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Total No. of Printed Pages: [01]

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B.Sc. (Hons.) Math (Semester – 6th)

COMPLEX ANALYSIS

Subject Code: BMATS1602

Paper ID: [19131227]

Time: 03 Hours

Maximum Marks: 60

Instruction for candidates:

1. Section A is compulsory. It consists of 10 parts of two marks each.
2. Section B consist of 5 questions of 5 marks each. The student has to attempt any 4 questions out of it.
3. Section C consist of 3 questions of 10 marks each. The student has to attempt any 2 questions.

Section – A

(2 marks each)

Q1. Attempt the following:

- a. Define Analytic function.
- b. Derive C-R equations in polar form.
- c. Prove that analytic function $f(z) = u + iv$ satisfies Laplace equations.
- d. State Laurents's theorem.
- e. Prove that Prilinear transformation maps cross ratio to cross ratio (preserves cross ratio).
- f. Prove that $w = cz$ maps circles into circle.
- g. Define Bilinear transformtions.
- h. Expand $f(z) = \frac{1}{(z-1)(z-2)}$ in the region $|z| > 2$.
- i. What is the significance of stereographic projection?
- j. Define any two types of singular points.

Section – B

(5 marks each)

- Q2. Expand $f(z) = \frac{1}{z(z^2-3z+2)}$ for the regions $0 < |z| < 1$ and $1 < |z| < 2$
- Q3. Obtain the Taylor series for the function $f(z) = e^z$ about $z = 0$.
- Q4. Check whether the $f(z) = e^{-x}(\text{Cos}y + i \text{Siny})$ is analytic or not.
- Q5. State and prove Taylors' theorem.
- Q6. Prove that the function $f(z) = \sqrt{|xy|}$ is not analytic at origin though C-R = ns are satisfied there at.

Section – C

(10 marks each)

- Q7. State and Prove Necessary and Sufficient conditions for the function to be analytic.
- Q8. Define conformal transformations and prove that every analytic function makes conformal transformation provided $f'(z) \neq 0$
- Q9. a. If $u + 2v = x^2 + 3xy - y^2$, find analytic function $f(z)$
b. Find the Bilinear transformation which maps $z = 1, i, -1$ into $w = i, 0, -i$ hence find image of $|z| < 1$