

M.Sc. (Physics) (NEP Pattern) Semester-I  
**NEP-236-1 / 01MSCPH4.1 - Paper-IV : Complex Analysis and Numerical  
Methods**

P. Pages : 2

Time : Three Hours



**GUG/S/25/15137**

Max. Marks : 80

**Either:**

1. a) State and prove Cauchy theorem. 8
- b) Determine whether the following function are analytic or not? 8
- i)  $1/z$  and
- ii)  $e^x(\cos y + i \sin y)$

**OR**

- e) Prove that the condition necessary for a function  $f(z) = u + iv$  to be analytic at all the point in a region R are  $\frac{\partial u}{\partial x} = \frac{\partial v}{\partial y}$  and  $\frac{\partial u}{\partial y} = -\frac{\partial v}{\partial x}$  8
- f) State and prove Cauchy integral formula. 8

**Either:**

2. a) Define the term singularity point. Differentiate between isolated and non isolated singularity. 8
- b) How one can find the residue. 8
- i) At simple pole
- ii) At pole of order n

**OR**

- e) Determine the poles of the function  $z$  8
- $f(z) = \frac{1}{z^4 + 1}$
- f) Evaluate following integral using residue theorem. 8
- i)  $\int_c \frac{1+z}{z(2-z)} dz$ , where c is circle  $|Z|=1$ .
- ii)  $\int_c \frac{4-3z}{z(z-1)(z-2)} dz$ , where C is circle  $|Z|=\frac{3}{2}$ .

**Either:**

3. a) Obtain the secant general formula for finding the root of the equation. 8
- b) Using Bisection methods find the root of  $x^3 - 5x + 3 = 0$  correct upto 4 decimal places. 8

**OR**

- e) Obtain the expression for false position method. 8
- f) Explain Newton – Raphson Method. 8

**Either:**

4. a) Deduce the formula for Newton's Dividend difference. 8
- b) Deduce the general formula for Lagrange's interpolation. 8

**OR**

- e) Deduce the formula for Linear least square. 8
- f) Explain Simpsons  $\frac{1}{3}$ <sup>rd</sup> rule and obtain the formula for it. 8

5. Attempt all the followings.

- a) Explain Complex numbers. 4
- b) Explain branch points. 4
- c) Explain Bisection Method. 4
- d) Explain the Runge – Kutta Method. 4

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