupper (), tolower ()), Math functions (sqrt (), abs (), sin (), cos (), Standard function- exit (), Memory allocation functions (malloc (), free (), realloc(), calloc()).

UNIT III Arrays and Pointers: Defining an array, array initialization, processing an array, passing array to a function, multidimensional arrays, arrays and strings, pointer declarations, passing pointer to a function, pointer and one dimensional arrays, Operation on pointers, functions returning pointers; Data files: File opening modes, character I/O(getc(), putc()), String I/O (fgets(), fputs()), Formatted console I/O(fscanf(), fprintf()), text mode versus binary mode, Unformatted console I/O functions − record I/O(fread(), fwrite(), ftell(), fseek(), rewind(), rename()), Record operations (append, delete, update, search, display, sorting of records).

UNIT IV: Floating point representation of numbers, Arithmetic operations with normalised floating point numbers, Errors of numbers, Binary representation of numbers; Interpolation − Lagrange's interpolation polynomials; difference tables − divided difference, forward difference, backward difference; Newton's forward and backward interpolation formula; Differentiation − first derivative; integration − simpson's 1/3rd rule, trapezoidal rule.;

UNIT V: Newton-Raphson method; regula-falsi method, secant method, bisection method for solving polynomial equations; Gauss elimination method for solving system of equations; numerical solution of differential equations − Euler's method, Runge-Kutta methods (up to second order) i;e; Heun's method, polygon method

5 : 2 : 20(17)

Books:

Text Books :

1. Kanetkar, Y.: Let us C, B. P. B Publication, 1993 Edition.
2. Gottfried, B. S.: Theory and Problems of Programming with C, Tata McGraw Hill Publication, 1998 Edition.
3. Rajaraman, V.: Computer Oriented Numerical Methods, PHI Learning Pvt. Ltd., New Delhi, 2002 Edition.
4. Scarborough, J.B., Numerical Mathematical Analysis, Oxford and IBH Publishing Ltd. New Delhi, 1930 Edition.

Reference Books:

1. Balaguruswamy, E.: Programming in ANSI C, Tata McGraw Hill publication, 2002 Edition.
2. Rajaraman, V.: Computer Programming in C, PHI Private Limited, New Delhi, 2002 Edition.
3. Jain, M. K., Iyenger, S. R. K., Jain, R. K.: Numerical Methods, Problems and solutions, Wiley Eastern Ltd., New Age International Publishers Ltd., 1995 Edition.
4. Kandasamy, P., Thilagavathy, K., and Gunavathy, K.: Numerical Methods, S. Chand & Co. Ltd., New Delhi, 2003 Edition.

****

Computer programming in C & Computer Oriented Numerical Analysis
(Practical)

Part: (B)

(Number of Practice/Teaching hours: 48;   Marks : 40)
Part-1

The following programs are to be practiced.

1. Roots of quadratic equation $Ax^2+Bx+C=0$,
2. Arrangement a given set of numbers in increasing/decreasing order; calculation of mean,
3. Evaluation e^x, sin x, cos x, log(1+x) using power series method,
4. Addition, subtraction and multiplication of matrices using function,
5. Evaluation of factorial of a positive integer and evaluation of binomial coefficients,
6. Determination of the transpose, determinant of the given matrix.(up to order 4),
7. Determination of the inverse of a given real matrix (up to order 4),
8. Searching a pattern in a given text and replacing every occurrence of it with another given string,
9. Writing a given number in words using function,
10. Copying the contents of one text to another text file using command line arguments,
11. Merging two text files to another text file,
12. Copying the contents of one text file to any number of given files using command line arguments,
13. Printing of every line of a text file containing a given pattern.

Part – 2

1. Lagrange's Interpolating Polynomial.
2. Newton Forward Difference Interpolating Polynomial.
3. Newton Backward Difference Interpolating Polynomial.
4. Simpson's 1/3 rule for Numerical Integration.
5. Trapezoidal Rule Rule for Numerical Integration.
6. Newton Raphson Method.
7. Regula-Falsi method.
8. Bisection method.
9. Gauss Elimination method.
10. Heun's method for solving an Initial Value problem.

NOTE : There will be practical examination for 40 marks of three hours duration of which 15 marks will be for Part 1 and 25 marks for Part 2 . All output should be in the form of an output file.

****