

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

P. Pages : 2

Time : Three Hours



GUG/W/24/15137(S)

Max. Marks : 80

Either :

1. a) State and prove Cauchy Integral formula. 8

b) Evaluate the following by Cauchy's Integral formula:

i) $\int_C \frac{4-3z}{z(z-1)(z-2)} dz$, where C is circle $|z| = \frac{3}{2}$. 4

ii) $\int_C \frac{z}{(z^2-3z+2)} dz$, where C is circle $|z-2| = \frac{1}{2}$. 4

OR

e) State and Prove Cauchy Theorem. 8

f) Find the modulus and principle argument of the complex number:

i) $\frac{1+2i}{1-(1-i)^2}$ 4

ii) $\frac{(1+i)^2}{1-i}$ 4

Either :

2. a) Discuss the method of finding residues at 8

i) Simple Pole

ii) Pole of order n

b) Evaluate poles and residues for following function's:

i) $f(z) = \frac{z^2}{(z-1)^2(z+2)}$ 4

ii) $f(z) = \frac{z^3}{(z-2)(z-3)}$ 4

OR

e) Evaluate the following using Residue theorem:

i) $\int_C \frac{\text{Coth}(z)}{(z-i)} dz, C: |z| = 2$ 4

ii) $\int_C \frac{dz}{\text{Cosh}(z)}, C: |z| = 2$ 4

f) Use Residue calculus to evaluate the following integral: 8

$$\int_0^{2\pi} \frac{1}{5-4\sin\theta} d\theta$$

Either :

3. a) Explain the false Position method in detail. 8

b) Define the finite difference. Explain the different type of finite difference. 8

OR

e) Find an approximate value of root of equation $x^3 + x - 1 = 0$ near $x = 1$, using the method of false Position two times. 8

f) Using Newton-Raphson method evaluate to two decimal figures, the root of equation $e^x = 3x$ lying between 0 and 1. 8

Either :

4. a) Deduce the general formula for Lagrange's interpolation. 8

b) Deduce the formula for linear least squares. 8

OR

e) Explain Simpson 1/3rd rule and obtain formula for it. 8

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

5. Answer the followings.

a) Show that $\log \frac{x+iy}{x-iy} = 2i \tan^{-1} \frac{y}{x}$ 4

b) Find the residue of $f(z) = \frac{1}{z^2(z-i)}$ at $z = i$ 4

c) Explain Trisection method. 4

d) Explain Simpson 3/8th rule. 4
