0320119023

(Please write your Enrollment Number)

Enrollment No:

End-Term Examination

(Course Name: B.Tech. CSE/IT/CSE-AI/AI-ML)

(Semester: 3^{rd}) OFFLINE mode

(December, 2024)

Subject Code: BAS 203	Subject Name: Numerical Methods
Time: 3 hours	Maximum Marks: 60

Note: Q1 is compulsory. Attempt one question each from the Units I, II, III & IV. A scientific, non-programmable calculator is allowed in the exam.

Q1	(Attempt all the parts.)	(2.5*8=20)	CO Mapping
a.	Represent $(-96)_{10}$ in floating point representation with 8-bits.(1-bit for sign,4-bits for exponent, 3-bits for mantissa). If the number π = 4 tan−1(1) is approximated using five decimal digits, find the percentage relative error due to a) chopping b) rounding.		1
b.	Compute one real of $e^x - 3x = 0$ correct to two decimal places using the method of bisection.		2
c.	Solve the integral $\int_0^{0.5} \exp(-x^2)dx$ numerically with the help of the Gauss–Legendre 3-points formula.		5
d.	Solve the system of equations using the Gauss Elimination method with partial pivoting. $2x_1 + 3x_2 = 8;\ 4x_1 + 7x_2 = 19.$		3
e.	The following table gives the measured output voltage (y) of an electronic circuit as a function of the applied input voltage (x). Find the least-squares straight-line fit for the given data:		4
f.	Find the function $g(x)$ whose first difference is $x^3 + 4x^2 + 9x + 12$. Also, compute its successive differences in factorial notation.		4
g.	Use the fourth-order Runge-Kutta method with $h = 0.1$, find $y(1.1)$ for IVP $dy/dx = x - y^2$ with $y(1) = 2$.		5
h.	Using Picard's method, find first approximate values of y and z corresponding to $x = 0.1$ given that $y(0) = 2$, $z(0) = 1$ and $dy/dx = x + z$ and $dz/dx = x - y^2$.		5

x in V	0.1	0.2	0.3	0.4	0.5	0.6	0.7
y in V	0.16	0.21	0.23	0.30	0.36	0.39	0.46

			CO Mapping
	UNIT-1		
Q2	Describe the process of the fixed-point iteration method. Using this method, determine the real root of the equation $\cos(x) - 2x + 3 = 0$ within the interval [1, 2] correct to three decimal places.	10	2
Q3	Find the approximate value for the real root of $x \log_{10} x - 1.2 = 0$ correct to five decimal places using the Newton-Raphson method.	10	2
	UNIT-2		**CO Mapping**
Q4	Explain the diagonally dominant system of equations. Find the solution to the system $6x_1 - x_2 + 2x_3 = 2$ $x_1 + 5x_2 + x_3 = 10$ $2x_1 + x_2 + 7x_3 = -3$ by using the Gauss–Seidel method upto five iterations.	10	3
Q5	Determine the smallest eigenvalue and the corresponding eigenvector of the matrix $\begin{bmatrix} 10 & 6 & 7 \\ 1 & 7 & -2 \\ 2 & 2 & 2 \end{bmatrix}$, considering the initial eigenvector $X^{(0)} = [111]^T$.	10	3
	UNIT-3		**CO Mapping**
Q6	Find the polynomial of the lowest possible degree, which takes the values as follows: x: 3, 2, 1, -1 $y = f(x)$: 3, 12, 15, -21 Also, calculate the values $f(2)$, $f(4)$ and $f(5)$.	10	4
Q7	Derive the Newton-cote's quadrature formula using Lagrange's interpolation method. Evaluate the value of the integral $\int_0^6 \frac{dx}{1+x^2} dx$ by Simpson's '1/3' rule and Simpson's '3/8' rule.	10	5
	UNIT-4		**CO Mapping**
Q8	Apply Euler's method to the ordinary differential equation $dy/dx = x + y$, with $y(0) = 1$ using increments of size $h = 0.2$. If the exact solution is $y = -1 - x + 2e^x$, then determine the error and percentage error at each step.	10	5
Q9	Use the Taylor series method to compute the values of $y(0.1)$ and $t(0.1)$ for the following system: $dy/dx = t + x$ and $dt/dx = y^2 + x + t$ with $y(0) = 0$ and $t(0) = 0$. Compute only the first five terms of the Taylor series.	10	5