Question Paper Code: R18A11HS03 **R18**

ANURAG Engineering College

(An Autonomous Institution)

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

MATHEAMTICS – I

(COMMON TO ALL BRANCHES)

Time: 3 Hours **Max. Marks: 75**

Section – A (Short Answer type questions) (25 Marks)

Answer All Questions

	Question	Course Outcome	B.T Level	Marks
1.	Write the elementary row transformations while the matrix to convert into row echelon form	CO1	L1	2M
2.	Determine the rank of a matrix by reducing into row echelon form $A=\begin{pmatrix}1 & 2 & 3\\ 2 & 3 & 1\\ 3 & 1 & 2\end{pmatrix}$	COI	L2	3M
3.	Is the matrix $A=\begin{pmatrix}1 & 2\\ 2 & -1\end{pmatrix}$ verify the Cayley Hamilton theorem. If so determine A^8	CO2	L2	2M
4.	Write the characteristic equation of the matrix $A=\begin{pmatrix}7 & 2 & -2\\ -6 & -1 & 2\\ -6 & -2 & 5\end{pmatrix}$	CO2	L1	3M
5.	Describe the test case conditions of D-Alembert's Ratio test	CO3	L1	2M
6.	Test for convergence $\frac{(n+3)!}{3!n!3^n}$	CO3	L2	3M
7.	Describe the Lagrange's mean value theorem	CO4	L1	2M
8.	Evaluate $\int_0^{\frac{\pi}{2}} sin^6\theta cos^7\theta \ d\theta$ by using the beta function	CO4	L2	3M
9.	Determine the Jacobian $\frac{\partial(u,v)}{\partial(x,y)}$ for $u = x\ siny, v = y\ sinx$.	CO5	L1	2M
10.	Divide 24 into three parts such that the continued product of the first, square of second and the cube of the third may be maximum then find their dimensions	CO5	L2	3M

Section B (Essay Questions)

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

	Question	Course Outcome	B.T Level	Marks
11. A)	Using the Gauss-Jordan method determine the solution of the following system of equations $2x-2y+4z+3t=9, x-y+2z+2t=6, 2x-2y+z+2t=3, x-y+t=2$	CO1	L3	10M
	OR			
B)	Using the row reduced echelon form determine the inverse of a matrix $A=\begin{pmatrix}1 & 2 & 3\\ 2 & -1 & 0\\ 3 & 1 & 2\end{pmatrix}$	CO1	L3	10M
12. A)	i) Verify the Cayley-Hamilton theorem for the matrix $A=\begin{pmatrix}1 & 2 & 3\\ 2 & 4 & 6\\ 3 & 5 & 6\end{pmatrix}$ and hence find the inverse of A. Determine A^4 ii) Express $B = A^8-11A^7-4A^6+A^5+A^4-11A^3-3A^2+2A+I$ as a quadratic polynomial in A. then determine B.	CO2	L3	10M
	OR			
B)	Determine the nature, index and signature of the quadratic form $2x^2+2y^2+3z^2+2xy-4xz-4yz$.	CO2	L3	10M

13. A)	Test for convergence of the series $1-\frac{1}{3!}+\frac{1}{5!}-\frac{1}{7!}+\cdots$	CO3	L3	10M
	OR			
B)	Examine the following series for absolute convergence $1-\frac{1}{3^2}+\frac{1}{5^2}-\frac{1}{7^2}+\frac{1}{9^2}------(-1)^{n+1}\frac{1}{(2n-1)^2}$	CO3	L3	10M
14. A)	Verify the Cauchy's mean value theorem for the functions $f(x)=x^4, g(x)=x^2$ in the interval [a,b]	CO4	L3	10M
	OR			
B)	Evaluate $\int_0^{\frac{\pi}{2}}\sqrt{cot\theta}\,d\theta$	CO4	L3	10M
15. A)	A rectangular box open at the top is to have a volume of 32 cubic feet find the dimension of the box requiring least material for its construction?	CO5	L3	10M
	OR			
B)	Examine for functional dependency, if so find the relation between them $u=x^2e^{-y}coshz, v=x^2e^{-y}sinhz, w=3x^4e^{-2y}$	CO5	L3	10M