TEZPUR UNIVERSITY
Assignment (Spring) 2018
MMS204: Numerical Analysis

Total Marks: 30

The figures in the right-hand margin indicate marks for the individual question.
All questions are compulsory.
Answers should be concise and entire answer to a question should be together. State assumptions wherever made.

1. Solve the equation $x^2 - 26x + 1 = 0$ considering five digit decimal machine using the standard quadratic formula for the roots. Given $\sqrt{168} \doteq 12.961$. Determine the relative errors in the computed roots. What were the relative errors for the data entering into the calculation? How many significant digits have been lost in the calculation? What is the reason for the loss? Suggest if possible remedial measures. **7**

2. Show that error in numerical quadrature can be expressed as $|R_n| \leq \frac{|C|}{(n+1)!} M_{n+1}$, where the symbols have their usual meanings. Clearly state the necessary assumptions. **8**

3. Consider the following system of equations. **8**

$$\begin{aligned} 5x_1 - 2x_2 - x_3 + x_4 &= 6 \\ -2x_1 + 4x_2 + x_3 &= 0 \\ x_1 + 2x_2 + 6x_3 - x_4 &= 6 \\ -x_1 + x_3 + 6x_4 &= -14 \end{aligned}$$

   The damped Jacobi method is given by $x^{(k+1)} = x^{(k)} + \omega D^{-1}(b - Ax^{(k)})$, where D is the diagonal matrix with ω the damping factor and the other symbols have their usual meanings. Write a c-programming to carry out 10 iterations with $\omega = 1/2$.

4. For a fixed-point iteration method $x_{n+1} = g(x_n)$ converging to the root α we have the formula $\lim_{n\to\infty} \frac{x_{n+1}-x_n}{x_n - x_{n-1}} = g'(\alpha)$, $x_0 = 1$. Take $g(x) = 1 + x - \frac{1}{5}x^2$ for which $\alpha = \sqrt{5}$. Write and run a program to use the above formula and find $g'(\sqrt{5})$ correct to four decimal places. **7**

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