Holistic Numerical Methods Institute
committed to bringing numerical methods to undergraduates

Multiple Choice Test

Gaussian Elimination

1. The goal of forward elimination steps in Naïve Gauss elimination method is to reduce the coefficient matrix to a (an) _____________ matrix.
   (A) diagonal
   (B) identity
   (C) lower triangular
   (D) upper triangular

2. Division by zero during forward elimination steps in Naïve Gaussian elimination of the set of equations [A][X]=[C] implies the coefficient matrix [A] is
   (A) invertible
   (B) nonsingular
   (C) not determinable to be singular or nonsingular
   (D) singular

3. Using a computer with four significant digits with chopping, Naïve Gauss elimination solution to

$$0.0030x_1 + 55.23x_2 = 58.12$$
$$6.239x_1 - 7.123x_2 = 47.23$$

is
   (A) $x_1 = 26.66$; $x_2 = 1.051$
   (B) $x_1 = 8.769$; $x_2 = 1.051$
   (C) $x_1 = 8.800$; $x_2 = 1.000$
   (D) $x_1 = 8.771$; $x_2 = 1.052$

4. Using a computer with four significant digits with chopping, Gaussian elimination with partial pivoting solution to

$$0.0030x_1 + 55.23x_2 = 58.12$$
$$6.239x_1 - 7.123x_2 = 47.23$$

is
   (A) $x_1 = 26.66$; $x_2 = 1.051$
   (B) $x_1 = 8.769$; $x_2 = 1.051$
   (C) $x_1 = 8.800$; $x_2 = 1.000$
   (D) $x_1 = 8.771$; $x_2 = 1.052$

5. At the end of forward elimination steps of Naïve Gauss Elimination method on the following equations

$$\begin{bmatrix} 4.2857\times10^{7} & -9.2307\times10^{5} & 0 & 0 \\ 4.2857\times10^{7} & -5.4619\times10^{5} & -4.2857\times10^{7} & 5.4619\times10^{5} \\ -6.5 & -0.15384 & 6.5 & 0.15384 \\ 0 & 0 & 4.2857\times10^{7} & -3.6057\times10^{5} \end{bmatrix} \begin{bmatrix} c_1 \\ c_2 \\ c_3 \\ c_4 \end{bmatrix} = \begin{bmatrix} -7.887\times10^{3} \\ 0 \\ 0.007 \\ 0 \end{bmatrix}$$

the resulting equations in the matrix form are given by

$$\begin{bmatrix} 4.2857\times10^{7} & -9.2307\times10^{5} & 0 & 0 \\ 0 & 3.7688\times10^{5} & -4.2857\times10^{7} & 5.4619\times10^{5} \\ 0 & 0 & -26.9140 & 0.579684 \\ 0 & 0 & 0 & 5.62500\times10^{5} \end{bmatrix} \begin{bmatrix} c_1 \\ c_2 \\ c_3 \\ c_4 \end{bmatrix} = \begin{bmatrix} -7.887\times10^{3} \\ 7.887\times10^{3} \\ 1.19530\times10^{-2} \\ 1.90336\times10^{4} \end{bmatrix}$$

The determinant of the original coefficient matrix is

(A) 0.00

(B) 4.2857×10^{7}

(C) 5.486×10^{19}

(D) -2.445×10^{20}

6. The following data is given for the velocity of the rocket as a function of time. To find the velocity at t=21 s, you are asked to use a quadratic polynomial, $v(t)=at^2+bt+c$ to approximate the velocity profile.

t	*(s)*	0	14	15	20	30	35
v(t)	*m/s*	0	227.04	362.78	517.35	602.97	901.67

The correct set of equations that will find *a*, *b* and *c* are

(A) $$\begin{bmatrix} 176 & 14 & 1 \\ 225 & 15 & 1 \\ 400 & 20 & 1 \end{bmatrix} \begin{bmatrix} a \\ b \\ c \end{bmatrix} = \begin{bmatrix} 227.04 \\ 362.78 \\ 517.35 \end{bmatrix}$$

(B) $$\begin{bmatrix} 225 & 15 & 1 \\ 400 & 20 & 1 \\ 900 & 30 & 1 \end{bmatrix} \begin{bmatrix} a \\ b \\ c \end{bmatrix} = \begin{bmatrix} 362.78 \\ 517.35 \\ 602.97 \end{bmatrix}$$

(C) $$\begin{bmatrix} 0 & 0 & 1 \\ 225 & 15 & 1 \\ 400 & 20 & 1 \end{bmatrix} \begin{bmatrix} a \\ b \\ c \end{bmatrix} = \begin{bmatrix} 0 \\ 362.78 \\ 517.35 \end{bmatrix}$$

(D) $$\begin{bmatrix} 400 & 20 & 1 \\ 900 & 30 & 1 \\ 1225 & 35 & 1 \end{bmatrix} \begin{bmatrix} a \\ b \\ c \end{bmatrix} = \begin{bmatrix} 517.35 \\ 602.97 \\ 901.67 \end{bmatrix}$$