QPC: RM20MSC119 | Reg. No | | | | | | | | | | | AR 20

GIET UNIVERSITY, GUNUPUR – 765022

M. Sc. (First Semester) Examinations, May – 2021

20MTPC105 – NUMERICAL ANALYSIS

Mathematics

Time: 2 hrs | Maximum: 50 Marks

PART – A **(2 x 10 = 20 Marks)**

Q.1. Answer ***ALL*** questions

a. State the problem of polynomial interpolation.

b. Write the Lagrange interpolating polynomial.

c. Show that $\Delta + \nabla = \frac{\Delta}{\nabla} - \frac{\nabla}{\Delta}$.

d. Give the Newton's bivariate interpolating polynomial for equispaced points.

e. State the minimax property on a Chebyshev polynomial.

f. What is the order of error in the composite Trapezoidal rule?

g. State the composite Simpson's rule for double integration.

h. Define an Eigen function.

i. Write the formulas for 2-step Milne method.

j. When do you say that a multistep method is (i) weakly stable and (ii) absolutely stable?

PART – B **(6 x 5 = 30 Marks)**

Answer **ANY *FIVE*** questions Marks

2. From the following data, find θ at $x = 43$ nd $x = 84$. (6)

x:	40	50	60	70	80	90
θ:	184	204	226	250	276	304

3. Using divided differences, obtain the interpolating polynomial f for the following data. (6)

x:	-1	1	2	3
$f(x)$:	-21	15	12	3

4. Using the following data, obtain the (i) Lagrange and (ii) Newton's bivariate interpolating polynomials. (6)

x / y	0	1	2
0	1	3	7
1	3	6	11
2	7	11	17

5. Determine as accurately as possible a straight line $y = ax + b$, approximating $\frac{1}{x^2}$ in the Chebyshev sense on the interval $[1, 2]$. What is the maximal error? Calculate a and (6)

b to two correct decimals.

6. Using the following data find $f'(6.0)$, error = $O(h)$, and $f''(6.3)$, error = $O(h^2)$ (6)

x:	6.0	6.1	6.2	6.3	6.4
$f(x)$:	0.1750	-0.1998	-0.2223	-0.2422	-0.2596

7. Evaluate the double integral (6)

$$\int_0^1 \int_1^2 \frac{2xy}{(1+x^2)(1+y^2)}\, dy\, dx$$

using

(i) the trapezoidal rule with h = k = 0.25.

(ii) the Simpson's rule with h = k = 0.25.

Compare the results obtained with the exact solution.

8. Use the classical Runge - Kutta formula of fourth order to find the numerical solution at $x = 0.8$ for (6)

$$\frac{dy}{dx} = \sqrt{x+y},\ \ y(0.4) = 0.41$$

Assume the step length $h = 0.2$.

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