

G 17003096



Reg. No.....

Name.....

M.Sc. DEGREE (C.S.S.) EXAMINATION, JULY 2017

Second Semester

Faculty of Science

Branch : II—Physics-A—Pure Physics

PH2 C05—MATHEMATICAL METHODS IN PHYSICS—II

(2012 Admission onwards)

Time : Three Hours

Maximum Weight : 30

Part A

Answer any six questions.

Weight 1 each.

1. Give the theorem to find the residue of a function $f(z)$ at infinity ?
2. State Cauchy's integral theorem.
3. Express Laurentz series of an analytic function $f(z)$ about center $z = z_0$.
4. State and prove addition theorem of Fourier transforms.
5. What is meant by Laplace transforms ?
6. Show that cyclic groups are abelian.
7. What is meant by irreducible representation of a group ?
8. What is a Lie group ?
9. Express Green's function for the Poisson's equation.
10. What is homomorphism ?

(6 × 1 = 6)

Part B

Answer any four questions.

Weight 2 each.

11. Evaluate the integral $\oint_C \frac{dz}{z^2 + z}$ where C is a circle defined by $|z| = |R| > 1$.
12. Find the residues of $f(z) = [z \exp(z)] / [(z - a)^3]$ at $z = a$.
13. Find the Fourier transform of the Gaussian distribution function $f(x) = N \exp(-\alpha x^2)$, where N and α are constants.

Turn over



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14. Obtain the irreducible representation of SU (2) group.
15. Solve Laplace's equation in spherical polar co-ordinates.
16. Explain the method of Green's function for solving non homogeneous differential equations.

(4 × 2 = 8)

Part C

Answer all questions.

Weight 4 each.

17. (a) State and prove the Cauchy-Riemann equations for a function of a complex variable to be analytic.

Or

- (b) State and prove Laurentz theorem of a complex function.

18. (a) Discuss the properties of inverse Laplace transform.

Or

- (b) State and prove convolution theorem in FT. Find the finite Fourier cosine transform of x . Obtain the FT of $\exp(-9x)$, $x > 0$.

19. (a) Give an example of a group which has a subgroup and constant multiplication table for its elements.

Or

- (b) State and prove the five important rules about irreducible representations and use them to derive a character table for C_{3v} point group.

20. (a) Derive heat conduction equation and solve it in two dimensional cartesian co-ordinates.

Or

- (b) Obtain Green's function for the Laplacian operator ∇^2 . Hence find an expression for the electrostatic potential at a point due to a given charge distribution.

(4 × 4 = 16)

