Question Paper Code: R22A11HS01

R22

ANURAG Engineering College

(An Autonomous Institution)

I B.Tech I Semester Supplementary Examinations, June/July - 2024

MATRICES AND CALCULUS

(COMMON TO ALL BRANCHES)

Time: 3 Hours **Max. Marks: 60**

Section – A (Short Answer type questions) (10 X 1M = 10M)

Answer All Questions

		Course Outcome	B.T Level	Marks
1.	Define singular and non-singular matrices.	CO1	L1	1M
2.	Write the conditions for Echelon form.	CO1	L1	1M
3.	Prove that if λ is an eigen value of A then $\frac{1}{\lambda}$ is an eigen value of A^{-1}	CO2	L2	1M
4.	Discuss the different natures of the Quadratic form.	CO2	L2	1M
5.	State the Rolle's theorem.	CO3	L1	1M
6.	Write the relation between Beta and Gamma function.	CO3	L1	1M
7.	Define Maxima and Minima of two variables.	CO4	L1	1M
8.	Whether the Rolle's theorem is applicable to f(x)=tanx in (0, π)	CO4	L2	1M
9.	Change the order of integration in $\int_0^1 \int_{x^2}^{2-x} f(x,y)dydx$	CO5	L2	1M
10.	Evaluate $\int_0^1 \int_0^2 \int_0^3 dxdydz$	CO5	L2	1M

Section B (Essay Questions)

Answer all questions, each question carries equal marks. **(5 X 10M = 50M)**

		Course Outcome	B.T Level	Marks
11. A)	i) Reduce the matrix to Echelon form and find its rank. $\begin{bmatrix} 2 & 1 & 3 & 5 \\ 4 & 2 & 1 & 3 \\ 8 & 4 & 7 & 13 \\ 8 & 4 & -3 & -1 \end{bmatrix}$.	CO1	L3	5M
	ii) Solve the system of equations $x+2y+3z=9,\ 4x+5y+6z=24,\ 3x+y-2z=4$ by Gauss elimination method	CO1	L3	5M
	OR			
B)	Show that the only real number λ for which the system $x+2y+3z=\lambda x, 3x+y+2z=\lambda y, 2x+3y+z=\lambda z$ has non-zero solution is 6 and solve them when $\lambda=6$.	CO1	L3	10M
12. A)	Diagonalize the matrix $A=\begin{bmatrix} 1 & 1 & 1 \\ 0 & 2 & 1 \\ -4 & 4 & 3 \end{bmatrix}$	CO2	L3	10M
	OR			
B)	Verify Cayley-Hamilton Theorem and find A^{-1} for $A=\begin{bmatrix} 3 & 0 & 0 \\ 5 & 4 & 0 \\ 3 & 6 & 1 \end{bmatrix}$	CO2	L3	10M

13. A)	If $a<b$ prove that $\frac{b-a}{1+b^2}<\tan^{-1}b-\tan^{-1}a<\frac{b-a}{1+a^2}$ using Lagrange's mean value theorem. Deduce the following $\frac{\pi}{4}+\frac{3}{25}<\tan^{-1}\frac{4}{3}<\frac{\pi}{4}+\frac{1}{6}$, $\frac{5\pi+4}{20}<\tan^{-1}2<\frac{\pi+2}{4}$	CO3	L3	10M
	OR			
B)	Show that $\int_0^1 \frac{x^2}{\sqrt{1-x^4}}dx \cdot \int_0^1 \frac{1}{\sqrt{1-x^4}}dx=\frac{\pi}{4}$	CO3	L3	10M
14. A)	Show that the functions $u=x+y+z, v=xy+yz+zx, \; w=x^2+y^2+z^2$ are functionally dependent and if so, find the relation between them.	CO4	L3	10M
	OR			
B)	Divide 24 into three parts such that the continued product of the first, square of second and cube of third is maximum.	CO4	L3	10M
15. A)	i) Evaluate $\iint_A xy\,dx\,dy$, where A is the domain bounded by the X–axis, ordinate $X = 2a$ and the curve $x^2 = 4ay$.	CO5	L3	5M
	ii) Evaluate $\int_0^a \int_0^{\sqrt{a^2-y^2}} \left(x^2+y^2\right)dydx$ by changing to polar coordinates.			5M
	OR			
B)	Find the volume bounded by the cylinder $x^2+y^2=4$ and the planes y+z=4, z=0	CO5	L3	10M