PYTHON WORKING QUESTIONS 02

1 . Write a NumPy program to compute the sum of the diagonal element of a given matrix.

$$\begin{bmatrix} 25 & 18 & 24 \\ 40 & 29 & 40 \\ 44 & 32 & 45 \end{bmatrix}$$

2 . Divide 5 by an infinite number

3 . Write a NumPy program to create a random vector of size 10. (use random function)

4 . Write a NumPy program to create a random int vector of size 10 and sort it.

5 . Convert the value of txt to lower case.

txt='Hello World'

6 . Reverse the given tuple

T=10,20,30,40,50 #Python code

7 . Check if all items in the tuple are the same

8 . Consider the following system of equations. Solve the system by using Gauss Elimination, Jacobi, and Gauss-Seidel methods and compare the results. Determine whether the system of linear equations has a solution or not.

2x - y + z = 8

-3x - y + 2z = -11

-2x + 3y + 2z = 3

9 . Consider a linear system with a highly ill-conditioned coefficient matrix. Which method, Gaussian elimination or iterative methods, is more suitable for solving such systems, and why?

10 . Consider the following system of equations. Solve the system by using Gauss Elimination, Jacobi, and Gauss-Seidel methods and compare the results. Determine whether the system of linear equations has a solution or not.

$$\begin{aligned} 2x &- 3y &+ z &= 16 \\ 4x &+ y &- z &= 6 \\ -2x &- 2y &+ 3z &= 10 \end{aligned}$$

11 . Using Bisection method find the root of cos(x) – x e^x = 0 with a = 0 and b = 1.

a) 0.617
b) 0.527
c) 0.517
d) 0.717

12 . Find the approximated value of x till 4 iterations for e^{-x} = 3 log(x) using Bisection Method.

a) 1.197
b) 1.187
c) 1.167
d) 1.176

13 . Apply Gauss Elimination method to solve the following equations.

x + 4y – z = -5
x + y – 6z = -12

$3x - y - z = 4$

a) x = 1.6479, y = -1.1408, z = 2.0845
b) x = 4.0461, y = -1.1408, z = 3.254
c) x = 7.2478, y = -2.586, z = 8.265
d) x = 2.8471, y = 5.5123, z = 2.0845

14 . The rate of convergence of the Newton-Raphson method is generally _____
a) Linear
b) Quadratic
c) Super-linear
d) Cubic

15 . The Newton-Raphson method fails if _____
a) $f'(x_0)=0$
b) $f''(x_0)=0$
c) $f(x_0)=0$
d) $f'''(x_0)=0$

16 . The equation f(x) is given as $x^2-4=0$. Considering the initial approximation at x=6 then the value of the next approximation corrects up to 2 decimal places is given as _____ by the Newton-Raphson method
a) 3.33
b) 1.33
c) 2.33
d) 4.33

17 . Secant method converges faster than Bisection method.
a) True
b) False

18 . A quadratic equation $x^2-4x+4=0$ is defined with an initial guess of 3 and 2.5. Find the approximated value of the root using Secant Method.
a) 1.33
b) 2.33
c) 3.33
d) 4.33

19 . A quadratic equation $x^4-x-8=0$ is defined with an initial guess of 1 and 2. Find the approximated value of x2 using Secant Method.
a) 7.538
b) 7.853
c) 7.358
d) 1.571

20 . 1.01x + 2y=2.01 and x + 2y = 2 is a well-conditioned set of linear equations.
a) True
b) False

21 . The Jacobi's method is a method of solving a matrix equation on a matrix that has no zeros along its main diagonal.
a) True
b) False

22 . Solve the system of equations by Jacobi's iteration method.

$10x + y - z = 11.19$

x + 10y + z = 28.08
-x + y + 10z = 35.61
correct to two decimal places.
a) x = 1.00, y = 2.95, z = 3.85
b) x = 1.96, y = 2.63, z = 3.99
c) x = 1.58, y = 2.70, z = 3.00
d) x = 1.23, y = 2.34, z = 3.45

23 . Which of the following statements are true?

I. A problem is ill-conditioned if its solution is highly sensitive to changes in its data.

II. We can improve the conditioning of a problem by switching from single to double-precision arithmetic.

III. In order to solve a problem numerically, it is necessary to have both a well-conditioned problem and a stable algorithm.

(a) I only (b) II only (c) I and III only (d) II and III only (e) I, II and III

OTHER QUESTIONS

TEST Perform one step of Jacobi's method method with starting guess $\begin{pmatrix} -2 \\ 1 \end{pmatrix}$ for the system of linear equations

$$\begin{aligned} 3x &+ y &&= 4 \\ 2x &+ 4y &&= -4 \end{aligned}$$

Take the result and perform one step of the Gauss-Seidel method.

TEST Consider the system of linear equations

$$\begin{aligned} 9x &+ 2y &&= 7 \\ 8x &+ 4y &&= 4 \end{aligned}$$

(a) Set up Jacobi iteration with initial guess $x = 0, y = 0$ and perform two steps of iteration.

(b) Set up Gauss-Seidel iteration with initial guess $x = 0, y = 0$ and perform two steps of iteration.

TEST Given $\begin{bmatrix} 2 & 4 \\ 6 & 1 \end{bmatrix} x = \begin{bmatrix} 6 \\ 7 \end{bmatrix}$, with initial guess $\begin{bmatrix} 0 \\ 0 \end{bmatrix}$

(a) Find the first two iterates of a converging Jacobi iteration.

(b) Find the first two iterates of a converging Gauss-Seidel iteration.