$-x - 2y + 2z - 1$ $2v$

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MIDTERM EXAMINATIONS – November 2024

Programme	: B.Tech.	Semester	: Interim Semester 2024-25
Course Title	: Applied Numerical Methods	Course Code	: MAT2003
Date/Session	: 6 Nov 2024/Session I	Slot	: B22+ F21
Time	: 1 ½ hours	Max. Marks	: 50

Answer all the Questions

Q.No.	Sub. Sec.	Question Description	Marks
1		Define the order of convergence for the iterative method. Prove that the order of convergence for the Newton-Raphson method is 2.	10
2		Find a root of the equation $x^2 = e^{\frac{x}{2}}$ in the interval $(0, 2)$ correct to three decimal places, using the Secant method.	10
3		Anushka, Ritika and Sakshi go to a jewelry store. Anushka buys 3 necklaces, 7 rings and 1 bracelets and spends \$26. Ritika buys 1 necklace, 2 rings and 6 bracelets and spends \$31. Sakshi buys 4 necklaces, 1 rings and 2 bracelet and spends \$29. Applying Gauss elimination method, find the cost of each type of jewellery.	10
4		Rearrange the following system of equations so that the coefficient matrix forms diagonally dominant, and find its solutions correct up to two decimal places using the Gauss-Seidel iteration method with the initial approximation $x^{(0)} = (0,0,0)$: $$-2x_1 + 6x_2 + x_3 = 9,$$ $$4x_1 - x_2 - x_3 = 3,$$ $$-x_1 + x_2 + 7x_3 = -6.$$	10
5	(a)	Show that $\left(E^{\frac{1}{2}} + E^{-\frac{1}{2}} \right)(1 - \nabla)^{-\frac{1}{2}} = 2 + \Delta$.	3
	(b)	The following table gives the population of a town during the last six censuses. Estimate the number of population in the years 1976, using Newton's interpolation method:	7

Year	1971	1981	1991	2001	2011	2021
Population (in thousands)	12	15	20	27	39	52

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