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Reg. No.....

Name.....

M.Sc. DEGREE (C.S.S.) EXAMINATION, JUNE 2018

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. What is meant by an analytic function ?
2. Write down Cauchy's integral formula.
3. Briefly explain residue theorem.
4. Illustrate Laplace transform.
5. What is the Fourier transform of a square wave ?
6. Briefly explain damped oscillations with Laplace transform.
7. Give the features of reduced representation.
8. Explain isomorphism.
9. Give the boundary conditions for partial differential equations.
10. State the heat equation.

(6 × 1 = 6)

Part B

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

11. State and prove Cauchy theorem.
12. If z is a complex variable, determine whether $f(z) = |z|^2$ has a derivative anywhere.
13. Find the Laplace transforms of (i) sin at ; and (ii) cosh at.

Turn over

14. Find the inverse transform of $\log_e \left(1 = \frac{w^2}{s^2}\right)$.

15. State and explain great orthogonality theorem.

16. Solve (i) $x^2\ p^2 + y^2\ q^2 = z^2$; and (ii) $(y - x)(qy - px) = \left(p - q^2\right)$.

(4 × 2 = 8)

Part C

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

17. (a) Obtain the Cauchy-Riemann conditions for a function $f(z)$ to be analytic. Show that $f^1(z)$ does not exist at any point if $f(z) = 2x + ix\ y^2$.

Or

(b) Obtain the Lorentz series expansion of a function around an isolated singular point.

18. (a) Obtain the Fourier transform of full wave rectifier output and that of a square wave too.

Or

(b) Apply inverse Laplace transform to LCR circuit and arrive at the conclusions.

19. (a) Discuss the group symmetries of a square and write its multiplication table.

Or

(b) State and prove the important rules for group representation and use them to derive the character table for C_{3V} point group.

20. (a) Obtain the solution of two dimensional Laplace's equation in cylindrical co-ordinates.

Or

(b) Discuss the steady flow of heat in two dimension and arrive at the solutions.

(4 × 4 = 16)