

Question Bank-Unit 1

Numerical Methods: MATH2300

B.Tech, III Sem

(Non-linear equations and system of linear equations)

S. No.	Questions	CO	Bloom's Taxonomy Level	Difficulty Level	Competitive Examination Question Y/N	Area	Topic
1	Define Inherent error with example	CO1	K1	L	N	Errors	Types of error
2	Define round off error with example	CO1	K1	M	N	Errors	Types of error
3	Define truncation error with example	CO1	K1	M	N	Errors	Types of error
4	Define absolute error	CO1	K1	M	N	Errors	Types of error
5	Define relative error	CO1	K1	M	N	Errors	Types of error
6	Define percentage error	CO1	K1	L	N	Errors	Types of error
7	Round off the number 3.6252782 up to 3 decimal places	CO1	K2	M	N	Errors	Accuracy of numbers
8	How many significant digits in the number 35.00537	CO1	K1	M	N	Errors	Accuracy of numbers
9	The number 56.487262 is correct up to three decimal places then maximum absolute error is.....	CO1	K2	L	N	Errors	Accuracy of numbers
10	Let $f(x, y)$ be a function of x and y , write the formula for maximum absolute error in the function	CO1	K1	L	N	Errors	Error in the approximation of a function
11	Distinguish between round off errors and truncation errors.	CO1	K2	M	N	Errors	Types of error
12	A root of the equation $f(x) = 0$ is that value of x where the graph of the function $y = f(x)$ the x -axis.	CO1	K2	M	N	Non-linear equations	Basic properties of equation
13	What is a transcendental equation? Elaborate with suitable examples.	CO1	K1	L	N	Non-linear equations	Basic properties of equation
14	Differentiate between polynomial and transcendental equations by giving two examples of each.	CO1	K2	M	N	Non-linear equations	Basic properties of equation

15	State the Intermediate Value Theorem. Where do we apply the theorem in our course?	C01	K1	L	N	Non-linear equations	Basic properties of equation
16	Explain the basic principle of root finding by Bisection method.	C01	K2	M	N	Non-linear equations	Bisection method
17	Find the number of iterations required in finding the root of a equation $f(x) = 0$ by Bisection method for achieving an accuracy ε .	C01	K1	M	N	Non-linear equations	Bisection method
18	Find the interval in which a real root of $x^3 - 2x - 5 = 0$ lies.	C01	K3	L	N	Non-linear equations	Basic properties of equation
19	Write the iteration methods in the descending order of their order of convergence: Newton- Raphson method, Regula- Falsi method, Secant method.	C01	K2	L	N	Non-linear equations	Convergence of iterative methods
20	Write condition of convergence of Newton-Raphson method.	C01	K2	M	N	Non-linear equations	Convergence of iterative methods
21	Under what condition secant method fails to converge to a solution.	C01	K2	M	N	Non-linear equations	Secant method
22	Give the geometrical interpretation of fixed-point iteration method.	C01	K2	M	N	Non-linear equations	Fixed point method
23	Discuss the situations where the fixed-point iteration process may not converge to a solution.	C01	K2	M	N	Non-linear equations	Fixed point method
24	What is difference between direct methods and iterative methods. Give some examples	C01	K2	M	N	System of linear equations	System of linear equations
25	Write sufficient condition for the convergence of Gauss Seidel method.	C01	K1	L	N	System of linear equations	Gauss Seidel method.
26	Round off the 0.77729, 0.0022218 numbers to four significant digits.	C01	K3	L	N	Errors	Accuracy of numbers
27	Find the absolute and relative error in $\sqrt{3} + \sqrt{5} + \sqrt{7}$ correct to 4 significant digits.	C01	K3	H	N	Errors	Accuracy of numbers
28	Round off the numbers 865250 and 37.46235 to four significant figures and compute absolute, relative and percentage error in each case	C01	K3	M	N	Errors	Accuracy of numbers
29	Find the absolute error if the number $X = 0.00545828$ is (i) Truncated to three decimal places (ii) Rounded off to three decimal places.	C01	K3	M	N	Errors	Accuracy of numbers
30	If $u = \frac{4x^2y^3}{z^4}$ and errors in x, y, z be 0.001, compute the maximum absolute, relative, percentage error in u , when $x = 1, y = 1, z = 1$	C01	K3	M	N	Errors	Error in the approximation of a function
31	The error in the measurement of the area of circle is not allowed to exceed 0.1%. How accurately should the diameter be measured?	C01	K3	H	N	Errors	Error in the approximation of a function

