National University of Computer and Emerging Sciences, Lahore Campus



Course:	Numerical Computing	Course Code:	CS 325
Program:	BS CS	Semester:	Fall 2020
Duration:	1.5 hours	Total Marks:	60
Paper Date:	November 23; 2020	Weight	20%
Section:	All	Page(s):	03
Exam:	Sessional - II	Instructors: Dr. Mubashir Qayyum, Iqra Yaqoot, M Shoaib	

Instruction/Notes:

Attempt All Questions.

Points (5)

Q1(A)

Find the minimum number of iterations needed by the bisection algorithm to approximate the root x = 3 of $x^3 - 6x^2 + 11x - 6 = 0$ with error tolerance 10^{-3} .

Note: Use general Form and Find the number of iterations only.

(B)

Points (5)

Develop Newton's method to compute the following:

- (a) $\ln(a)$ (natural log of a) (a > 0)
- (b) $arc\cos a$

(C)

Points (5)

(Applied) Consider the van der Walls equation of state:

$$\left(P + \frac{a}{V^2}\right)(V - b) = RT$$

Use Newton's method to compute the specific volume V of carbon dioxide at a temperature of $T=300^{\circ}\mathrm{K}$, given P=1 atom, R=0.082054 J (kg°K), a=3.592 Pa·m⁶/kg², $b=0.04267\mathrm{m}^2/\mathrm{kg}$.

Obtain the initial approximation V_0 from the ideal gas law: PV = RT.

(D)

Points (10)

Find third approximate positive root of the equation $x^3 - 4x - 9 = 0$ using fixed point iteration process.

PTO

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Find the solution by Gauss Jacobi's Method by taking TWO iterations with intial estimates $x^{(0)} = 0$ for the following linear system. Then use the obtained solution (Jacobi's solution after 2^{nd} Iteration) as an initial estimate, and perform ONE iteration of Gauss-Seidal Method for finding the approximate solution.

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

Q3(A)

Points (15)

Solve the system given in Question 2 using Doolittle Method.

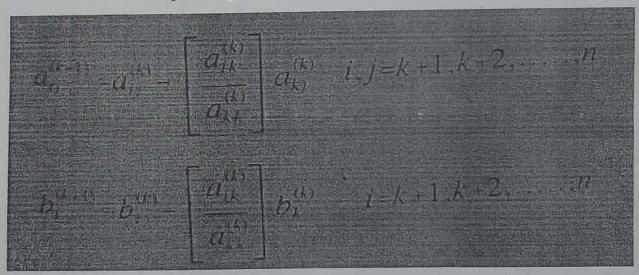
(B)

Points (10)

Solve the following system using Gauss Elimination with Partial Pivoting Method

$$\begin{bmatrix} 4 & 10 & 8 \\ 10 & 26 & 26 \\ 8 & 26 & 61 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 44 \\ 128 \\ 214 \end{bmatrix}$$

Note: If partial pivoting criterial fails at any step of elimination, then in such a step switch the criteria to total pivoting.



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