C 4758 **(Pages : 2)** Name.......................................

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

SECOND SEMESTER M.Sc. DEGREE (REGULAR/SUPPLEMENTARY) EXAMINATION, APRIL 2021

(CBCSS)

Physics

PHY 2C 06—MATHEMATICAL PHYSICS-II

(2019 Admissions)

Time : Three Hours Maximum : 30 Weightage

General Instructions

1. *In cases where choices are provided, students can attend* **all** *questions in each section.*
2. *The minimum number of questions to be attended from the Section / Part shall remain the same.*
3. *There will be an overall ceiling for each Section / Part that is equivalent to the maximum weightage of the Section / Part.*

Section A

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

1. State and provide proof of Cauchy's integral formula.
2. Explain isomorphism.
3. Explain the method of Lagrange Multipliers briefly.
4. Describe a Fredholm integral equation of the second kind.
5. Explain the symmetry property of Dirac-delta function.
6. Discuss about the generators of the SU (2) group.
7. Mention any two problems solved using the variation principle.
8. Enlist different types of integral transforms. Represent the mathematical form of any one of the integral transform.

($8 \times 1 = 8$ weightage)

Section B

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

9. Discuss the representation of the two dimensional unitary group SU (2).

Turn over

10. Obtain the Green's function for a one-dimension operator.
11. Explain the Rayleigh-Ritz variation technique for the computation of approximate solutions to partial differentiation equations.
12. Deduce the Cauchy-Reimann condition for a function to be analytic.

(2 × 5 = 10 weightage)

Section C

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

13. Evaluate the integral $\oint\limits_{c} \frac{dz}{z^2 + z}$.
14. Prove that a group of order 4 may or may not be a cyclic group. Give example in both cases.
15. Find the residue of $f(z) = \frac{e^z}{z^2 + a^2}$ at its singularities.
16. Maximize $\mathrm{I}(y) = \int\limits_{x1}^{x2} 1 + y'^2 dx$ where $y(x1) = y(x2) = 0$.
17. Obtain the eigen functions for Green's function.
18. Solve the integral equation $\mathrm{S} = \int\limits_{0}^{s} e^{s-t} g(t)\, dt$
19. Find Laurent series of function $f(z) = \frac{1}{\left(1 - z^2\right)}$ with centre at $z = 1$.

(4 × 3 = 12 weightage)