23P207 (Pages: 2) Name: .....

Reg.No: .....

SECOND SEMESTER M.Sc. DEGREE EXAMINATION, APRIL 2024

(CBCSS - PG)

(Regular/Supplementary/Improvement)

CC19P PHY2 C06 - MATHEMATICAL PHYSICS – II

(Physics)

(2019 Admission onwards)

Time : 3 Hours Maximum : 30 Weightage

Section A

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

1. Give a brief explanation of Laurent series.
2. Locate and name all the singularities of $f(z) = \frac{z^8+z^4+2}{(z-1)^3(3z+2)^2}$
3. What is an Abelian group? Give an example.
4. Define a subgroup. What is the difference between a subgroup and a proper subgroup?
5. What is meant by reducible representation.
6. Write the expression for Euler equation in the presence of constraints.
7. Write a short note on seperable Kernel method in solving integral equation.
8. What is meant by Sturm -Liouville equation? Name any two properties of one dimentional Greens's function.

(8 × 1 = 8 Weightage)

Section B

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

9. Explain the concept of poles. Prove Cauchy's residue theorem and obtain a formula to find the residue.
10. Compare Homomorphism and Isomorphism. Explain how SU(2) and SO(3) groups are homomorphic to each other.
11. Explain the concept of variation and hence determine the optical path near event horizon of a blackhole.
12. Explain the fourier transform method for solving integral equation. Illustrate with a suitable example.

(2 × 5 = 10 Weightage)

Section C

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

13. Find the analytic function for the following cases. (a) $u(x, y) = x^3 - 3xy^2$ (b) $v(x, y) = e^{-y} \sin x$.

14. Evaluate the integral, $I = \int_0^\infty \frac{\sin x}{x}\, dx$

15. Find the conjugate element of $C_2{}^a$ of the symmetry group of an equilateral triangle.

16. Obtain the Laplace equation using variational concept.

17. Transform the linear oscillator equation y''+ω^2 y=0 into an integral equation with y(0)=0 and y'(0)=1.

18. Show that Green's function is symmetric using Eigenfunction expansion method.

19. Solve the eigenvalue equation for the harmonic oscillator equation and find the corresponding eigenfunction. Use them to obtain the expression for Green's function using eigenfunction expansion.

(4 × 3 = 12 Weightage)

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