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Mahindra University Hyderabad

École Centrale School of Engineering

Minor-I exam

Program: B. Tech. Branch: AI, CAM, CE, CSE, ECM NT Year: II Semester: II

Subject: Numerical Methods (MA2208)

Date: 28/02/2024 Start Time: 10:00 AM

Time Duration: 1.5 Hours Max. Marks: 15

Instructions:

1) Answer all the questions.
2) All questions are self-explanatory; no clarification will be provided during the exam.
3) Use of non-programmable scientific calculator is allowed. However, sharing calculators during exams is strictly prohibited.

Question 1 (3 marks)

(a) Convert the IEEE 754 single-precision binary representation of a floating-point number, [1]

$$\boxed{0} \qquad \boxed{10000000} \qquad \boxed{10000000000000000000000}$$

to decimal.

(b) Find a fixed point of the function [1]

$$f(x) = x^2 - 4x + 6.$$

(Find the exact value without using any numerical methods.)

(c) Write a line of MATLAB code to generate 10 equally spaced points between -1 and 1. [1]

Question 2 (6 marks)

(a) Write the Newton-Raphson's procedure for finding $\sqrt[3]{N}$, where N is a real number. [3]

(b) Find the order of convergence of the following method to find $\sqrt{a}$ [3]

$$x_{n+1} = g(x_n) = \frac{x_n}{2}\left(3 - \frac{x_n^2}{a}\right).$$

Question 3 (6 marks)

Solve the following system of equations using Gaussian elimination with partial pivoting

$$\begin{bmatrix} 2 & 1 & 1 \\ 4 & -6 & 0 \\ -2 & 7 & 2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 7 \\ -8 \\ 18 \end{bmatrix}$$