NPTEL Online Certification

COMPUTATIONAL HYDRAULICS
Week 6 : Assignment
July 24-October 13, 2017

NOTE: Attempt **ALL** questions. Make suitable assumptions, wherever necessary.

1. In Scilab, use *ludcomp.sci* to solve the following problem

$$\begin{pmatrix} 10 & 13 & 11 & -9 & 2 \\ 1 & 4 & -7 & 1 & 13 \\ 0 & 3 & -5 & -7 & 9 \\ 1 & 2 & -3 & 4 & 5 \\ 5 & 1 & 3 & -2 & 1 \end{pmatrix} \begin{Bmatrix} \phi_1 \\ \phi_2 \\ \phi_3 \\ \phi_4 \\ \phi_5 \end{Bmatrix} = \begin{Bmatrix} 43 \\ 57 \\ 8 \\ 37 \\ 13 \end{Bmatrix}$$

The value of ϕ_3 term of the inverse matrix is

- **3**

2. In Scilab, use *ludcomp.sci* to solve the following problem

$$\mathbf{A} = \begin{pmatrix} 10 & 2 & 3 & 5 \\ 6 & 12 & 8 & 9 \\ 10 & 11 & 13 & 13 \\ 14 & 15 & 16 & 15 \end{pmatrix} \begin{Bmatrix} \phi_1 \\ \phi_2 \\ \phi_3 \\ \phi_4 \end{Bmatrix} = \begin{Bmatrix} 43 \\ 90 \\ 123 \\ 152 \end{Bmatrix}$$

The value of ϕ_2 term of the inverse matrix is

- **2**

3. In Scilab, use *jacobi.sci* to solve the following problem

$$\begin{pmatrix} 10 & 13 & 11 & -9 & 2 \\ 5 & 1 & 3 & -2 & 1 \\ 1 & 4 & -7 & 1 & 13 \\ 0 & 3 & -5 & -7 & 9 \\ 1 & 2 & -3 & 4 & 5 \end{pmatrix} \begin{Bmatrix} \phi_1 \\ \phi_2 \\ \phi_3 \\ \phi_4 \\ \phi_5 \end{Bmatrix} = \begin{Bmatrix} 43 \\ 13 \\ 57 \\ 8 \\ 37 \end{Bmatrix}$$

Starting from initial value 1 The value of ϕ_3 term of the inverse matrix is

- **NaN or Inf**

4. In Scilab, use *gseidel.sci* to solve the following problem

$$\begin{pmatrix} 10 & 13 & 11 & -9 & 2 \\ 5 & 1 & 3 & -2 & 1 \\ 1 & 4 & -7 & 1 & 13 \\ 0 & 3 & -5 & -7 & 9 \\ 1 & 2 & -3 & 4 & 5 \end{pmatrix} \begin{Bmatrix} \phi_1 \\ \phi_2 \\ \phi_3 \\ \phi_4 \\ \phi_5 \end{Bmatrix} = \begin{Bmatrix} 43 \\ 13 \\ 57 \\ 8 \\ 37 \end{Bmatrix}$$

Starting from initial value 1 The value of ϕ_3 term of the inverse matrix is

- **NaN or Inf**

CONTINUED

5. In Scilab, use *tdma.sci* to solve the following problem

$$\begin{pmatrix} 1 & 1 & 0 & 0 & 0 & 0 \\ 5 & 1 & 2 & 0 & 0 & 0 \\ 0 & 4 & 1 & 3 & 0 & 0 \\ 0 & 0 & 3 & 1 & 4 & 0 \\ 0 & 0 & 0 & 2 & 1 & 5 \\ 0 & 0 & 0 & 0 & 1 & 1 \end{pmatrix} \begin{Bmatrix} \phi_1 \\ \phi_2 \\ \phi_3 \\ \phi_4 \\ \phi_5 \\ \phi_6 \end{Bmatrix} = \begin{Bmatrix} 11 \\ 43 \\ 33 \\ 23 \\ 13 \\ 3 \end{Bmatrix}$$

The value of ϕ_3 term of the inverse matrix is

- **NaN or Inf**

6. In Scilab, use *tdma.sci* to solve the following problem

$$\begin{pmatrix} 10 & 1 & 0 & 0 & 0 & 0 \\ 5 & 10 & 2 & 0 & 0 & 0 \\ 0 & 4 & 10 & 3 & 0 & 0 \\ 0 & 0 & 3 & 10 & 4 & 0 \\ 0 & 0 & 0 & 2 & 10 & 5 \\ 0 & 0 & 0 & 0 & 1 & 10 \end{pmatrix} \begin{Bmatrix} \phi_1 \\ \phi_2 \\ \phi_3 \\ \phi_4 \\ \phi_5 \\ \phi_6 \end{Bmatrix} = \begin{Bmatrix} 65 \\ 88 \\ 69 \\ 50 \\ 31 \\ 12 \end{Bmatrix}$$

The value of ϕ_3 term of the inverse matrix is

- **4**

7. In Scilab, use *newton_raphson.sci* to solve the following problem

$$\begin{pmatrix} \phi_1 & \phi_2 & \phi_3 \\ \phi_1 & \phi_2 & -1 \\ 1 & 1 & 1 \end{pmatrix} \begin{Bmatrix} \phi_1 \\ \phi_2 \\ \phi_3 \end{Bmatrix} = \begin{Bmatrix} 3 \\ 1 \\ 3 \end{Bmatrix}$$

The value of ϕ_3 term of the inverse matrix is

- **NaN or Inf**

8. In Scilab, use *newton_raphson.sci* to solve the following problem

$$\begin{pmatrix} \phi_1 & \phi_2 \\ \phi_1 & -1 \end{pmatrix} \begin{Bmatrix} \phi_1 \\ \phi_2 \end{Bmatrix} = \begin{Bmatrix} 5 \\ -1 \end{Bmatrix}$$

The value of ϕ_1 term of the inverse matrix is

- **1**

9. In Scilab, use *gseidel.sci* to solve the following problem

$$\begin{pmatrix} 16 & 3 \\ 7 & -11 \end{pmatrix} \begin{Bmatrix} \phi_1 \\ \phi_2 \end{Bmatrix} = \begin{Bmatrix} 11 \\ 13 \end{Bmatrix}$$

Starting from initial value 0. If the relaxation factor is 0.5, then number of iterations required in Gauss-Seidel-SOR method is

- **more than that required for Gauss-Seidel approach**
- **less than that required for Gauss-Seidel-SOR approach with relaxation factor 0.25**

10. Full matrix approach can not be solved using

- **triadiagonal matrix algorithm**