

M.Sc. (Physics) (CBCS Pattern) Semester-I
PSCPHYT02 - Complex Analysis and Numerical Methods Paper-II

P. Pages : 2

Time : Three Hours



GUG/S/25/11180

Max. Marks : 80

Either :

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

OR

- e) Prove that the conditions necessary for a function $f(z) = u + iv$ to be analytic at all the points 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 theorem. 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 the 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 Linear least square. 8
- b) Deduce the general formula for Lagrange's interpolation. 8

OR

- e) Deduce the formula for Newton's Dividend difference. 8
- f) Explain Simpsons $\frac{1}{3}$ rd rule and obtain the formula for it. 8

5. Attempt all of the following.
- a) Explain Complex numbers. 4
- b) Explain branch points. 4
- c) Explain Iteration Method. 4
- d) Explain the Runge – Kutta method. 4
