# 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

**Course code: PGP 4521** **Time: 3 Hrs**
**Course Title: Mathematical Physics** **Max. Marks: 75**

**Answer any FIVE Questions** **5 x 15 = 75**

1. State and prove Cauchy's integral formula for a complex variable function, and obtain the nth derivative of the function with respect to $Z$.
2. Explain the evaluation of Residues for (i) Simple pole, (ii) Multipole of order m, and (iii) For a complex function of the type $f(Z) = \frac{g(Z)}{h(Z)}$.
3. Derive Cauchy residue theorem and explain the evaluation method for a definite integral of the form $\int_0^{2\pi} f(sin\theta, cos\theta)d\theta$
4. Prove the Recurrence relation for Bessel function,

   (i) $xJ_n'(x) = -nJ_n(x) + xJ_{n-1}(x)$ and (ii) $\frac{d}{dx}[x^{-n}J_n(x)] = -x^{-n}J_{n+1}(x)$
5. State and Prove Convolution Theorem.
6. State and prove Schwartz inequality. And show that the Schwartz inequality becomes and equality if and only if the two vectors are proportional.
7. What is a D3 group? What are its elements? Show that the elements form a group.

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