

C 83629

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Name.....23.....

Reg. No.....

**SECOND SEMESTER M.Sc. DEGREE EXAMINATION, JUNE 2015**

(CUCSS)

Physics

PHY 2C 06 – MATHEMATICAL PHYSICS – II (4C)

(2012 Admissions)

Time : Three Hours

Maximum : 36 Weightage

**Section A**

*Answer all questions.*

*Each question carries a weightage of 1.*

1. Define an analytic function. Give an example.
2. Find the nature of singularity of the function  $f(z) = \exp(1/z)$ .
3. Indicate how a simply connected region is converted into a multiply connected region.
4. Give an example for an abelian group.
5. What is meant by irreducible representation?
6. Show that the identity element of a group is a class by itself.
7. Explain the concept of variation.
8. Prove the symmetry of Greens function.
9. What is the equation to a plane curve along which a particle acted upon by gravity alone would descent down?
10. Explain the conversion of a differential equation into an integral equation.
11. What are separable kernels?
12. How is Green's function related to spherical Bessel function?

(12 × 1 = 12 weightage)

**Section B**

*Answer any two questions.*

*Each question carries a weightage of 6.*

13. State and prove Cauchy's residue theorem.
14. Explain homomorphism of groups. Establish the homomorphism of SU (2) and SO (3).

Turn over

15. Solve the equation  $\phi(x) = f(x) + \lambda \int_a^b k(x, t) \phi(t) dt$  by the Neumann series method.
16. Derive Euler's equation for one independent and one dependent variable.

(2 × 6 = 12 weight)

### Section C

Answer any four questions.

Each question carries a weightage of 3.

17. Evaluate  $\int_C e^z/(z^2 + 1)^2$  where C is the circle  $|z - 1| = 3$ .
18. Show that every group of prime order is cyclic.
19. Expand  $f(z) = \ln(1 + z)$  as a Taylor series about  $z = 0$ .
20. Find the equation to a line connecting two parallel coaxial wire circles such that the revolving about the x-axis produces the minimum surface area.
21. Convert the equation  $y'' + \omega^2 y = 0$  to an integral equation.
22. From the lens equation  $1/u + 1/v = 1/f$ , find the minimum object image distance  $(u + v)$  for formation of real image, applying Lagrangian multipliers.

(4 × 3 = 12 weight)