

MCA.I/02.22.002

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MCA DEGREE FIRST SEMESTER EXAMINATION, FEBRUARY 2022
20-382-0102 MATHEMATICAL FOUNDATIONS AND NUMERICAL TECHNIQUES
(Regular)

Time : 3 Hours

Maximum Marks:50

Write any five questions.
 (Each question carries 10 Marks)

Q.Nos	QUESTIONS	MARKS	CO	BL	PI
1.	(a) Check the consistency of the given system and find the solution if it exists $\begin{aligned} 3x - y + z &= 2 \\ 2x + y &= 1 \\ x + 2y - z &= 3 \end{aligned}$	6	CO1	L3	1.2.1
	(b) Find the inverse of the given matrix if it exists $A = \begin{bmatrix} -1 & 1 & 2 \\ 3 & -1 & 1 \\ -1 & 3 & 4 \end{bmatrix}$	4	CO1	L3	1.2.1
2.	Solve the following system of equations using Gauss-Jacobi method and correct up to 3 decimal places. $\begin{aligned} x + y + 54z &= 110 \\ 27x + 6y - z &= 85 \\ 6x + 15y + 2z &= 72 \end{aligned}$	10	CO2	L3	1.7.1
3.	(a) An average of 2 cars enter a certain parking lot per minute, what is the probability that during any given minute 4 or more cars will enter the lot?	4	CO6	L3	1.2.2
	(b) A manufacturer of metal pistons finds that on the average, 12% of his pistons are rejected because they are either oversize or undersize. What is the probability that a batch of 10 pistons will contain i. no more than 2 rejects? ii. at least 2 rejects	6	CO6	L3	1.2.2

4.		Solve the recurrence relation $a_r - 2a_{r-1} - 3a_{r-2} = 0, r \geq 2$, $a_0 = 3, a_1 = 1$ by generating functions.	10	CO4	L3	1.7.1
5.	(a)	Draw the Hasse diagram which represents the partial ordering $\{(a,b) a \text{ divides } b\}$ on the set $\{1,2,3,4,6,8,12\}$	5	CO5	L4	2.7.1
	(b)	Determine whether the relations represented by the graphs below are equivalence	5	CO3	L3	2.8.4
6.	(a)	Find the eigenvalues and corresponding Eigen vectors of the matrix: $A = \begin{bmatrix} 1 & -1 & 4 \\ 3 & 2 & -1 \\ 2 & 1 & -1 \end{bmatrix}$	7	CO1	L3	1.7.1
	(b)	Verify De Morgan's laws for the given sets $A = \{1, 2, 3, 4, 5\}$ and $B = \{0, 3, 6\}$ if $U = \{0,1,2,\dots,10\}$	3	CO5	L2	1.2.1
7.	(a)	Explain the differences of Row Echelon Form and Reduced Row Echelon Form of a matrix with the help of examples.	3	CO2	L2	1.6.1
	(b)	Solve the following system of equations using Jacobi method correct up to 3 decimal places. $\begin{aligned} 5x - 2y + 3z &= -1 \\ -3x + 9y + z &= 2 \\ 2x - y - 7z &= 3 \end{aligned}$	7	CO2	L3	2.8.1
