

**CMR TECHNICAL CAMPUS**  
**UGC AUTONOMOUS**

**B. Tech. I Sem Supply End Examinations, January-2024**  
**Algebra & Calculus**  
**Common to CE, ME, AIML, CSG, ECE, CSD, CSE, IT, CSM**

Time: 3 Hours

Max. Marks: 70

**Note**

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

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**PART-A**

10 X 02 = 20 Marks

		Marks	CO	BL
1.	a	2M	CO1	L1
	a	2M	CO1	L3
	b	2M	CO2	L2
	c	2M	CO2	L2
	d	2M	CO2	L2
	e	2M	CO3	L4
	f	2M	CO3	L2
	g	2M	CO4	L3
	h	2M	CO4	L3
	i	2M	CO5	L2
	j	2M	CO5	L1

**PART- B**

5 X 10 = 50 Marks

		Marks	CO	BL
2.	a	5M	CO1	L5
	b	5M	CO1	L4

Find the rank of  $A = \begin{bmatrix} 1 & 2 & 3 & 4 \\ -2 & -3 & 1 & 2 \\ -3 & -4 & 5 & 8 \\ 1 & 3 & 10 & 14 \end{bmatrix}$

- b Solve the system of equations by Gauss elimination method  
 $3x + y + 2z = 3; 2x - 3y - z = -3; x + 2y + z = 4$

OR

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- 3 a Find the inverse of  $\begin{bmatrix} 1 & -2 & -3 \\ 0 & 2 & 0 \\ 0 & 0 & 3 \end{bmatrix}$  using Gauss Jordan method 5M CO1 L5
- b Verify the matrix  $A = \frac{1}{2} \begin{bmatrix} 1 & 2 & 3 & 4 \\ -2 & -3 & 1 & 2 \\ -3 & -4 & 5 & 8 \\ 1 & 3 & 10 & 14 \end{bmatrix}$  is orthogonal. 5M CO1 L3
- 4 Reduce the quadratic form to canonical form by an orthogonal reduction and state the nature of the quadratic form  $5x^2 + 26y^2 + 10z^2 + 4yz + 14zx + 6xy$  10M CO2 L4  
OR
- 5 a Find the inverse of  $\begin{bmatrix} 1 & -1 & 0 \\ 0 & 1 & 1 \\ 2 & 1 & 2 \end{bmatrix}$  by using Caley Hamilton theorem. 5M CO2 L3
- b Find the eigen values and eigen vectors of the matrix  $\begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$  5M CO2 L3
- 6 Find the nature of the series  $\sum \frac{x^{2n}}{(n+2)\sqrt{n+1}}$ , ( $x > 0$ ). 10M CO3 L5  
OR
- 7 a Examine the convergence of  $\sum \frac{(n^3 - 5n^2 + 7)}{(n^5 + 4n^4 - n)}$  5M CO3 L4
- b Examine the convergence of  $1 - \frac{1}{\sqrt{2}} + \frac{1}{\sqrt{3}} - \frac{1}{\sqrt{4}} + \dots$  5M CO3 L4
- 8 a Using Rolle's theorem, show that  $f(x) = 8x^3 - 6x^2 - 2x + 1$  has a zero between 0 and 1. 5M CO4 L3
- b Find the Taylor's series expansion of  $\sin 2x$  about  $x = \frac{\pi}{4}$  5M CO4 L1  
OR
- 9 a Verify Cauchy's mean value theorem for  $f(x) = x^2$ ,  $g(x) = x^3$  in  $[1, 2]$ . 5M CO4 L3
- b Using beta function, solve  $\int_0^1 \frac{x}{\sqrt{1-x^2}} dx$  5M CO4 L5
- 10 a If  $u = x + y + z$ ;  $uv = y + z$ ;  $uvw = z$ ; then evaluate  $\frac{\partial(x,y,z)}{\partial(u,v,w)}$  5M CO5 L4
- b Find the minimum value of  $x^2 + y^2 + z^2$  given  $x + y + z = 3a$  5M CO5 L3  
OR
- 11 a Discuss the maximum and minimum of  $f(x, y) = x^2 + y^2 + 6x + 12$  5M CO5 L4
- b Verify  $\frac{\partial^2 u}{\partial x \partial y} = \frac{\partial^2 u}{\partial y \partial x}$  for the functions  $u = \tan^{-1} \frac{x}{y}$ . 5M CO5 L3