Total number of printed pages–4

2017

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) Using Bisection Method find a real root
of $x^3 - 3x + 1.06 = 0$ to correct upto
three decimal places. 4

(b) Prove that $\dfrac{E-1}{E} = \Delta$, where E is shift

operator and Δ is forward difference
operator. 4

(c) Using Runge-Kutta Method of fourth

order, solve $\dfrac{dy}{dx} = xy + y^2$ with $y(0) = 1$

at $x = 0.1, 0.2, 0.3$. 12

Contd.

2. *(a)* Using Regula-Falsi Method find a real root of $x^3 - 4x - 9 = 0$ correct to three decimal places. 5

(b) Apply Lagrange's formula to find $f(5)$ from the following data : 7

x	:	1	2	3	4	7
$f(x)$	:	2	4	8	16	128

(c) Using Modified Euler Method, find y at $x = 0.1$ and $x = 0.2$ given that

$$\frac{dy}{dx} = y - \frac{2x}{y}, \quad y(0) = 1 \text{ with correct}$$

result upto four places of decimals. 8

3. *(a)* Using Newton-Raphson Method find a real root of $3\tan 3x = 3x + 1$ correct to fourth decimal places. 4

(b) Using Gauss-elimination method solve— 6

$$2x + y + 4z = 12$$

$$8x - 3y + 2z = 20$$

$$4x + 11y - z = 33$$

(c) Using Improve Euler Method, find a solution of the equation $\frac{dy}{dx} = y + x^2$ with initial condition $y = 1$ at $x = 0$ for the range $0 \le x \le 1$ in steps of 0·2.

10

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

4

(b) Compute $f(3·8)$ from the following data :

8

x	:	0	1	2	3	4
$f(x)$	:	1	1·5	2·2	3·1	4·3

(c) Compute $f'(0·1)$ from the following data :

8

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

5. (a) Using Gauss-Seidel Method, solve —

8

$$5x + 2y + z = 12$$
$$x + 4y + 2z = 15$$
$$x + 2y + 5z = 20$$

(b) Given the values 6

$$x \quad : \quad 5 \quad 7 \quad 11 \quad 13 \quad 17$$
$$f(x) \; : \; 150 \quad 392 \quad 1452 \quad 2366 \quad 5202$$

Evaluate $f(9)$

(c) Derive Newton's divided difference formula. 6

6. *(a)* Write the principle of least square method. Fit a second degree parabola $y = a + bx + cx^2$ to the following data :

1+9=10

$$x : \quad 1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6 \quad 7$$
$$y : \quad 1{\cdot}8 \quad 1{\cdot}3 \quad 2{\cdot}1 \quad 1{\cdot}2 \quad 1{\cdot}5 \quad 2{\cdot}5 \quad 6{\cdot}3$$

(b) Solve $\dfrac{dy}{dx} = \dfrac{1}{2}(1+x)y^2$ with $y(0) = 1$ at $x = 0{\cdot}2, 0{\cdot}4, 0{\cdot}6$ by Euler Method and hence find $y(0{\cdot}8)$ by Milne's Method.

10

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