

Code No.: MA101BS

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H.T.No.

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CMR ENGINEERING COLLEGE: : HYDERABAD

UGC AUTONOMOUS

I-B.TECH-I-Semester End Examinations (Regular) - JULY- 2021

LINEAR ALGEBRA AND CALCULUS

(Common to CSE, CSM, CSD, CSC, IT, ECE and ME)

[Time: 3 Hours]

[Max. Marks: 70]

1. Answer Any **FIVE** Questions. Each Question Carries 14 Marks
2. Illustrate your answers with NEAT sketches wherever necessary.

5 x 14M=70M

1. a) Find the rank of a Matrix $\begin{bmatrix} 1 & 2 & -1 & 3 \\ 4 & 1 & 2 & 1 \\ 3 & -1 & 1 & 2 \\ 1 & 2 & 0 & 1 \end{bmatrix}$ using Echelon form

b) Solve the system of equations $2x + 3y + z = 9$, $x + 2y + 3z = 6$ and $3x + y + 2z = 8$.

2. Find the Eigen values and Eigen Vectors for $A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$

3. Verify Cayley Hamilton theorem for $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 5 \\ 3 & 5 & 6 \end{bmatrix}$ and hence find A^{-1} and A^4 .

4. Reduce the quadratic form $2xy + 2yz + 2zx$ to canonical form and hence find the rank, index and nature of the quadratic form.

5. Test the convergence of the series $\sum_{n=1}^{\infty} \frac{2n!}{3.5.7 \dots (2n+1)}$.

6. a) Verify Rolle's theorem for $f(x) = \log \left(\frac{x^2 + ab}{x(a+b)} \right)$ on (a, b) , $a > 0$ and $b > 0$.

b) Evaluate $\int_0^{\infty} 2^{-3x^2} dx$ using gamma function.

7. Find the volume of the greatest rectangular parallelopiped that can be inscribed in the ellipsoid $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$.

8. a) Find volume of the object by revolving the semi-circle $x^2 + y^2 = a^2$, $a > 0$ about its diameter.

b) Verify $u = 2x - y + 3z$, $v = 2x - y - z$ and $w = 2x - y + z$ are functionally dependent and If so, find the relation between them.
