C 42802 **(Pages : 2)** **Name.......................................**

Reg. No...................................

SECOND SEMESTER M.Sc. DEGREE (REGULAR/SUPPLEMENTARY) EXAMINATION, APRIL 2023

(CBCSS)

Physics

PHY 2C 06—MATHEMATICAL PHYSICS—II

(2019 Admission onwards)

Time : Three Hours Maximum : 30 Weightage

Section A

8 *Short questions answerable within* 7.5 *minutes.*
Answer **all** *questions, each question carries* 1 *weightage.*

1. Write the Cauchy-Reimann differential equations and explain their significance.
2. What conditions should be satisfied for a group to be abelian ?
3. Mention any two problems solved using the variation principle.
4. Find the Neumann series solution for the Fredholm integral equation of the second kind.
5. Enlist different types of integral transforms. Represent the mathematical form of any one of the integral transform.
6. Why is homomorphism also called multiple-isomorphism?
7. Describe Fredholm integral equation of first kind.
8. Briefly summarize the properties of Green's function.

($8 \times 1 = 8$ weightage)

Section B

4 *essay questions answerable within* 30 *minutes.*
Answer any **two** *questions, each question carries* 5 *weightage.*

9. Obtain the expansion of the Green's function for a boundary value problem in terms of the eigen functions of the corresponding eigen value problem.
10. Explain the operations associates with point groups that lead to representation of SO (2) and SO (3) groups.

Turn over

11. Deduce the Cauchy-Reimann condition for a function to be analytic.

12. Explain the Rayleigh-Ritz variation technique for the computation of approximate solutions to partial differentiation equations.

(2 × 5 = 10 weightage)

Section C

7 problems answerable within 15 minutes.
Answer any **four** *questions, each question carries 3 weightage.*

13. A complex variable $z = x + iy$. Check if z^{-1} is analytic ?

14. Find the residue of $\dfrac{z^3 - z^2 + 1}{z^3}$ at infinity.

15. Prove that group of order 3 is always cyclic.

16. Find Laurent series of function $f(z) = \dfrac{1}{(1 - z^2)}$ with centre at $z = 1$.

17. Solve the integral equation $s = \int_0^s e^{s-t}\, g(t)\, dt$.

18. Prove that the inverse of the product of two elements of a group is the product of the inverse in reverse order.

19. Maximize $\mathrm{I}(y) = \int_{x1}^{x2} 1 + y'^2\, dx$ where $y(x1) = y(x2) = 0$.

(4 × 3 = 12 Weightage)