

SET B

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Student University Roll No.:	
School of Engineering	
First Sessional Examination, Odd Semester (AS: 2023-24)	
B. Tech: ALL Branch	
Year: 1	Semester: 1
Course Title: Matrices and Calculus	M.M.: 30
Course Code: NBS4101	Time: 1 hr

Instructions if any: Read the question Carefully.

SECTION 'A'		Course Objective	Marks
Q.N.1. Attempt all parts of the following:			
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 10 th derivative of $(2x+3)^{-1}$	CO2	1
SECTION 'B'		Course Objective	Marks
Q.N.2. Attempt any two parts of the following:			
a)	For what value of λ and μ the equation $x+y+z=6$ $x+2y+5z=10$ $2x+3y+\lambda z=\mu$ 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 $u = \log(x^3 + y^3 + z^3 - 3xyz)$ 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'		Course Objective	Marks
Q.N.3. Attempt any one part of the following			
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 $y = \cos(a \sin^{-1} x)$ then find $y_a(0)$	CO2	10