

# CMR TECHNICAL CAMPUS

## UGC AUTONOMOUS

B. Tech I Sem Regular & Supply End Examinations, January-2024

Matrices & Calculus

Common to ECE, AIML, CSC, CSM, CSD, CSE, IT, CSIT

Time: 3 Hours

Max. Marks: 60

### Note

- This Question paper contains Part- A and Part- B.
- All the Questions in Part A are to be answered compulsorily.
- All Questions from Part B are to be answered with internal choice among them.

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### PART-A

10 X 01 = 10 Marks

		Marks	CO	BL
1. a	Find the rank of the matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 6 \\ 3 & 6 & 9 \end{bmatrix}$ by echelon form	1M	CO1	L2
b	Write Gauss -Seidel Iteration Method	1M	CO1	L1
c	Write any two properties of Eigen values	1M	CO2	L1
d	State Cayley – Hamilton Theorem	1M	CO2	L1
e	State Lagrange's mean value theorem.	1M	CO3	L1
f	Define Gamma function	1M	CO3	L1
g	Find the first order partial derivative of $\log(x^2 + y^2)$	1M	CO4	L2
h	Write the necessary conditions for maxima and minima	1M	CO4	L1
i	Evaluate $\int_0^2 \int_0^x y dy dx$	1M	CO5	L5
j	Evaluate $\int_0^1 \int_0^1 \int_0^1 (x+y+z) dz dy dx$	1M	CO5	L5

### PART- B

5 X 10 = 50 Marks

		Marks	CO	BL
2. a	Find the rank of the matrix $A = \begin{bmatrix} 1 & 2 & 1 & 0 \\ -2 & 4 & 3 & 0 \\ 1 & 0 & 2 & -8 \end{bmatrix}$ by using echelon form	5M	CO1	L3
b	Find the inverse of the matrix $A = \begin{bmatrix} 1 & 3 & 3 \\ 1 & 4 & 3 \\ 1 & 3 & 4 \end{bmatrix}$ by using Gauss-Jordon method	5M	CO1	L3

OR

3 a Solve the system of equations  $x + y + 2z = 4$ ,  $2x - y + 3z = 9$ ,  $3x - y - z = 2$  using Gauss elimination method. 5M

b Solve the system of equations  $8x + 3y + 2z = 13$ ,  $x + 5y + z = 7$ ,  $2x + y + 6z = 9$  using Gauss Seidel iteration method 5M

4 Verify Cayley – Hamilton Theorem for the matrix  
 $A = \begin{bmatrix} 3 & 4 & 1 \\ 2 & 1 & 6 \\ -1 & 4 & 7 \end{bmatrix}$  and hence find  $A^{-1}$  and  $A^4$  10M

OR

5 Reduce the quadratic for  $3x^2 - 2y^2 - z^2 - 4xy + 8xz + 12yz$  to canonical form by an orthogonal transformation. 10M

6 a Verify Rolle's theorem for the  $f(x) = e^{-x} \sin x$  in  $(0, \pi)$  5M

b Verify Cauchy's mean value theorem for the function  $f(x) = x^2$  and  $g(x) = x^3$  in  $[1, 2]$  5M

OR

7 a Obtain Taylor's series expansion for the function  $f(x) = \cos x$  in powers of  $(x - \frac{\pi}{4})$  5M

b Show that  $\Gamma(\frac{1}{2}) = \sqrt{\pi}$  5M

8 a If  $u = f(y - z, z - x, x - y)$  then find  $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z}$  5M

b If  $u = x^2 - 2y$ ,  $v = x + y + z$  and  $w = x - 2y + 3z$ , find  $\frac{\partial(u, v, w)}{\partial(x, y, z)}$  5M

OR

9 Find the volume of the largest parallelopiped that can be inscribed in the ellipsoid  $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$  10M

10 a Evaluate  $\int_0^{2\sqrt{ax}} \int_{x^2/4a}^{x\sqrt{ax}} dx dy$  by change of order of integration. 5M

b Find the area of the cardioid  $r = a(1 - \cos \theta)$  5M

OR

11 Find the volume of the sphere  $x^2 + y^2 + z^2 = a^2$  10M

CO : Course Outcomes BL : Bloom's Taxonomy Levels L 1 : Remembering

L 2 : Understanding L 3 : Applying L 4 : Analysing L 5 : Evaluating L 6 : Crea

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