**Week 8 Assignment 8**

The due date for submitting this assignment has passed. **Due on 2018-09-26, 23:59 IST**

As per our records you have not submitted this assignment.

1) Consider the linear equation \( Ax = b \). Let us express \( A = L + D + U \), where \( L \) is a lower triangular matrix, \( D \) is a diagonal matrix and \( U \) is an upper triangular matrix. All diagonal elements of \( L \) and \( U \) matrices are zero. Using Gauss-Seidel method, one can write
\[
 x^{i+1} = Mx^i + C
\]

Choose the correct expressions for \( M \) and \( C \)
(a) \( M = -D^{-1}(L+U) \), \( C = D^{-1}b \)
(b) \( M = D^{-1}(L+U) \), \( C = D^{-1}b \)
(c) \( M = -(D+L)^{-1}U \), \( C = (D+L)^{-1}b \)
(d) \( M = (D+L)^{-1}U \), \( C = (D+L)^{-1}b \)

- a
- b
- c
- d

No, the answer is incorrect.

Score: 0

Accepted Answers:

2) Scarborough criteria for sufficient condition of convergence in Gauss-Seidel method is

(a) \( \sum_{i=1}^{n} \frac{|a_{ib}|}{a_{ii}} \leq 1 \): for all equations, where symbols have usual meaning

(b) \( \sum_{i=1}^{n} \frac{|a_{ib}|}{a_{ii}} < 1 \): at least for one equation, where symbols have usual meaning

(c) \( \sum_{i=1}^{n} \frac{|a_{ib}|}{a_{ii}} \geq 1 \): for all equations, where symbols have usual meaning

(d) \( \sum_{i=1}^{n} \frac{|a_{ib}|}{a_{ii}} > 1 \): at least for one equation, where symbols have usual meaning
No, the answer is incorrect.
Score: 0
Accepted Answers:
a
3) Using iterative method, one can write
\[ x^{n+1} - Mx^n + C \]
Choose the correct statement
(a) To achieve a high rate of convergence, spectral radius of convergence should be small as possible.
(b) To achieve a high rate of convergence, spectral radius of convergence should be.
(c) Sufficient condition for convergence is \( \max(\|M\|_r, \|M\|_c) > 1 \), where the symbols have usual meaning.
(d) Sufficient condition for convergence is \( \min(\|M\|_r, \|M\|_c) < 1 \), where the symbols have usual meaning.

No, the answer is incorrect.
Score: 0
Accepted Answers:
a
4) Consider the following two set of equations
Set 1
\[ x_1 + x_2 + x_3 = 3 \]
\[ 2x_1 + 3x_2 + 4x_3 = 9 \]
\[ x_1 + 7x_2 + x_3 = 9 \]
Set 2
\[ 5x_1 - 2x_2 + 3x_2 = -1 \]
\[ -3x_1 + 9x_2 + x_3 = 2 \]
\[ 2x_1 - x_2 - 7x_3 = 3 \]
Choose the correct statement:
(a) Gauss Seidel method can be applied to both set of equations
(b) Gauss Seidel method can not be applied to both set of equations.
(c) Gauss Seidel method can be applied to Set 1, while it cannot be applied to set 2.
(d) Gauss Seidel method cannot be applied to Set 1, while it can be applied to set 2.

No, the answer is incorrect.
Score: 0
5) For the solution of a system of linear algebraic equations, the convergence criterion for the residuals is set to $10^{-9}$. If the spectral radius of convergence is 0.9, the number of iterations using Gauss–Seidel iterative method should be greater than

(a) 55  
(b) 112  
(c) 197  
(d) 154

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
c

6) Consider the following set of equations

\[ 3x_1 + 7x_2 + 13x_3 = 76 \]
\[ x_1 + 5x_2 + 3x_3 = 28 \]
\[ 12x_1 + 3x_2 - 5x_3 = 1 \]

For getting solution, one has applied Gauss-Seidel method. State which of these statements are correct.

(a) It is not possible to apply Gauss-Seidel method for getting solution  
(b) The solution will not converge since the coefficient matrix is not diagonally dominant  
(c) The solution will converge since the equations can be rewritten to make the coefficient matrix diagonally dominant  
(d) The solution will converge since coefficient matrix in the current form is diagonally dominant

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
c
7) Consider the following set of equations

\[\begin{align*}
2x_1 + 3x_2 + 10x_3 &= 10 \\
5x_1 - 2x_2 + 2x_3 &= 5 \\
x_1 + 10x_2 + 5x_3 &= 6
\end{align*}\]

For getting solution, one has applied Gauss Seidel method. The number of iterations to get six decimal accuracy should be greater than

(a) 35
(b) 62
(c) 26
(d) 53

[Multiple choice options]

**No, the answer is incorrect.**

Score: 0

Accepted Answers:

b

8) Consider the following statement regarding the characteristics of a matrix.

(i) A matrix \( C \) is said to be symmetric if \( C = C^T \). (\( C^T \) is the transpose of \( C \))

(ii) A matrix \( C \) is said to be positive definite if \( C = C^T \).

(iii) A matrix \( C \) is said to be symmetric if \( v^T C v > 0 \), where \( v \) is an arbitrary vector.

(iv) A matrix \( C \) is said to be positive definite if \( v^T C v > 0 \), where \( v \) is an arbitrary vector.

Which of the above statements are correct?

(a) (i) only
(b) (ii) only
(c) (i) and (iv)
(d) (ii) and (iii)

[Multiple choice options]

**No, the answer is incorrect.**

Score: 0

Accepted Answers:

c

9)
An analyzer tries to apply the gradient search based methods for solving the systems $Ax=b$. Consider the following statements:

(i) Gradient search method can be applied provided that $A$ is symmetric only
(ii) Gradient search method can be applied provided that $A$ is positive definite only
(iii) Gradient search method can be applied provided that $A$ is positive definite and symmetric
(iv) Gradient search method can be applied provided that all the eigen values of $A$ are negative

Which of the above statements are correct?
(a) (i) and (iv)
(b) (ii) and (iv)
(c) (iii)
(d) (i), (ii) and (iv)

No, the answer is incorrect.
Score: 0
Accepted Answers: 

10)

One has applied Steepest Descent method for solving $Ax=b$. The iteration equation is written as

$$x^n = x^{n-1} + \alpha_n r_{n-1}$$

where $r_{n-1}$ is the residual at $(n-1)^{th}$ iteration and is given by $r_{n-1} = b - Ax_{n-1}$. Choose the correct expression for $\alpha_{n-1}$

(a) $\alpha_{n-1} = \frac{r_{n-1}^T r_{n-1}}{r_{n-1}^T A r_{n-1}}$
(b) $\alpha_{n-1} = \frac{r_{n-1}^T A r_{n-1}}{r_{n-1}^T r_{n-1}}$
(c) $\alpha_{n-1} = \frac{r_{n-1}^T r_{n-1}}{A^T r_{n-1} A}$
(d) $\alpha_{n-1} = \frac{A^T r_{n-1} A}{r_{n-1}^T r_{n-1}}$

No, the answer is incorrect.
Score: 0
Accepted Answers: 

a