PSCPHYT02 - Core Paper-II : Complex Analysis and Numerical Methods

P. Pages : 2 | | | | | | **GUG/W/23/11180**

Time : Three Hours   *6207*   Max. Marks : 80

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Either:

1. a) State and prove Cauchy theorem. **8**

    b) State and prove Cauchy integral formula. **8**

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 $\dfrac{\partial u}{\partial x} = \dfrac{\partial v}{\partial y}$ and $\dfrac{\partial u}{\partial y} = -\dfrac{\partial v}{\partial x}$. **8**

    f) Determine whether the following function are analytic or not? **8**
       i)   1/z and
       ii) e^x (cos y + i sin y)

Either:

2. a) Define the term singularity point. Differentiate between isolated and non isolated singularity. **8**

    b) Find the singularity of the following function. **8**
       i) $f(z) = \sin \dfrac{1}{z}$

       ii) $g(z) = \dfrac{\theta^2}{z^2}$

OR

    e) How one can find the residue. **8**
       i)   At simple pole
       ii)   At pole of order n

    f) Applying calculus of residue, prove that **8**

$$I = \int_0^{2\pi} \frac{\sin^2 \theta}{a + b\cos\theta}\, d\theta = \frac{2\pi}{b^2}\left[a - \sqrt{(a^2 - b^2)} \right] \text{ where, } a > b > 0$$

Either:

3. a) Obtain the expression for false position method. **8**

    b) Explain Newton-Raphson Method. **8**

OR

e)	Define finite difference. Explain the different types of finite difference.	**8**
f)	Deduce the general formula for secant method.	**8**

Either:

4.	a)	Deduce the formula for Newton's Dividend difference.	**8**
	b)	Obtain the formula for trapezoidal rule.	**8**

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OR

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e)	Deduce the formula for Linear least square.	**8**
f)	Deduce the general formula for Lagrange's interpolation.	**8**

5. All questions are compulsory.

a)	Explain Complex numbers.	**4**
b)	Explain Branch points.	**4**
c)	Find out the root of the given equation using Newton's -Raphson method, $x^3 - 2x - 5$.	**4**
d)	Explain the Runge-Kutta method.	**4**

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