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Reg. No.....

Name.....

M.Sc. DEGREE (C.S.S.) EXAMINATION, JUNE 2019

Second Semester

Faculty of Science

Branch II—Physics-(A)-Pure Physics

PH2C05—MATHEMATICAL METHODS IN PHYSICS—II

(2012 Admission onwards)

Time : Three Hours Maximum Weight : 30

Part A (Short Answer Type Questions)

Answer any **six** *questions.*
Each question carries weight 1.

1. Explain the Cauchy-Riemann conditions.
2. What are singularities ? Explain.
3. State Cauchy's principle value theorem.
4. Briefly explain LT of a function.
5. State the applications of Fourier transform.
6. Briefly explain point group.
7. What is meant by irreducable representation ?
8. Explain homomorphism.
9. Give an example for non-linear partial differential equation.
10. Obtain the Green's function for Poisson equation.

(6 × 1 = 6)

Part B

Answer any **four** *questions.*
Each question carries weight 2.

11. State and prove Cauchy's integral formula.
12. Bring out the idea of poles and essential singular points with reference to the functions of a complex variable.

Turn over

13. Prove that $\mathrm{L}(t) = \frac{1}{s^2}$ and $\mathrm{L}(1) = \frac{1}{s}$ if $s > 0$.

14. Obtain the permutation group S_n. Show that any finite group of order n is a subgroup of S_n.

15. Distinguish between reducible and irreducible representations.

16. Solve $2z + p^2 + qy + 2y^2 = 0$.

(4 × 2 = 8)

Part C

Answer **all** *questions.*
Each question carries weight 4.

17. (a) State and prove : (i) Cauchy theorem ; (ii) Cauchy's integral formula.

Or

(b) Solve $\int_{-\infty}^{+\infty} \frac{e^{i3x}}{\left(x^2+2\right)^2\left(e^{2x}+1\right)}\,dx$ using residue theorem.

18. (a) Obtain the Fourier sine and cosine integrals of $f(x) = e^{-kx}$ $(x > 0, k > 0)$.

Or

(b) Apply Laplace transform to a driven oscillator and obtain the solution of the differential equation.

19. (a) Obtain the proof of unitarity theorem. Bring out any one application.

Or

(b) State and prove equivalence theorem.

20. (a) Obtain the solution of Poisson's equation and discuss heat equation in one dimension.

Or

(b) Discuss the two dimensional heat flow and explain the conclusions arrived at.

(4 × 4 = 16)