M.Sc.- I (Physics) (CBCS Pattern) Sem-I

PSCPHYT02 / PSCPHY02 - Paper-II : Complex Analysis and Numerical Method

P. Pages : 2 **GUG/W/22/11180**

Time : Three Hours * 1 9 3 4 * Max. Marks : 80

Note : All questions are compulsory and carry equal marks.

Either:

1. a) Find the values of c_1 and c_2 such that the function **8**

$$f(z) = x^2 + c_1y^2 - 2xy + i\left(c_2x^2 - y^2 + 2xy\right)$$

is analytic. Also find F'(z)

b) Evaluate : $\int_c \frac{2}{\left(z^2 - 3z + 2\right)} dz$ **8**

by using Cauchy's integral formula where C is circle |z - 2) = ½

OR

e) Prove that If a function F(z) is analytic and its derivative F'(z) continuous at all points inside and an a simple closed curve C, then $\int_c f(z)dz = 0$ **8**

f) Find the modulus and argument of the following complex numbers **8**

i) $\frac{1+2i}{1-(1-i)^2}$ ii) $\frac{(1+i)^2}{1-i}$

Either:

2. a) How one can find the residue- **8**

i) At simple pole ii) At pole of order n

b) Determine the poles and the residue at each pole of the function **8**

i) $F(z) = \frac{z^2}{(z-1)^2(z+2)}$ ii) F(z) = crt z

OR

e) Determine the poles of the function z $f(z) = \frac{1}{z^4+1}$ **8**

f) Define singularity of a function. Find the singularities of the functions **8**

i) $f(z) = \sin 1/z$ ii) $g(z) = \frac{e1/z}{z^2}$

Either:

3. a) Using Bisection methods find the root of $x^3 - 5x + 3 = 0$ correct upto 4 decimal places **8**

b) Find the root of equation cosx = 3x-1 using iteration method correct upto 3 decimal places **8**

OR

e) Obtain the secant general formula for finding the root of the equation. **8**

f) Define finite difference. Explain the different types of finite differences. **8**

Either:

4. a) Deduce the formula for linear least squares. **8**

b) Obtain the general formula for trapezoidal rule and show it graphically. **8**

OR

e) Explain Simpson's $\frac{1}{3}^{rd}$ rule and obtain the formula for it **8**

f) Evaluate $\int_1^2 e^{-x/2}\,dx$ using Simpson's $1/3^{rd}$ rule **8**

5. Attempt all of the following

a) Explain Bisection method. **4**

b) Explain branch points. **4**

c) Define complex number and show that the sum and product of complex number and its conjugate complex are both real. **4**

d) What are divided differences? **4**

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