

U.G. 5th Semester Examination 2021

MATHEMATICS (Honours)

Paper : DC-12

[Numerical Methods & C Programming Language]

(CBCS)

Full Marks : 32

Time : 2 Hours

*The figures in the margin indicate full marks.
Notations and symbols have their usual meanings.*

Group - A

(4 Marks)

1. Answer any *four* questions : 4×1=4
- (a) Find the number of significant figures in the approximate number 0.4785, given its relative error as 0.2×10^{-2} .
 - (b) In what kind of interpolation Lagrange's method is suitable?
 - (c) In case of multiple root α of $f(x) = 0$, can we obtain it using Newton-Raphson method? Justify your answer.
 - (d) What is the effect of round-off error in Gauss Elimination method?
 - (e) Functions in C programming is classified in two categories. Write their names.
 - (f) What is an entry controlled loop in C programming?
 - (g) Give an example of rule of defining constants in C programming.

Group - B

(10 Marks)

Answer any *two* questions :

2×5=10

1. (a) Compute $f''(1.5)$ for the function $y = f(x)$, given in the following table : 2

x	:	1	2	3	4	5	6
$f(x)$:	1	8	27	64	125	216

- (b) Find $y(1)$ by Euler's method from the given differential equation by taking

$$h = 0.2 \frac{dy}{dx} = xy, y = 1, \text{ when } x = 0. \quad 3$$

3. Solve the following system

$$\begin{aligned} 3x_1 + 2x_2 - 4x_3 &= 12 \\ -x_1 + 5x_2 + 2x_3 &= 1 \\ 2x_1 - 3x_2 + 4x_3 &= -3 \end{aligned}$$

by matrix factorization method. 5

4. Use Lagrange's interpolation formula to find $f(10)$ from the given tabular values

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

5. Use Stirling's Interpolation formula, to compute $f(0.22)$ from the following table

x	:	0.0	0.1	0.2	0.3	0.4
$f(x)$:	1.0000	1.1052	1.2214	1.3498	1.4918

Group - C

(18 Marks)

Answer any *two* questions :

2×9=18

6. (a) Establish Newton-cotes formula for numerical integration. Derive Simpson's one third rule from this. 5+1

(b) Calculate the value of $\int_{1.2}^{1.6} \left(x + \frac{1}{x}\right) dx$ correct upto two significant figures, taking four intervals. 3

7. (a) Compute $y(1.3)$, from $\frac{dy}{dx} = x^2 + y^2$ with $y(1) = 0$, using Runge-Kutta method of order 4. 5

(b) Use the power method to find the dominant eigen value and corresponding eigen vector of the matrix

$$A_{3 \times 3} = \begin{bmatrix} 1 & 6 & 1 \\ 1 & 2 & 0 \\ 0 & 0 & 3 \end{bmatrix} \quad 4$$

8. (a) Write a computer program in C to evaluate a real root of the equation $f(x) = 0$ by the method of bisection. 3

(b) Show that $\left(\frac{\Delta^2}{E}\right) e^x \times \frac{E e^x}{\Delta^2 e^x} = e^x$. 3

(c) Discuss about for Loop, while Loop, do-while Loop. 3
