Department of Mathematics,
Indian Institute of Technology Patna

MA 218, Complex Analysis

Quiz-2. April 19, 2023 Maximum Marks: 10

Instruction: Please do not forget to write your **name and roll number** in the answer sheet.

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(1) Classify the nature of singularity of the function

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

and compute the residue. 2 marks.

(2) If $f(z)$ is analytic at z_0 such that $f(z_0) \neq 0$ and $g(z)$ has a zero of order 2 at z_0. Then show that

$$Res_{z=z_0} \frac{f(z)}{g(z)} = \frac{6f'(z_0)g''(z_0) - 2f(z_0)g'''(z_0)}{3\{g''(z_0)\}^2}.$$

2 marks.

(3) Evaluate the integral

$$\int_C \frac{1}{(z+i)} dz.$$

where C is the square with vertices $2-2i$, $2+2i$, $-2+2i$ and $-2-2i$. 2 marks.

(4) Evaluate the integral

$$\int_C \frac{4z-5}{(z^2-z)} dz,$$

where C is the positively oriented circle centered at origin with radius 2. 2 marks.

(5) Evaluate the integral

$$\int_0^\infty \frac{xsin2x}{(x^2+3)} dx$$

2 marks.