Question Paper Code: R18A11HS01 **R18**

ANURAG Engineering College

(An Autonomous Institution)

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

MATHEAMTICS – I

(COMMON TO ALL BRANCHES)

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

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

Answer All Questions

Q. No.	Question	Course Outcome	B.T Level	Marks
1.	Write the elementary row and column transformations while the matrix to convert into normal form	CO1	L1	2M
2.	Determine the rank of a matrix by reducing into normal form $A = \begin{pmatrix} 1 & 2 & 3 \\ 1 & 4 & 2 \\ 2 & 6 & 5 \end{pmatrix}$	CO1	L2	3M
3.	Is the matrix $A = \begin{pmatrix} 2 & 5 \\ 1 & -3 \end{pmatrix}$ verify the Cayley Hamilton theorem. If so determine A^{-1}	CO2	L2	2M
4.	Determine the sum and product of the Eigen values of the matrix without finding the Eigen values of the matrix $A = \begin{pmatrix} 1 & 0 & -1 \\ 1 & 2 & 1 \\ 2 & 2 & 3 \end{pmatrix}$	CO2	L2	3M
5.	Describe the test case conditions of Cauchy's root test	CO3	L1	2M
6.	Test the convergence of the series $1 + \frac{1}{2} + \frac{1.3}{2.4} + \frac{1.3.5}{2.4.6} + \cdots \ldots\ldots$	CO3	L2	3M
7.	Describe the Cauchy's mean value theorem	CO4	L1	2M
8.	Evaluate $\int_0^{\frac{\pi}{2}} sin^{10}\theta \; d\theta$ by using the beta function	CO4	L2	3M
9.	Determine the Jacobian $\frac{\partial(u,v)}{\partial(x,y)}$ for $u = e^x \, siny, v = x + \log(siny)$.	CO5	L1	2M
10.	Determine the maximum value of $x^m y^n z^p$ when $x + y + z = a$.	CO5	L2	3M

Section B (Essay Questions)

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

Q. No.	Question	Course Outcome	B.T Level	Marks
11. A)	Reduce A to Echelon form and then to its row canonical form (or row reduced Echelon form) where $A = \begin{pmatrix} 1 & 3 & -1 & 2 \\ 0 & 11 & -5 & 3 \\ 2 & -5 & 3 & 1 \\ 4 & 1 & 1 & 5 \end{pmatrix}$	CO1	L3	10M
	OR			
B)	Determine the solution of the system of equation by Gauss-Jordan method $3x + 3y + 2z = 1, x + 2y = 4, 10y + 3z = -2, 2x - 3y - z = 5$.	CO1	L3	10M
12. A)	Diagonalize the matrix $A = \begin{pmatrix} 1 & 6 & 2 \\ 1 & 2 & 0 \\ 0 & 0 & 3 \end{pmatrix}$ by finding its Eigen values and Eigen vectors.	CO2	L3	10M
	OR			
B)	Verify the Cayley-Hamilton theorem for the matrix $A = \begin{pmatrix} 1 & 4 & -3 \\ 0 & 3 & 1 \\ 0 & 2 & -1 \end{pmatrix}$. Also compute (i) A^{-1} (ii) A^5	CO2	L3	10M

13. A)	Test for convergence of the series $\frac{1^2}{2^2}+\frac{1^2.3^2}{2^2.4^2}+\frac{1^2.3^2.5^2}{2^2.4^2.6^2}+$-------	CO3	L3	10M
	OR			
B)	Test for convergence of the series $\sum(\frac{n+1}{2n+5})^n$	CO3	L3	10M
14. A)	Use the langrage's mean value theorem to prove that if $0<u<v, \frac{v-u}{1+v^2}<tan^{-1}v-tan^{-1}u<\frac{v+u}{1+v^2}$.	CO4	L3	10M
	OR			
B)	Evaluate $\int_0^2 x\sqrt[3]{8-x^3}\,dx$	CO4	L3	10M
15. A)	Determine the dimensions of a rectangular box of maximum capacity whose surface area is 108 Sq. inches when (i) box is open at the top (ii) box is closed at the top.	CO5	L3	10M
	OR			
B)	Examine for functional dependency, if so, find the relation between them$u=\frac{x}{y}, v=\frac{x+y}{x-y}$	CO5	L3	10M