# Question Bank-Unit 1
# Numerical Methods: MATH 2300
# B.Tech , III Sem
## (Non-linear equations and system of linear equations)

| S. No. | Questions | CO | Bloom's Taxonomy Level | Difficulty Level | Competitive Exam 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 56.487262is 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 |

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| 15 | State the Intermediate Value Theorem. Where do we apply the theorem in our course? | CO1 | K1 | L | N | Non-linear equations | Basic properties of equation |
| 16 | Explain the basic principle of root finding by Bisection method. | CO1 | 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 $\varepsilon$. | CO1 | K1 | M | N | Non-linear equations | Bisection method |
| 18 | Find the interval in which a real root of $x^3-2x-5=0$ lies. | CO1 | 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. | CO1 | K2 | L | N | Non-linear equations | Convergence of iterative methods |
| 20 | Write condition of convergence of Newton-Raphson method. | CO1 | K2 | M | N | Non-linear equations | Convergence of iterative methods |
| 21 | Under what condition secant method fails to converge to a solution. | CO1 | K2 | M | N | Non-linear equations | Secant method |
| 22 | Give the geometrical interpretation of fixed-point iteration method. | CO1 | 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. | CO1 | K2 | M | N | Non-linear equations | Fixed point method |
| 24 | What is difference between direct methods and iterative methods. Give some examples | CO1 | K2 | M | N | System of linear equations | System of linear equations |
| 25 | Write sufficient condition for the convergence of Gauss Seidel method. | CO1 | K1 | L | N | System of linear equations | Gauss Seidel method. |
| 26 | Round off the 0.77729, 0.0022218 numbers to four significant digits. | CO1 | 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. | CO1 | 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 | CO1 | K3 | M | N | Errors | Accuracy of numbers |
| 29 | Find the absolute error if the number $X=0.00545828$ is<br>(i) Truncated to three decimal places<br>(ii) Rounded off to three decimal places. | CO1 | 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 $x=1, y=1, z=1$ | CO1 | 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? | CO1 | K3 | H | N | Errors | Error in the approximation of a function |

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| 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 $0.01$ | CO1 | 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. | CO1 | 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. | CO1 | 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. | CO1 | 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. | CO1 | K4 | H | N | Non linear equations | Newton- Raphson method |
| 37 | Use the fixed-point iteration method to find a root of the equations: $x^3 - 9x + 1 = 0$ | CO1 | 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: $x = 4 - 10^x$ ? | CO1 | K4 | H | N | Non linear equations | Fixed point method |
| 39 | Solve the following equations by using Gauss elimination method: $2x + 2y + z = 6$, $4x + 2y + 3z = 4$, $x - y + z = 0$. | CO1 | 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. | CO1 | 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. | CO1 | K3 | M | N | Non linear equations | Bisection method |
| 42 | Show that rate of convergence of Newton-Raphson method is quadratic | CO1 | 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. | CO1 | 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. | CO1 | K4 | H | N | Non linear equations | Convergence of iterative methods |

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| 45 | Find the positive root of the equation $x^4 - x = 10$ correct to three decimal places, using Newton- Raphson's method. | CO1 | 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. | CO1 | 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. | CO1 | 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. | CO1 | K3 | H | N | Non linear equations | Regula- Falsi method |
| 49 | Solve the following system of linear equations by Gauss Jordan method: $\begin{bmatrix} 2 & 3 & -1 \\ 4 & 4 & -3 \\ -2 & 3 & -1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 5 \\ 3 \\ 1 \end{bmatrix}$ | CO1 | K3 | M | N | System of linear equations | Gauss Jordan method |
| 50 | Solve the following system of linear equations by Gauss Jordan method: $x + y + z = 9$, $2x - 3y + 4z = 13$, $3x + 4y + 5z = 40$ | CO1 | 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. | CO1 | 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: $2x + y + 4z = 7$, $3x + y + 2z = 6$, $-x + 4y + 2z = 5$. | CO1 | 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. | CO1 | 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. | CO1 | 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. | CO1 | K3 | L | N | Errors | Accuracy of numbers |