QP Code: RD22MSC131 | Reg. No | | | | | | | | | | | AY 22

GIET UNIVERSITY, GUNUPUR – 765022

M. Sc (Third Semester) Regular Examinations, December – 2023

22MTPC302 – Numerical Analysis

(Mathematics)

Time: 3 hrs | Maximum: 70 Marks

(The figures in the right hand margin indicate marks.)

PART – A **(2 x 10 = 20 Marks)**

Q.1. Answer ***ALL*** questions	CO #	Blooms Level
a. Write the condition of existence of interpolating polynomial for a given set of tabular points.	CO1	K1
b. Prove that $\mu = \sqrt{1+\frac{\delta^2}{4}}$.	CO1	K2
c. Prove that $\mu\delta = \frac{\Delta+\nabla}{2}$.	CO1	K2
d. Construct the divide difference table for following data:	CO1	K1

x:	0.5	1.5	3.0	5.0	6.5	8.0
$f(x)$:	1.625	5.875	31.00	131.00	282.125	521.0

e. What are the normal equations used to find least square straight line and quadratic fit for discrete data?	CO2	K1
f. Write the formula for Simpson's one-third rule.	CO3	K1
g. Evaluate $I = \int_0^1 \frac{dx}{1+x^2}dx$ by two-point Gaussian quadrature formula.	CO3	K2
h. Write the formula for modified Euler's method.	CO4	K1
i. Write the formula for RK-4 method.	CO4	K1
j. Find y(1.2) by modified Euler's method given $\frac{dy}{dx} = \frac{2y}{x} + x^3$, y(1)=0.5	CO4	K2

PART – B **(10 x 5 = 50 Marks)**

Answer ***ANY FIVE*** questions	Marks	CO #	Blooms Level
2. a. Use Lagrange's formula to find the value of y at $x = 6$ from the following data	5	CO1	K3

x	3	7	9	10
y	168	120	72	63

b. Construct divide difference table for the data	5	CO1	K3			

x:	0.5	1.5	3.0	5.0	6.5	8.0
$f(x)$:	1.625	5.875	31.0	131.0	282.125	521.0

Hence find an approximation to $f(7)$.

3.a.	For the following data, construct forward difference table and obtain the interpolating polynomial. Interpolate at $x = 0.25$ and $x = 0.35$. x: 0.1 0.2 0.3 0.4 0.5; $f(x)$: 1.4 1.56 1.76 2.00 2.28.	5	CO1	K3
b.	Find $y(337.5)$ using Gauss backward difference formula from	5	CO1	K3

x	310	320	330	340	350	360
y	2.4914	235052	2.5185	2.5315	2.5441	2.5563

4.	Use the method of least squares to fit the curve $f(x) = c_0 x + \left(\frac{c_1}{\sqrt{x}}\right)$ for the following data x: 0.2 0.3 0.5 1 2; $f(x)$: 16 14 11 6 3.	10	CO2	K4
5.	Find an approximation of $f''(3)$ using quadratic interpolation for the data x: 3 4 6; $f(x)$: 54 128 512. Also, obtain an upper bound on the error.	10	CO2	K4
6. a.	Evaluate $\int_0^1 e^{-x^2}\,dx$ by dividing the range into 4 equal parts using Trapezoidal rule.	5	CO3	K4
b.	Evaluate $\int_0^{\frac{\pi}{2}} \mathbf{Sin}\, x dx$ by Simpson's one-third rule with n=6.	5	CO3	K2
7.a.	Compute $\int_{4.0}^{5.2} log x\,dx$ using Simpson's three-eight rule with 6 sub-intervals.	5	CO3	K2
b.	Find y(0.2) by modified Euler's method given $\frac{dy}{dx} = x^2 + y^2$, y(0)=1.	5	CO4	K2
8.	Given that $\frac{dy}{dx} + \frac{y}{x} = \frac{1}{x^2}$, $y(1) = 1$. Evaluate $y(1.3)$ by modified Euler's method.	10	CO4	K3