

Name of the Student: _____ I.D. No. _____

Name of the Teacher: _____ Section No. _____

Note: Check the total number of pages are Six (6).
(15 Multiple choice questions and Two (2) Full questions)

The Answer Tables for Q.1 to Q.15 : Marks: 2 for each one ($2 \times 15 = 30$)

Ps. : Mark {a, b, c or d} for the correct answer in the box.

Q. No.	1	2	3	4	5	6	7	8	9	10
a,b,c,d										

Q. No.	11	12	13	14	15
a,b,c,d					

Quest. No.	Marks Obtained	Marks for Questions
Q. 1 to Q. 15		30
Q. 16		5
Q. 17		5
Total		40

Question 1: The number of bisections required to solve the equation $x^3 - 2x = 1$ in $[1.5, 2]$ accurate to within 10^{-4} is:

- (a) 13 (b) 11 (c) 15 (d) None of these

Question 2: Given $x_0 = 0$ and $x_1 = 0.1$, then the next approximation x_2 of the solution of the reciprocal of 5 using the Secant method is:

- (a) 0.15 (b) 0.1 (c) 0.175 (d) None of these

Question 3: The order of convergence of the Newton's method for $f(x) = \tan x$ at the root $\alpha = \pi$ is:

- (a) 2 (b) 1 (c) 3 (d) None of these

Question 4: The l_∞ -norm of the inverse of the Jacobian matrix of the nonlinear system $x^2 + y^2 = 1$, $xy = 1$ at the point $(1, 0)$ is:

- (a) 2 (b) 1 (c) 0.5 (d) None of these

Question 5: In the LU factorization with Doolittles method of the matrix $A = \begin{pmatrix} 1 & -1 \\ \alpha & 1 \end{pmatrix}$, the matrix U is singular if α is equal to:

- (a) ± 1 (b) 1 (c) -1 (d) None of these

Question 6: The first approximation for solving linear system $A\mathbf{x} = [1, 3]^T$ using Jacobi iterative method with $A = \begin{pmatrix} -4 & 5 \\ 1 & 2 \end{pmatrix}$ and $\mathbf{x}^{(0)} = [0.5, 0.5]^T$ is:

- (a) $[0.375, 1.250]^T$ (b) $[1.375, 1.315]^T$ (c) $[1.375, 1.250]^T$ (d) None of these

Question 7: Solving linear system $A\mathbf{x} = [4, 5]^T$, with $A = \begin{pmatrix} 2 & 1 \\ 1 & 2 \end{pmatrix}$, by Gauss-Seidel iterative method, if $\|\mathbf{x}^{(1)} - \mathbf{x}^{(0)}\| = 0.75$, then the number of iterations needed to get an accuracy within 10^{-2} is:

- (a) 10 (b) 6 (c) 8 (d) None of these

Question 8: If $\hat{x} = [1.01, 0.99]^T$ is an approximate solution for the system of two linear equations $2x - y = 1$ and $x + y = 2$, then the error bound for the relative error is:

- (a) 0.045 (b) 0.035 (c) 0.025 (d) None of these

Question 9: Using data points: $(0, -2), (0.1, -1), (0.15, 1), (0.2, 2), (0.3, 3)$, the best approximate value of $f(0.25)$ by a linear Lagrange polynomial is:

- (a) 1.5 (b) 2.5 (c) 3.5 (d) None of these

Question 10: If $f(x) = x^2e^x$, then $f[1, 1, 2]$ equals to:

- (a) $4e^2 + 4e$ (b) $4e^2 - 4e$ (c) $4e^2 - 3e$ (d) None of these

Question 11: Using data points: $(0, -2), (0.1, -1), (0.15, 1), (0.2, 2), (0.3, 3)$, the best approximation of $f'(0.25)$ using 3-point difference formula is:

- (a) 10.0 (b) 20.0 (c) 15.0 (d) None of these

Question 12: Using data points: $(0, -2), (0.1, -1), (0.15, 1), (0.2, 2), (0.3, 3)$, then the best approximation of $f''(0.15)$ using 3-point difference formula is:

- (a) -400.00 (b) -44.44 (c) -3.33 (d) None of these

Question 13: Using data points: $(0, -2), (0.1, -1), (0.15, 1), (0.2, 2), (0.3, 3)$, the best approximate value of the integral $\int_0^{0.3} f(x) dx$, using the composite Trapezoidal rule is:

- (a) 0.25 (b) 0.1 (c) 0.15 (d) None of these

Question 14: If $f(0) = 3, f(1) = \frac{\alpha}{2}, f(2) = \alpha$, and the Simpson's rule for $\int_0^2 f(x) dx = 4$, then the value of α is:

- (a) 1.5 (b) 2.0 (c) 3.0 (d) None of these

Question 15: Given $xy' + y = 1, y(1) = 0$, the approximate value of $y(2)$ using Euler's method when $n = 1$ is:

- (a) 1.5 (b) 1.0 (c) 2.0 (d) None of these

Question 16: Use the following table to find the best approximation of $f(0.6)$ by using quadratic Lagrange interpolating polynomial for equally spaced data points:

x	0.15	0.2	0.3	0.5	0.55	0.8	1
$f(x)$	-0.0427	-0.0644	-0.1084	-0.1733	-0.1808	-0.1428	0

The function tabulated is $f(x) = x^2 \ln x$. Compute the absolute error and an error bound (using error bound formula for equally spaced data points) for the approximation.

Question 17: Use best integration rule to find the absolute error for the approximation of $\int_0^{1.2} f(x) dx$ by using the following set of data points:

x	0.0	0.1	0.21	0.3	0.42	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2
$f(x)$	1.00	1.10	1.19	1.26	1.33	1.38	1.43	1.47	1.51	1.52	1.54	1.55	1.56

The function tabulated is $f(x) = x + \cos x$. How many points approximate the given integral to within accuracy of 10^{-6} ?

