21P207 (Pages: 2) Name: ....

Reg.No: ....

SECOND SEMESTER M.Sc. DEGREE EXAMINATION, APRIL 2022

(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. Locate and name all the singularities of $f(z)=\frac{z^8+z^4+2}{(z-1)^3(3z+2)^2}$
2. Find the residue of the function $f(z)=\frac{z}{(z-1)(z+1)^2}$ at z= -1.
3. State and prove Lagrange theorem of subgroups.
4. What is meant by reducible representation?
5. What are the features of an SO(2) group?
6. Give one application of Euler equation.
7. Write a short note on seperable Kernel method in solving integral equation.
8. Contrast the interpretation of Green's function in Sturm-Liouville eigenvalue equation with ordinary inhomogenous 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. Derive Euler’s equation by applying variational principle. How can it be generalized for the case of several dependent and several independent variables?
12. Solve the Fredholm integral $e^{-x^2}=\int_{-\infty}^{\infty} e^{-(x-t)^2}\varphi(t)dt$ using the Fourier convolution technique.

(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. Obtain the Laurent expansion of $\frac{ze^z}{(z-1)}$ about z = 1

15. Starting from an element subject to the only condition $A^n = E$, the identity element, such that n is the smallest integer satisfying the condition, generate the group.

16. Obtain an equation for a particle sliding on a cylindrical surface.

17. Derive the volterra integral equation corresponding to $y''(x) - y(x) = 0$, $y(0) = 0$, $y(0) = 1$.

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

19. Find the Green's function for operator L=d2dx2L=d2dx2 with boundary conditions y(0)=0 and y'(1)=0.

(4 × 3 = 12 Weightage)

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