

92031

B.Sc. 3rd Semester (Hons) New Scheme

Examination, December-2015

PHYSICS

Paper-PHY-301

Mathematical Physics-III

Time allowed : 3 hours]

[Maximum marks : 40

Note : Attempt five questions in all selecting at least two questions from each unit.

Unit-I

1. Using De-Moivre's Theorem find all the roots of $x^{12} - 1 = 0$ and identify the roots which are also the roots of $x^4 - x^2 + 1 = 0$. 8
2. (a) Determine the analytic function $f(z) = u + iv$, given that $3u + 2v = y^2 - x^2 + 16xy$. 4
(b) Show that an analytic function with complete real part is constant. 4
3. (a) Explain Cauchy integral formula. 4
(b) State and prove Morera Theorem. 4

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(2)

4. (a) Find the first four terms of the Taylor series expansion of the complex variable function

$$f(z) = \frac{z+1}{(z-3)(z-4)}$$

about $z = 2$. Find the region of convergence. 4

- (b) Find the residue of $f(z) = \frac{ze^z}{(z-a)^3}$ at it's pole. 4

Unit-II

5. Using Contour integration, evaluate the real integral

$$\int_0^{\pi} \frac{1+2\cos\theta}{5+4\cos\theta} \cdot d\theta$$

8

6. Find the power series solution of

$$(1-x^2)y'' - 2xy' + 2y = 0 \text{ about } x = 0.$$

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7. Prove that

$$(a) J_{\frac{1}{2}}(x) = \sqrt{\frac{2}{\pi x}} \cdot \sin x.$$

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$$(b) J_{-\frac{1}{2}}(x) = \sqrt{\frac{2}{\pi x}} \cdot \cos x.$$

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8. Explain Legendre, equation and Legendre's Polynomial

$$P_n(x).$$

8

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