



# THE AMERICAN COLLEGE, MADURAI

(An Autonomous Institution Affiliated to Madurai Kamaraj University)  
Re-accredited (2<sup>nd</sup> Cycle) by NAAC with Grade "A", CGPA – 3.46 on a 4-point scale

## Backlog Arrear Examination, March 2021

**MAT/MAS 1431/1551**

**MATHS FOR PHYSICS- I**

**Time: 3 Hrs**

**Marks: 75**

**Answer any Five questions (5×15=75)**

1. Determine  $f(r)$  so that the vector  $\{f(r)r\}$  both solenoidal and irrotational.
2. Verify stoke's theorem when  $F = (2x - y)i - yz^2j - y^2zk$  where S is the upper hemisphere of the unit sphere  $x^2 + y^2 + z^2 = 1$ .

3. Find the eigen values and eigen vectors of the matrix 
$$\begin{bmatrix} 2 & -2 & 2 \\ 1 & 1 & 1 \\ 1 & 3 & -1 \end{bmatrix}$$
.

4. If  $u + v = (x - y)(x^2 + 4xy + y^2)$  and  $f(z) = u + iv$  find the analytic function of  $f(z)$

5. Evaluate  $\int_0^{2\pi} \frac{d\theta}{5 + 4\sin\theta}$  by using Contour integration.

6. (a) Prove that  $F = (y^2 \cos x + z^3)i + (2y \sin x - 4)j + (3xz^2 + 2)k$  is irrotational and find its scalar potential.

(b) Show that the equations  $x + y + z = 6$ ,  $x + 2y + 3z = 14$ ,  $x + 4y + 7z = 30$  are consistent and solve them.

7. (a) Evaluate  $\int_C \frac{e^z}{z^2 + 4} dz$  where C is  $|z - i| = 2$  using Cauchy's Integral formula.

(b) Evaluate  $\int_C \frac{dz}{2z + 3}$  where C is  $|z| = 2$  using Cauchy's Residue theorem.