SET B

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School of Engineering **First Sessional Examination, Odd Semester (AS: 2023-24)** **B. Tech: ALL Branch**	
Year: 1	**Semester: 1**
Course Title: Matrices and Calculus **Course Code: NBS4101**	**M.M.: 30** **Time: 1 hr**

Instructions if any: Read the question Carefully.

	SECTION 'A' **Q.N.1. Attempt all parts of the following:**	**Course Objective**	**Marks**
a)	Define Involuntary matrix with example.	CO1	1
b)	Define Canonical form of matrix.	CO1	1
c)	For what value of k the rank of $A=\begin{bmatrix} 1 & 7 \\ -3 & 3k \end{bmatrix}$ is 1	CO1	1
d)	If $A=\begin{bmatrix} 1 & 0 \\ 2 & -1 \end{bmatrix}$ then find A^{-1} by using Cayley's Hamilton theorem.	CO1	1
e)	Find 10th derivative of $(2x+3)^{-1}$	CO2	1
	SECTION 'B' **Q.N.2. Attempt any two parts of the following:**	**Course Objective**	**Marks**
a)	For what value of λ and μ the equation x+y+z=6 x+2y+5z=10 2x+3y+λz=μ Have (i) no solution (ii) a unique solution (iii) an infinite number of solution.	CO1	7.5
b)	Reduce the matrix to Echelon form and then find its rank. $A=\begin{bmatrix} 1 & 3 & -1 & 2 \\ 0 & 11 & -5 & 3 \\ 2 & -5 & 3 & 1 \\ 4 & 1 & 1 & 5 \end{bmatrix}$	CO1	7.5
c)	Examine the vector X_1=(1,-1,1), X_2=(2,1,1), X_3=(3,0,2) for linear dependence. If dependent, find the relation between them.	CO1	7.5
d)	If $u=\log\left(x^3+y^3+z^3-3xyz\right)$ then show that $\left(\frac{\partial}{\partial x}+\frac{\partial}{\partial y}+\frac{\partial}{\partial z}\right)^2 u=-\frac{9}{(x+y+z)^2}$	CO2	7.5
	SECTION 'C' **Q.N.3. Attempt any one part of the following**	**Course Objective**	**Marks**
a)	Find the rank of the matrix by reducing it to normal form $A=\begin{bmatrix} 2 & 3 & 4 & 5 \\ 3 & 4 & 5 & 6 \\ 4 & 5 & 6 & 7 \\ 9 & 10 & 11 & 12 \end{bmatrix}$	CO1	10
b)	Find the Eigen value and Eigen vector of matrix $A=\begin{bmatrix} 1 & 0 & -1 \\ 1 & 2 & 1 \\ 2 & 2 & 3 \end{bmatrix}$	CO1	10
c)	If $y=\cos\left(a\sin^{-1}x\right)$ then find $y_n(0)$	CO2	10