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NPTEL

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Courses » Introduction to Finite Volume Methods II

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Unit 2 - Week 1 - Linear solvers

Register for Certification exam

Course outline

How to access the portal

Week 1 - Linear solvers

- Linear solvers-I
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- Linear solvers-V
- Quiz : Assignment 1
- Solution for Assignment 1

Week 2 - Linear solvers + Convection term discretisation

Week 3 - Convection term discretisation

week 4 - Convection term discritisation +

Assignment 1

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment.

Due on 2019-02-13, 23:59 IST.

1) Consider a linear system of algebraic equation **Ax=b**, where *1 point*

$$A=\begin{bmatrix} 4 & -4 & -1 & 4 & 11 \\ 2 & -5 & -2 & 2 & -1 \\ 1 & 2 & 3 & 4 & 5 \\ 1 & 2 & 1 & 0 & 4 \\ 2 & -3 & -1 & 2 & 3 \end{bmatrix} \text{ and } b=\begin{bmatrix} 4 \\ 9 \\ 50 \\ -5 \\ 4 \end{bmatrix}$$

While using Gauss elimination method, what is the value of vector **b** after forward elimination step?

- $\begin{bmatrix} 4 \\ 9 \\ 50 \\ -5 \\ 4 \end{bmatrix}$
- $\begin{bmatrix} 4 \\ 7 \\ 56 \\ 9 \\ -1/3 \end{bmatrix}$
- $\begin{bmatrix} 4 \\ -7 \\ 50 \\ -9 \\ 1/3 \end{bmatrix}$

$$\begin{bmatrix} 4 \\ 7 \\ -50 \\ 9 \\ -1/2 \end{bmatrix}$$

No, the answer is incorrect.
Score: 0

Accepted Answers:

$$\begin{bmatrix} 4 \\ 7 \\ 56 \\ 9 \\ -1/3 \end{bmatrix}$$

2) In **Q1**, solve for **x** using Gauss elimination method. ***1 point***

$$\begin{bmatrix} 0 \\ -44 \\ 79 \\ -26 \\ 1 \end{bmatrix}$$

$$\begin{bmatrix} 4 \\ 7 \\ 56 \\ 9 \\ -1/3 \end{bmatrix}$$

$$\begin{bmatrix} 0 \\ 44 \\ 79 \\ 26 \\ 1 \end{bmatrix}$$

$$\begin{bmatrix} 4 \\ -7 \\ 50 \\ -9 \\ 1/3 \end{bmatrix}$$

No, the answer is incorrect.
Score: 0

Accepted Answers:

$$\begin{bmatrix} 0 \\ -44 \\ 79 \\ -26 \\ 1 \end{bmatrix}$$

3) In **Q1**, after performing LU decomposition, **A = LU**, **U** = ? ***1 point***

$$\begin{bmatrix} 4 & -4 & -1 & 4 & 11 \\ 0 & -3 & -3/2 & 0 & -13/2 \\ 0 & 0 & 7/4 & 3 & -17/4 \\ 0 & 0 & 0 & -4/7 & -41/7 \\ 0 & 0 & 0 & 0 & -1/3 \end{bmatrix}$$

$$\begin{bmatrix} 4 & -4 & -1 & 4 & 11 \\ 0 & 3 & 3/2 & 0 & 13/2 \\ 0 & 0 & 7/4 & 3 & -17/4 \\ 0 & 0 & 0 & 4/7 & 41/7 \\ 0 & 0 & 0 & 0 & -1/3 \end{bmatrix}$$

$$\begin{bmatrix} 4 & -4 & -1 & 4 & 11 \\ 0 & -3 & -3/2 & 0 & -13/2 \\ 0 & 0 & -7/4 & -3 & 17/4 \\ 0 & 0 & 0 & -4/7 & -41/7 \\ 0 & 0 & 0 & 0 & 1/3 \end{bmatrix}$$

$$\begin{bmatrix} 4 & -4 & -1 & 4 & 11 \\ 0 & 3 & 3/2 & 0 & 13/2 \\ 0 & 0 & 7/4 & 3 & -17/4 \\ 0 & 0 & 0 & 4/7 & 41/7 \\ 0 & 0 & 0 & 0 & 1/3 \end{bmatrix}$$

