MID-TERM EXAM

NOTES

(i) Students are allowed to use materials.

(ii) Students are only allowed to use calculators. It is not allowed to use calculation software such as MatLab, Maple, etc.

(iii) Let $\mathbf{m}$ and $\mathbf{n}$ be the two last digits of the student ID ($\mathbf{0 \leqslant m, n \leqslant 9}$). Put $\mathcal{M} = \dfrac{\mathbf{2m + n + 12}}{\mathbf{10}}$. For example, if the student ID is 1910273, then $m = 7$, $n = 3$ and $\mathcal{M} = \dfrac{2 \times 7 + 3 + 12}{10} = 2.9$

(iv) Send exam results to my email: **nan.thanh@lethai.vn**

(v) Exam time is 60 minutes. You have 10 minutes to send the email.

QUESTIONS

Question 1. Given the equation $f(x) = 2x^3 + \mathcal{M}\sqrt{x^3} - 11.3 = 0$ in the root-isolated interval $[1, 2]$. Use the Bisection method to find the approximated root x_7.

Question 2. Given the equation $f(x) = 2x^4 + 3\mathcal{M}x - 18 = 0$ in the root-isolated interval $[1, 2]$. Use the Newton method to find the approximated root x_2 and its error Δ_{x_2}.

Question 3. Given the matrix $A = \begin{bmatrix} 2\mathcal{M} & -2 & 3 \\ 5 & \mathcal{M} & -4 \\ 1 & -3 & 2\mathcal{M} \end{bmatrix}$. Use the Crout method to factorize $A = LU$. Find u_{23} and l_{33}.

Question 4. Given the matrix $A = \begin{bmatrix} 3\mathcal{M} & -1.7 & 1.3 \\ -1.7 & 3\mathcal{M} & 1.5 \\ 1.3 & 1.5 & 3\mathcal{M} \end{bmatrix}$. Use the Choleski method to factorize $A = CC^T$. Find c_{32} and c_{33}.

Question 5. Given the matrix $A = \begin{bmatrix} -2.3 & 2\mathcal{M} & 3.7 \\ -3\mathcal{M} & 3.5 & 2.8 \\ -3.5 & 4.1 & 2\mathcal{M} \end{bmatrix}$. Find the conditional number $k_\infty(A)$ of A with the l_∞-norm.

Question 6. Given the linear system: $\begin{cases} 5.4\mathcal{M}x_1 + 2.7x_2 = 11.3 \\ 2.9x_1 + 4.8\mathcal{M}x_2 = 15.7 \end{cases}$ Use the Jacobi method with $X^{(0)} = (0.3, 0.6)^T$ to find the approximated solution $X^{(2)}$ and its error. Use l_∞-norm.

Question 7. Given the linear system: $\begin{cases} 3.3\mathcal{M}x_1 - 2.1x_2 = 8.67 \\ 1.8x_1 + 3.1\mathcal{M}x_2 = 9.58 \end{cases}$ Use the Gauss-Seidel method with $X^{(0)} = (0.4, 0.5)^T$ to find the approximated solution $X^{(2)}$ and its error. Use l_∞-norm.

Question 8. Given the table:

x	1.0	1.3	1.7	2.0
y	2.51	$0.7\mathcal{M}$	2.89	$\mathcal{M}$

Use Lagrange's polynomial to approximate the value $y(1.48)$.

Question 9. Given the table:

x	1.0	1.3	1.6	1.9
y	2.17	$\mathcal{M}$	3.87	A

If $N(x)$ is the forward Newton polynomial, then find A such that $N(1.5) = \mathcal{M}$.

Question 10. Given the table:

x	2.0	2.3	2.5
y	1.45	$\mathcal{M}$	2.78

. Use the natural cubic spline to approximate $y(1.12)$ and $y(2.39)$.
