This question paper contains 1 printed page.

Your Roll No.....

1741

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MCA / IV Sem.

Paper MCA – 407 – Numerical Computing

(Admissions of 2009 and onwards)

Time : 2 hours

Maximum Marks :50

Write your Roll No. on the top immediately on receipt of this question paper.
Attempt all questions. Use of Scientific Calculator is allowed.

1. Find the root of smallest magnitude of the following equation using a 4-digit decimal mantissa.

$$x^2 + 0.4002 \times 10^0 x + 0.8 \times 10^{-4} = 0$$ **(2)**

2. Use the Regula-Falsi or Secant method to find a root of the equation $\ln(1+x) - \cos(x) = 0$. Given that the real root lies between 0 and 1. **(6)**

3. Find the iterative formulas for finding the $\sqrt[5]{7}$ using Newton's method. **(6)**

4. Find the linear least squares approximation to $f(x) = e^x$ on [1,2]. Compare the error with the linear Taylor polynomials to $f(x) = e^x$ about the point $x_0 = 1.5$. **(6)**

5. Solve the following system of equations using the Gauss-Seidel method.

$$\begin{aligned} 2x - 3y + 20z &= 25 \\ 20x + y - 2z &= 17 \\ 3x + 20y - z &= -18 \end{aligned}$$ **(6)**

6. Approximate the following integration using the Gaussian quadrature for $n = 3$.

$$\int_0^{\pi/2} e^x \sin(x)\,dx$$ given $x = \pm 0.7746$ & 0 and weight 0.5556 & 0.8889 **(6)**

7. Using modified Euler's method; obtain the solution of the differential equation

$$\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$$

with the initial condition $y_0 = 1$ at $x_0 = 0$ for the range $0 \le x \le 0.2$ in steps of 0.1. **(6)**

8. Find the interpolating polynomial which takes the following values:

(-4,1245), (-1,33), (0,5), (2,9), (5,1345). **(6)**

9. Use the Rayleigh-Ritz method to approximate the solution of

$$\frac{d^2y}{dx^2} = 3x + 1, \qquad y(0) = 0, \qquad y(1) = 0,$$

Using a quadratic in x as the approximating function. **(6)**