CLASS: IMSc   SEMESTER : IV/ VI
BRANCH: MATHS & COMPUTING   SESSION : SP2023

SUBJECT: MA311 NUMERICAL TECHNIQUES

TIME: 02 Hours   FULL MARKS: 25

INSTRUCTIONS:
1. The question paper contains 5 questions each of 5 marks and total 25 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates

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Q.1(a)   Define the absolute, relative and percentage errors   [2]   1   1

Q.1(b)   Perform five iterations of Newton's method to find the real root of $x^2 - 2x - 5 = 0$ [3]   1   2
         with initial guess $x_0 = 2$.

Q.2   Define the convergence rate. Prove that the Newton-Raphson method has second-order   [5]   1   3
         convergence.

Q.3   Using the Gauss elimination method, find the solution of the system of equations: $x +$ [5]   2   2
         $y + z = 6$; $3x + 3y + 3z = 20$; $2x + y + 3z = 13$

Q.4(a)   Determine the maximum absolute row sum norms of the following matrix,   [2]   2   2
         $\begin{pmatrix} 1 & 7 & -4 \\ 4 & -4 & 9 \\ 12 & -1 & 3 \end{pmatrix}$.

Q.4(b)   Perform three iterations of the *Gauss-Seidel method* to solve the system equations: [3]   2   3
         $-2x - y = 7$; $-x + 2y - z = 1$; $-y + 2z = 1$; with initial guess $x_0 = (0, 0, 0)$.

Q.5(a)   Using Newton's divided difference interpolation formula, construct a unique polynomial,   [2]   3   2
         such that $f(0) = 1, f(1) = 3, f(3) = 55$.

Q.5(b)   Find the missing term in the following table: [3]   3   3

x	0	1	2	3	4	5
y	1	2	4	8	k	32

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