No, the answer is incorrect.
Score: 0

Accepted Answers:

$$\begin{bmatrix} 4 & -4 & -1 & 4 & 11 \\ 0 & -3 & -3/2 & 0 & -13/2 \\ 0 & 0 & 7/4 & 3 & -17/4 \\ 0 & 0 & 0 & -4/7 & -41/7 \\ 0 & 0 & 0 & 0 & -1/3 \end{bmatrix}$$

4) From **Q3**, find **L** = ? ***1 point***

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 1/2 & 1 & 0 & 0 & 0 \\ 1/4 & 1 & 1 & 0 & 0 \\ 1/4 & 1 & 1/7 & 1 & 0 \\ 1/2 & -1/3 & 0 & 0 & 1 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 1/2 & 1 & 0 & 0 & 0 \\ 1/4 & -1 & 1 & 0 & 0 \\ 1/4 & -1 & -1/7 & 1 & 0 \\ 1/2 & 1/3 & 0 & 0 & 1 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 1/2 & 1 & 0 & 0 & 0 \\ 1/4 & 1 & 1 & 0 & 0 \\ 1/4 & 1 & -1/7 & 1 & 0 \\ 1/2 & -1/3 & 0 & 0 & 1 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ -1/2 & 1 & 0 & 0 & 0 \\ -1/4 & 1 & 1 & 0 & 0 \\ -1/4 & 1 & 1/7 & 1 & 0 \\ -1/2 & -1/3 & 0 & 0 & 1 \end{bmatrix}$$

No, the answer is incorrect.
Score: 0

Accepted Answers:

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 1/2 & 1 & 0 & 0 & 0 \\ 1/4 & -1 & 1 & 0 & 0 \\ 1/4 & -1 & -1/7 & 1 & 0 \\ 1/2 & 1/3 & 0 & 0 & 1 \end{bmatrix}$$

5) In **Q1**, if we solve **Ax=b** using **LU** decomposition such that, **Ux=y** and **Ly=b**, find **y**=? ***1 point***

$$\begin{bmatrix} 4 \\ 9 \\ 50 \\ -5 \\ 4 \end{bmatrix}$$

$$\begin{bmatrix} 4 \\ 7 \\ 56 \\ 9 \\ -1/3 \end{bmatrix}$$

$$\begin{bmatrix} 4 \\ -7 \\ 50 \\ -9 \\ 1/3 \end{bmatrix}$$

$$\begin{bmatrix} 4 \\ 7 \\ -50 \\ 9 \\ -1/2 \end{bmatrix}$$

No, the answer is incorrect.
Score: 0

Accepted Answers:

$$\begin{bmatrix} 4 \\ 7 \\ 56 \\ 9 \\ -1/3 \end{bmatrix}$$

6) In **Q5**, find **x** = ? ***1 point***

- $\begin{bmatrix} 0 \\ -44 \\ 79 \\ -26 \\ 1 \end{bmatrix}$
- $\begin{bmatrix} 4 \\ 7 \\ 56 \\ 9 \\ -1/3 \end{bmatrix}$
- $\begin{bmatrix} 0 \\ 44 \\ 79 \\ 26 \\ 1 \end{bmatrix}$
- $\begin{bmatrix} 4 \\ -7 \\ 50 \\ -9 \\ 1/3 \end{bmatrix}$

No, the answer is incorrect.
Score: 0

Accepted Answers:

$$\begin{bmatrix} 0 \\ -44 \\ 79 \\ -26 \\ 1 \end{bmatrix}$$

7) How are x obtained in **Q6** and **Q2** related? ***1 point***

- Same
- Same in this case but may be different
- Different
- Can't say

No, the answer is incorrect.
Score: 0

Accepted Answers:
Same

8) How are **b** obtained from **Q1** after forward elimination and **y** obtained from **Q5** related? ***1 point***

- Same
- Same in this case but may be different
- Different
- Can't say

No, the answer is incorrect.
Score: 0

Accepted Answers:
Same

9) What is the advantage of using LU decomposition over Gauss elimination method? ***1 point***

- No advantage
- Cost of computation is less for solving single system of equations
- Cost of computation is less for solving multiple system of equations with same **A** but different **b**'s
- Cost of computation is less for solving multiple system of equations with different **A**'s and **b**'s

No, the answer is incorrect.
Score: 0

Accepted Answers:
*Cost of computation is less for solving multiple system of equations with same **A** but different **b**'s*

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