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

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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   **8**

point in a region R are $\dfrac{\partial u}{\partial x} = \dfrac{\partial v}{\partial y}$ and $\dfrac{\partial u}{\partial y} = -\dfrac{\partial v}{\partial x}$

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) $f(z) = \sin 1/z$

    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**

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

Either:

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

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

<div align="center">OR</div>

     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**

<div align="center">OR</div>

     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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