

ANURAG Engineering College

(An Autonomous Institution)

I B.Tech I Semester Regular/Supplementary Examinations, Jan/Feb-2024

**MATRICES AND CALCULUS
(COMMON TO ALL BRANCHES)**

Time: 3 Hours

Max. Marks: 60

Section – A (Short Answer type questions)

Answer All Questions

(10 Marks)

	Course Outcome	B.T Level	Marks
1. Find the rank of a matrix $\begin{bmatrix} 1 & 2 & 1 \\ -1 & 0 & 2 \\ 2 & 1 & -3 \end{bmatrix}$	CO1	L1	1M
2. Define a linear equation with n unknowns.	CO1	L1	1M
3. Find the eigen values of $\begin{bmatrix} 2 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 3 \end{bmatrix}$	CO2	L1	1M
4. If r is the rank and s is the number of positive terms in a quadratic form, then write the signature of a quadratic form.	CO2	L1	1M
5. State Rolle's theorem.	CO3	L2	1M
6. Find the value of $\Gamma(1/2)$.	CO3	L1	1M
7. If $z = x^2 + y^2$ then find $\frac{\partial z}{\partial x}$.	CO4	L2	1M
8. Let $x(u, v) = u^2 - v^2$, $y(u, v) = 2uv$. Find the Jacobian J (u, v).	CO4	L2	1M
9. Evaluate $\int_{x=2}^{x=4} \int_{y=1}^{y=2} x^2 y^3 dx dy$.	CO5	L1	1M
10. Evaluate $\int_{x=1}^{x=2} \int_{y=1}^{y=2} \int_{z=1}^{z=2} xyz dx dy dz$.	CO5	L2	1M

Section B (Essay Questions)

Answer all questions, each question carries equal marks.

(5 X 10M = 50M)

11. A) Reduce the matrix $\begin{bmatrix} 1 & 2 & 3 & 0 \\ 2 & 4 & 3 & 2 \\ 3 & 2 & 1 & 3 \\ 6 & 8 & 7 & 5 \end{bmatrix}$ into normal form and hence find its rank.	CO1	L3	10M
OR			
B) Solve the equations $10x+y+z=12$; $x+10y-z=10$ and $x-2y+10z=9$ by Gauss-Jordan method.	CO1	L3	10M
12. A) Verify Cayley-Hamilton theorem for the matrix $A = \begin{bmatrix} 1 & -2 & 2 \\ 1 & -2 & 3 \\ 0 & -1 & 2 \end{bmatrix}$. Hence find A^{-1} .	CO2	L3	10M
OR			
B) Identify the nature, index, signature, and rank of the following Quadratic form $3x_1^2 + 3x_2^2 + 3x_3^2 + 2x_1x_2 + 2x_1x_3 - 2x_2x_3$.	CO2	L3	10M
13. A) Prove that $\frac{\pi}{6} + \frac{1}{5\sqrt{3}} < \sin^{-1}\left(\frac{3}{5}\right) < \frac{\pi}{6} + \frac{1}{8}$.	CO3	L3	10M
OR			
B) Compute $\beta\left(\frac{9}{2}, \frac{7}{2}\right)$.	CO3	L3	10M

14. A) If $u = x^2 - y^2, v = 2xy$ and $x = r \cos\theta, y = r \sin\theta$, find $\frac{\partial(u,v)}{\partial(r,\theta)}$. CO4 L3 10M
- OR**
- B) Find the maximum value of $x^2 + y^2 + z^2$ under the condition $ax + by + cz = p$. CO4 L3 10M
15. A) Change the order of integration in $I = \int_0^{4a} \int_{x^2/4a}^{2\sqrt{ax}} dydx$ and hence evaluate. CO5 L3 10M
- OR**
- B) Evaluate $\int_0^1 \int_0^{\sqrt{1-y^2}} \int_0^{\sqrt{1-y^2-z^2}} xyzdzdydx$. CO5 L3 10M