

22P207

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Name:

Reg.No:

SECOND SEMESTER M.Sc. DEGREE EXAMINATION, APRIL 2023

(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. Evaluate the differentiability of the function $f(z) = \frac{1}{z}$.
2. Briefly explain the difference between Taylor expansion and Laurent expansion.
3. State and prove the Rearrangement theorem.
4. Show that the identity element of a group is a class by itself.
5. Write a note on permutation groups.
6. What is Lagrangian multiplier in calculus of variation?
7. Explain the difference between Fredholm and Volterra integral equations.
8. Write a brief note on Sturm-Liouville equation.

(8 × 1 = 8 Weightage)

Section B

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

9. State and prove Cauchy's integral theorem. Illustrate with a suitable example.
10. Explain the homomorphism of groups. Establish the homomorphism between SU(2) and SO(3) groups.
11. Explain the concept of variation and hence determine the optical path near event horizon of a blackhole.
12. Discuss the technique of separable kernel for solving integral equation.

(2 × 5 = 10 Weightage)

Section C

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

13. Show that e^{z^2} has an essential singularity at infinity. {Hint: use Taylor expansion}
14. Use the residue theorem to evaluate the integral $I = \int_{-\infty}^{\infty} \frac{e^{ax}}{1+e^x} dx$ with $a > 0$.
15. Find out the conjugate element of C_3 of the symmetry group of equilateral triangle.

16. Obtain the Lagrangian equation of motion using variational principle.
17. Solve $\varphi(x) = x + \int_0^x (t - x)\varphi(t)dt$ using Laplace transform solution method.
18. Show that Green's function is symmetric using Eigenfunction expansion method.
19. Find the Green's function for $y''(x) + \lambda y(x) = 0$ with boundary conditions $y(0)=y(1)=0$.

(4 × 3 = 12 Weightage)
