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Name.......................................

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

SECOND SEMESTER M.Sc. DEGREE REGULAR/SUPPLEMENTARY EXAMINATION, APRIL 2024

(CBCSS)

Physics

PHY2C06—MATHEMATICAL PHYSICS – II

(2019 Admission onwards)

Time : Three Hours Maximum : 30 Weightage

Section A

Answer **all eight** *questions.*
Each question carries 1 *weightage.*

1. Distinguish between simply connected and multiple connected regions. Explain their relevance in complex analysis
2. Show that z* is not analytic
3. State and explain Cauchy's integral theorem
4. State the conditions for the formation of a group
5. Distinguish between reducible and irreducible representations
6. Draw the fundamental SU(3) representation weight diagrams for the u d s quarks and anti-quarks
7. Give any two different forms of Euler equation and show their equivalence
8. Distinguish between integral equations of I and II kinds.

(8 × 1 = 8 weightage)

Section B

Answer any **two** *questions.*
Each question carries 5 *weightage.*

9. Explain the term residue . State and prove Cauchy's residue theorem
10. a) Explain with examples: Cyclic groups, Cosets, Normal sub group and factor group.

    b) Distinguish between homomorphism and isomorphism with at least two properties. Give an example.

Turn over

11. Explain the features of calculus of variation . Derive Euler equation for a stationa

12. Give a brief account of quantum mechanical theory of scattering using Green's fu

(2 × 5 =

Section C

Answer any **four** *questions.*
Each question carries 3 weightage.

13. Evaluate the following integral by Cauchy's Integral formula $\oint \frac{dz}{z^2 - 1}$ b) $\oint \tan z$

contour of integration is a circle centered at origin and having radius = 2.

14. Find the classes and subgroups of the group of symmetry elements of a square (C

15. Using the calculus of variations, find the optical path near event horizon of a blac

16. Prove that any non-unitary representation of a finite group is equivalent to a repr
unitary matrices.

17. Find the Green's function to solve the following boundary value problem $y'' + k^2 y =$

initial condition $y(0) = 0, y(L) = 0$ where k and L are constants.

18. Derive the Volterra integral equation corresponding to :

a) $y''(x) - y(x) = 0$ with $y(0) = 0$ and $y'(0) = 1$.

b) $y''(x) - y(x) = 0$ with $y(0) = 1$ and $y'(0) = -1$.

19. Find the Neumann series solution for the integral equation :

$\phi(x) = 1 - 2\int_0^x t\phi(t)\,dt$.

(4 × 3 =