Total number of printed pages–4

53 (MA 401) NMCP

2019

NUMERICAL METHODS AND COMPUTER PROGRAMMING

Paper : MA 401

Full Marks : 100

Time : Three hours

The figures in the margin indicate full marks for the questions.

Answer ***any five*** *questions.*

1. *(a)* Find a real root of the equation $x^3 - x - 11 = 0$, using the bisection method correct to three decimal places. 6

   (b) State Newton's forward interpolation formula. Compute $f(1.2)$ from the following data : 1+7=8

x :	1.0	1.5	2.0	2.5	3.0
$f(x)$:	9.0	32.75	79.0	155.25	269.0

Contd.

(c) Given that $\frac{dy}{dx} = \frac{y-x}{y+x}$ with initial condition $y = 1$ at $x = 0$, find y for $x = 0.4$ by Euler's method. 6

2. (a) Find a real root of the equation $x^3 - 2x - 5 = 0$ by the method of Regula-Falsi correct to three decimal places. 5

(b) The observed values of a function are respectively 168, 120, 72 and 63 at the position 3, 7, 9 and 10 of the independent variables respectively. What is the best estimate you can give for the value of the function at the position 6 of the independent variables? 8

(c) Using Gauss-elimination method solve the following equations: 7

$$2x + 2y + z = 12$$
$$3x + 2y + 2z = 8$$
$$5x + 10y - 8z = 10$$

3. (a) Find a positive root of $3x^3 - 9x^2 + 8 = 0$ correct to fourth decimal places, using Newton-Raphson method. 4

(b) Compute the first derivative of the function at the point 0.1 from the following data: 6

x :	0	1	2	3	4
$f(x)$:	1	0	1	10	33

(c) Using Runge-Kutta fourth order method, find an approximate value of y when $x = 0.4$ given that $\frac{dy}{dx} = x + y$ and $y = 1$ when $x = 0$. 10

4. (a) Using Secant method, find a real root of $e^x - x = 2$ correct to three-decimal places. 4

(b) Given that $\frac{dy}{dx} = x^3 + y$, $y(0) = 2$. The values of $y(0.2) = 2.073$, $y(0.4) = 2.452$ and $y(0.6) = 3.023$ are obtained by Runge-Kutta method of fourth order. Find $y(0.8)$ by Milne's predictor-corrector method taking $h = 0.2$. 10

(c) Use Trapezoidal rule with $n = 4$ to estimate $\int_1^2 x^2 dx$ and compare this approximation with exact value. 6

5. *(a)* Using Iteration method, find a real root of $3x - log_{10}(x) - 16 = 0$ correct to fourth decimal places. 5

(b) Given the following data : 5

x :	0	1	2	5
$f(x)$:	2	3	12	147

What is the form of the function ?

(c) Fit a parabola $y = a + bx + cx^2$ to the following data : 10

x :	2	4	6	8	10	12
y :	3.07	12.85	31.47	57.38	91.29	100.02

6. *(a)* Apply the Gauss-Seidel method to solve the following equations : 7

$$28x + 4y - z = 32$$
$$x + 3y + 10z = 24$$
$$2x + 17y + 4z = 35$$

(b) Evaluate $f(3.8)$ from the following data : 5

x :	0	1	2	3	4
$f(x)$:	1	1.5	2.2	3.1	4.6

(c) Using Euler's Improved method, find a solution of the equation $\frac{dy}{dx} = y + x^2$ with initial condition $y = 1$ when $x = 0$ for the range $0 \le x \le 0.8$ in steps of 0.2. 8