PG/IIS/MCA-205/16

MCA 2nd Semester Examination, 2016

COMPUTER ORIENTED NUMERICAL METHODS

PAPER—MCA - 205

Full Marks : 100

Time : 3 hours

Answer any five questions

The figures in the right-hand margin indicate marks

Candidates are required to give their answers in their own words as far as practicable

Illustrate the answers wherever necessary

1. (*a*) What is interpolation ? Compute $f(0{\cdot}5)$ from the following table, using Newton's Forward difference interpolation formula : 7

x	0	1	2	3
$f(x)$	1	2	11	34

(*b*) Use the following table, to compute $f(1{\cdot}38)$: 7

x	1·1	1·2	1·3	1·4
$f(x)$	7·831	8·728	9·697	10·744

2. (*a*) Explain the Gauss-elimination method to solve a system of 3 linear equations in 3 unknowns. 7

(*b*) Solve the following system of equation

$$\begin{pmatrix} 8 & 1 & 1 \\ 2 & 4 & 1 \\ 1 & 3 & 5 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} = \begin{pmatrix} 8 \\ 4 \\ 5 \end{pmatrix}$$

by Gauss-Seidel iteration method correct to 3 decimal places. 7

3. (*a*) Explain the Newton-Raphson method for computing a real root of an equation $f(x) = 0$. When the method fails ? 7

(*b*) Solve the equation $x^3 - 9x + 1 = 0$ for the root lying between 2 and 3, by bisection method, correct to 3 significant figures. 7

4. (*a*) Compute the positive root of $x^3 - x - 0{\cdot}1 = 0$, by Newton-Raphson method, correct to six significant figure. 7

(*b*) Explain Regula-Falsi method for computing a simple real root of an equation $f(x) = 0$. 7

5. (*a*) Describe Trapezoidal rule by using Newton's Forward interpolation formula. Give its geometrical interpretation. Also write down 7-points composite rule. 10

(*b*) Calculate the value of

$$\int_0^1 \frac{x}{1+x}\,dx$$

correct up to three significant figures, taking six intervals by Simpson's one-third rule. 4

6. (*a*) Compute $y(0{\cdot}3)$, from the equation

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

taking $h = 0{\cdot}1$, by fourth order Runge-Kutta method, correct to five decimal places. 9

(*b*) Give geometrical interpretation of Newton -Raphson Method. 5

7. (*a*) Compute $y(z)$, if $y(x)$ satisfies the equation

$$\frac{dy}{dx} = \frac{1}{2}(x + y),$$

given that $y(0) = 2$, $y(0{\cdot}5) = 2{\cdot}636$, $y(1{\cdot}0) = 3{\cdot}595$ and $y(1{\cdot}5) = 4{\cdot}968$, using predictor-corrector method. 8

(*b*) Explain the method of bisection of computing a simple root of an equation $f(x) = 0$. 6

[*Internal Assessment* : 30 Marks]