2021

(May)

MATHEMATICS

(Honours)

SEVENTH PAPER

(Computer Programming in C and Numerical Analysis)

Full Marks **: 50**
Pass Marks **: 18**

Time **: 3 hours**

The figures in the margin indicate full marks for the questions

(Attempt any five questions selecting at least two questions from each section)

SECTION – A

(Computer Programming in C)

1. (a) Distinguish between operating software and application software. Bring out the difference between compiler and interpreter. What are the advantages of high-level languages? 2+2+1=5

   (b) Write a C program to convert an octal number to its equivalent binary number. 5

2. (a) Describe the four basic data types. Write a C program to find the sum of the series S = 1!+2!+3!+4!+…+10!. 2+3=5

   (b) What is modulo operator? Explain the advantages of using symbolic constants over literal constants. What are the purpose of break statement and continue statement? 1+2+2=5

3. (a) In a switch statement, what will happen if a break statement is omitted? Distinguish the loop control structures available in C. Explain how linear search is different from binary search? 1+2+2=5

   (b) Write a C program to find the product of two matrices and print the result. 5

4. (a) What are the parts associated with a function? What is the difference between function declaration and function definition? 2+3=5

   (b) Explain the purpose and general form of return statement. Write a C program to find the factorial of a positive integer using function. 2+3=5

5. (a) Distinguish between actual and formal parameters in functions. Discuss the various ways of parameter passing in functions. 2+3=5

(b) What is recursion? Write a C program to find the GCD of two given positive integers using recursive function. 1+4=5

Section - B

(Numerical Analysis)

1. (a) (i) Evaluate: $\dfrac{\Delta^2 x^3}{E x^3}$, the interval of differencing being unity. 2

(ii) Estimate the missing term in the following: 3

x	1	2	3	4	5	6	7
y	2	4	8	-	32	64	128

Explain why the result differs from 16.

(b) Apply Newton-Gregory forward interpolation formula to the following table which gives the amount of a chemical dissolved in water and compute the amount dissolved at $22°$: 5

Temp:	$10°$	$15°$	$20°$	$25°$	$30°$	$35°$
Solubility:	19.97	21.51	22.47	23.52	24.65	25.89

2. (a) Using Lagrange's interpolation formula, find f(10) from the following table: 5

x	5	6	9	11
f(x)	12	13	14	16

(b) Find $f'(10)$ from the following table: 5

x	3	5	11	27	34
f(x)	-13	23	899	17315	35606

3. (a) Using Simpson's three-eighth rule, find an approximate value of $\displaystyle\int_0^1 \dfrac{2x}{1+x^2}\,dx$ by taking six equidistant ordinates correct up to four decimal places and obtain an approximate value of $\log_e 2$. 5

(b) Find the value of $y(1.1)$ using Runge-Kutta method of fourth order, given that

$\dfrac{dy}{dx} = 3x + y^2$, $y = 1.2$ when $x = 1$. 5

4. (a) Using Newton-Raphson method, find a root of the equation $x^3 + 29x - 97 = 0$, which lies between 2 and 3, correct to four places of decimal. 5

(b) Apply Gauss's Elimination Method to solve the system, 5

$$5x_1 + 3x_2 + 7x_3 = 4,$$
$$x_1 + 5x_2 + 3x_3 = 2,$$
$$7x_1 + 2x_2 + 10x_3 = 5$$

5. (a) Use the method of least square polynomial approximation to fit a straight line to the following data: 5

x_i	1	2	3	4	6	8
y_i	2.4	3.1	3.5	4.2	5.0	6.0

(b) A switching path between parallel railroad tracks is to be a cubic polynomial joining positions (0,0) and (4,2) and tangents to the lines y=0 and y=2. Apply Hermite's method to find the polynomial, given 5

	x	y	y'
x_1	0	0	0
x_2	4	2	0