32	Compute the percentage error in the time period $T = 2\pi\sqrt{\frac{l}{g}}$ for $l = 1m$, if the error in the measurement of l is 0.01	C01	K3	M	N	Errors	Error in the approximation of a function
33	Using Regula-Falsi method, compute the real root of $3x + \sin x = e^x$. Perform three iterations.	C01	K3	M	N	Non linear equations	Regula- Falsi method
34	Find a root of the equation $x.\log_{10} x = 1.9$ by secant method. Perform four iterations.	C01	K3	M	N	Non linear equations	Secant method
35	Find a root of $x^3 - x^2 - 1 = 0$ using the Newton-Raphson method correct to three decimal places.	C01	K3	M	N	Non linear equations	Newton- Raphson method
36	The bacteria concentration in a reservoir varies as $C = 4e^{-2t} + e^{-0.1t}$. Using Newton-Raphson method calculate the time required for the bacteria concentration to be 0.5.	C01	K4	H	N	Non linear equations	Newton- Raphson method
37	Use the fixed-point iteration method to find a root of the equations: $x^3 - 9x + 1 = 0$	C01	K3	H	N	Non linear equations	Fixed point method
38	What is the convergence criteria for the Fixed Point method? Can the method be applied to find a real root of the equation: $x = 4 - 10^x$?	C01	K4	H	N	Non linear equations	Fixed point method
39	Solve the following equations by using Gauss elimination method: $2x + 2y + z = 6$, $4x + 2y + 3z = 4$, $x - y + z = 0$.	C01	K4	M	N	System of linear equations	Gauss Elimination method
40	Find a root of the equation $\cos x = xe^x$ by Bisection method. Perform six iterations.	C01	K3	M	N	Non linear equations	Bisection method
41	Using Bisection method, find a negative root of the equation $x^3 - 4x + 9 = 0$. Perform six iterations.	C01	K3	M	N	Non linear equations	Bisection method
42	Show that rate of convergence of Newton-Raphson method is quadratic	C01	K4	H	N	Non linear equations	Newton- Raphson method
43	Find a positive root of $x = e^{-x}$ by using fixed-point iteration process with the initial guess as $x_0 = 0.5$, correct up-to four places of decimal.	C01	K4	H	N	Non linear equations	Fixed point method
44	Define the rate of convergence. Show that the rate of convergence fixed point method is linear.	C01	K4	H	N	Non linear equations	Convergence of iterative methods

45	Find the positive root of the equation $x^4 - x = 10$ correct to three decimal places, using Newton- Raphson's method.	C01	K3	H	N	Non linear equations	Newton- Raphson method
46	Find by Newton- Raphson's method, the real root of the equation $3x = \cos x + 1$, correct to four decimal places.	C01	K3	M	N	Non linear equations	Newton- Raphson method
47	Find the root of the equation $x^3 - 2x - 5 = 0$ using secant method correct to three decimal places.	C01	K3	L	N	Non linear equations	Secant method
48	Use the method of False-position, to find the fourth root of 32 correct to three decimal places.	C01	K3	H	N	Non linear equations	Regula- Falsi method
49	Solve the following system of linear equations by Gauss Jordan method: $\begin{bmatrix} 2 & 3 & -1 \\ 4 & 4 & -3 \\ -2 & 3 & -1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 5 \\ 3 \\ 1 \end{bmatrix}$	C01	K3	M	N	System of linear equations	Gauss Jordan method
50	Solve the following system of linear equations by Gauss Jordan method: $x + y + z = 9$, $2x - 3y + 4z = 13$, $3x + 4y + 5z = 40$	C01	K4	M	N	System of linear equations	Gauss Jordan method
51	Find the solution of the system of equations: $45x + 2y + 3z = 58$, $-3x + 22y + 2z = 47$, $5x + y + 20z = 67$ Perform 3 iterations, using the Gauss-Seidel iteration method.	C01	K4	H	N	System of linear equations	Gauss Seidel method
52	Test if the following system of equations is diagonally dominant and hence solve this system of equations by using Gauss Seidel method. Perform four iterations: $2x + y + 4z = 7$, $3x + y + 2z = 6$, $-x + 4y + 2z = 5$.	C01	K3	H	N	System of linear equations	Gauss Seidel method
53	Find the fourth root of 32 by Newton- Raphson's method, correct to four decimal places.	C01	K3	H	N	Non linear equations	Newton- Raphson method
54	Find the interval in which a real root of equation $x^3 - 17 = 0$ lies.	C01	K3	L	N	Non-linear equations	Basic properties of equation
55	Round off the numbers 32.265 and 0.002358 correct to 2 decimal places.	C01	K3	L	N	Errors	Accuracy of numbers