

**SECOND SEMESTER M.Sc. DEGREE EXAMINATION, APRIL 2024**  
**(Regular/Improvement/Supplementary)**

**PHYSICS**  
**FPHY2C06: MATHEMATICAL PHYSICS II**

**Time: 3 Hours**

**Maximum Weightage: 30**

**Part A: Short answer questions. Answer *all* questions. Each carries 1 weightage.**

1. State and explain Cauchy's Integral Theorem.
2. Explain the terms: a) Singularity; b) Non-isolated singularity.
3. What is an abelian group?
4. Distinguish between homomorphism and Isomorphism
5. Discuss about the generators of SO(2) group.
6. Mention any two problems solved using variation principle.
7. Explain the symmetry property of Greens function.
8. Obtain the eigen function expansion of Greens function.

**(8 × 1 = 8 weightage)**

**Part B: Essay questions. Answer any *two* questions. Each carries 5 weightage.**

9. Deduce the Cauchy Riemann Condition for a function to be analytic.
10. Show that a two fold homomorphism exists between SU(2) and SO(3) group.
11. Explain Separable Kernel method for finding the solution of an integral equation.
12. Define Greens function. Obtain the solution to the Poissons equation using Green's function.

**(2 × 5 = 10 weightage)**

**Part C: Problems. Answer any four questions. Each carries 3 weightage.**

13. Obtain the group of symmetry transformations of a square.
14. Obtain the Lorent series for the function  $F(z) = \frac{1}{(z+1)(z+3)}$  in the region  $1 < |z| < 3$ .
15. Prove that the inverse of the product of two elements of a group is the product of the inverse in reverse order.

**(P.T.O.)**

16. Show that the shortest distance between two points in the Euclidian plane is a straight line.
17. Find the Euler equation, if  $f = f(y_{xx}, y_x, y, x)$  assuming that  $y$  and  $y_x$  have fixed values at the end points of their interval of definition.
18. Maximize  $I(y) = \int_{x_1}^{x_2} (1 + y^2) dx$  where  $y(x_1) = y(x_2) = 0$ .
19. Starting with the ODE, integrate twice and derive the Volterra integral equation corresponding to  $y''(x) - y(x) = 0$ ;  $y(0) = 1$ ,  $y'(0) = -1$ .

**(4 x 3 = 12 weightage)**