D2APH2002 **(2 Pages)** **Name.....**
Reg.No.....

SECOND SEMESTER M.Sc. DEGREE EXAMINATION, APRIL 2021
PHYSICS
FPHY2C06: MATHEMATICAL PHYSICS-II

Time: 3 Hours **Maximum Weightage: 30**

Part A: Short answer questions. *All* questions can be answered. Each carries *one* weightage.

(Ceiling 6 weightage)

1. What you mean by pole and residue?
2. Explain any two applications of group theory in Physics.
3. Give the generators of SU(3) group.
4. Briefly explain Rayleigh-Ritz variational technique.
5. Prove that every cyclic group is abelian.
6. Explain separable kernels.
7. Give the rules for construction of character table.
8. Explain the relation between Green's function and Dirac Delta function.

Part B: Essay questions. *All* questions can be answered. Each carries *six* weightage.

(Ceiling 12 weightage)

9. Obtain Cauchy-Riemann conditions. Extent the result to multiply connected domains. Derive Cauchy's integral formula.
10. Construct the symmetry group of an equilateral triangle. Give its multiplication table, subgroups and classes.
11. What is Lagrangian multiplier in calculus of variation? Illustrate with example. What are its advantages and disadvantages?
12. Solve quantum mechanical scattering problem using a suitable Green's function.

(PTO)

Part C: Problems. *All* questions can be answered. Each carries *four* weightage.
(Ceiling 12 weightage)

13. Find the residues of a function $f(z) = \frac{ze^{iZ}}{z^4+a^4}$ at its poles.
14. What you mean by analyticity of a complex function. Check the analyticity of the complex function f(z) = ln z.
15. Show that Euler equation predicts that the shortest distance between two fixed points in Euclidean space is a straight line.
16. Show that the symmetry transformations of a square constitute a group.
17. Derive a Fredholm integral equation corresponding to

    $y''(x) - y(x) = 0$, $y(1) = 1, y(-1) = 1$

    By integrating twice and by forming the Green's function.
18. Solve using Newmann series

    $\phi(x) = 1 + \lambda^2 \int (x-t)\phi(t)\,dt$
19. Using Green's function method find the solution of oscillator equation

    $y''(x) + \lambda y(x) = 0$ $y(0) = y(1) = 0$.