2022

(May/June)

MATHEMATICS

(Honours)

(Computer Programming in C and Computer Oriented Numerical Analysis)

(HOP–1)

Marks : 45

Time : 3 hours

The figures in the margin indicate full marks for the questions

Answer **five** questions, taking **one** from each Unit

UNIT—I

1. *(a)* What are the commonly used input/output function in C? How are they assessed? 3

(b) Name and describe the four basic data types in C. 3

(c) Describe the five arithmetic operators in C. Summarize the rules associated with their use. 3

2. *(a)* Describe the output that will be generated by the following C program : 5

```
# include <stdio.h>
  main( )
    {
      int i, j, x = 0;
      for (i=0; i < s; ++i)
        for (j = 0; j < i, ++j)
        {
          x += (i+j–1);
          printf ("%d", x);
        }
      printf ("\n x = %d", x);
    }
```

(b) What is the purpose of the while statement? When is the logical expression evaluated? What is the minimum number of times that a while loop can be executed? 4

UNIT—II

3. *(a)* Suppose function F1 calls function F2 within a C program. Does the order of the function definitions make any difference? Explain. 3

(b) What is meant by a function call? From what parts of a program can a function be called? 3

(c) Describe the output generated by the following program : 3

```
# include <stdio.h>
  int funct (int count);
  main( )
  {
    int a, count;
    for (count = 1; count <=5; ++count)
      {
        a = funct1 (count);
        printf ("%d", a);
      }
  }
int funct 1 (int x)
    {
      int y;
      y = x * x;
      return (y);
    }
```

4. *(a)* What is recursion? What advantage is there in its use? 3

(b) Each of the following is the first line of a function definition. Explain the meaning of each : 2

(i) float f (float a, float b)

(ii) void f(int a)

(c) Describe the output generated by the following program : 4

```
# include <stdio.h>
int funct 1 (int a);
int funct 2 (int a);
main( )
{
  int a=0, b=1, count;
  for (count=1; count<=3; ++count)
  {
    b+ = funct1(a) + funct2(a);
    printf {"%d", b);
    }
  }
  funct 1 (int a)
  {
    int b;
    b = funct2(a);
    return (b);
  }
  funct2 (int a)
  {
    int b=1;
    b+=1;
    return (b+a);
  }
```


UNIT—III

5. (a) How are arrays usually processed in C? Can entire arrays be processed with single instruction, without repetition? 2

(b) What conditions must be satisfied by all of the elements of any given array? How are individual array elements identified? 2+2=4

(c) Describe the array that is defined in each of the following statements : 1×3=3

(i) char name [3 0];

(ii) float C[6];

(iii) int params [5][5];

6. (a) How can a file be opened in C? Describe two file opening modes used for opening of files. 4

(b) What is a string? What is the purpose of the functions strlen(), strcpy? Illustrate the usage of these functions with examples. 3½

(c) Write the syntax of fprintf() with an example. 1½

UNIT—IV

7. *(a)* Using Newton's forward formula compute the pressure of the steam at temperature 142 °C from the following steam table : 4½

Temperature (in °C)	:	140	150	160	170	180
Pressure (in kgf/cm^2)	:	3·685	4·854	6·302	8·076	10·225

(b) Fit a polynomial of degree at most three which takes the following values : 4½

x	:	3	4	5	6
y	:	6	24	60	120

8. *(a)* Use Lagrange's interpolation formula to fit a polynomial to the following data :

x	:	–1	0	2	3
y	:	–8	3	1	2

Hence find $y(4)$ and $y(1)$. 4½

(b) Given that $y = \log x$, and

x	:	4·0	4·2	4·4	4·6	4·8	5·0
y	:	1·3863	1·4351	1·4816	1·5261	1·5686	1·6094

evaluate $I = \int_4^5 \log x \, dx$ by Trapezoidal rule. 4½

(Continued)

UNIT—V

9. *(a)* Use Secant method to find the root of the function $f(x) = 3x + \sin x - e^x$ to 5 decimal places. Perform two iterations. Use $x_0 = 0$ and $x_1 = 1$. 4½

(b) Use Heun's method to solve the initial value problem $y' = \frac{t - y}{2}$ on [0, 3] with $y(0) = 1$, taking $h = 1$. 4½

10. *(a)* Using Regula-Falsi method, compute the real root of the equation $x^3 - 4x - 9 = 0$ in the interval [2, 3], performing two iterations. 4½

(b) Solve the ODE

$$\frac{dy}{dx} + xy^2 = y$$

$$y(0) = 5, \quad 0 \le x \le 2$$

by any Runge-Kutta second-order method of your choice. Take the step size h to be $h = 1$. 4½

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