THE AMERICAN COLLEGE, MADURAI

(An Autonomous Institution Affiliated to Madurai Kamaraj University)

Re-accredited (2nd Cycle) by NAAC with Grade "A", CGPA – 3.46 on a 4-point scale

Backlog Arrear Examination, March 2021

MAT 2431/2551 **Max: 75 Marks**

Maths for Chemistry - I **Time: 3 hours**

Answer ANY FIVE questions **(5x15=75 Marks)**

1. Find the inverse of the matrix $A = \begin{pmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \end{pmatrix}$ using elementary operations.
2. Find the Eigen values and Eigen vectors of the matrix $A = \begin{pmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{pmatrix}$
3. Use Cayley Hamilton's theorem for the following matrix and find A^{-1}.

$$A = \begin{pmatrix} 1 & 0 & -2 \\ 2 & 2 & 4 \\ 0 & 0 & 2 \end{pmatrix}$$

4. Let G be the set of all real numbers except -1. Define * on G by a*b=a+b+ab. Then show that (G,*) is an abelian group.
5. A group of 10 rats fed on diet A and another group of 8 rats fed on different diet B recorded the following increase in weights in grams. Test whether diet A is superior to diet B. ($t_{0.05}$ = 2.12 for 16 d.f)

Diet A	5	6	8	1	12	4	3	9	6	10
Diet B	2	3	6	8	1	10	2	8	-	-

6. Evaluate $\int_0^1 \frac{1}{1+x}\,dx$, correct to three decimal places taking h = 0.5, 0.25 and 0.125 respectively using Simpson's and Trapezoidal rules.
7. (a) Show that the following system of equations is consistent and solve it. (8)

   x – 4y – 3z = -16, 4x – y + 6z = 16, 2x + 7y +12 z = 48, 5x – 5y + 3z = 0

   (b) Find the root of the equation x^3-2x-5=0 that lies between 2 and 3 using Newton-Raphson method. (7)

****