LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – **MATHEMATICS**

SIXTH SEMESTER – **APRIL 2019**

MT 6606– COMPLEX ANALYSIS

Date: 03-04-2019 Dept. No. Max. : 100 Marks

Time: 09:00-12:00

Part-A

Answer ALL The Questions **(10X 2=20)**

1. Define an analytic function and give an example.
2. Verify Cauchy Riemann equationfor $f(z) = z^3$.
3. Define conformal mapping.
4. Find critical point for $w = sinz$.
5. Define simply connected region.
6. Find Maclaurin's seriesexpansion for $f(z) = e^z$.
7. Evaluate $\int_C \frac{zdz}{z-2}$ where C is the circle $|z| = 1$.
8. Find the zeros of $f(z) = \frac{z^2+1}{1-z^2}$
9. Define a bilinear transformation.
10. Define Removable singularity.

Part-B

Answer Any Five Questions **(5 X 8 = 40)**

11. State and prove Laurent's theorem.
12. Let f be analytic in a region D and $f'(z_0) \neq 0$ for $z_0 \in D$. Prove that f is conformal at z_0.
13. Find bilinear transformation which maps the points $z_1 = 2, z_2 = i, z_3 = -2$ onto $w_1 = 1, w_2 = i, w_3 = -1$ respectively.
14. State and prove Liouville's theorem.
15. Evaluate: $\int_c \frac{e^{2z}}{(z+1)} dz$ *where* $C: |z| = 2$ *using cauchy integral formula.*
16. State and prove the fundamental theorem of algebra.
17. State and prove Maximum modulus theorem.
18. State and prove Rouche's theorem.

Part-C

Answer Any Two Question **(20 x2=40)**

19.(a) Derive C-R equations as necessary condition for $w = f(z)$ to be analytic.

(b) If $f(z) = u(x, y) + iv(x, y)$ is an analytic function and $u(x, y) = \frac{sin2x}{cosh2y+cos2x}$, find $f(z)$.

(10 +10)

20.(a) Find the image of the circle $|z - 3i| = 3$ under the map $w = \frac{1}{z}$.

(b) Using contour integration find $\int_0^\infty \frac{x^2}{(x^6+1)} dx$.

(8+12)

21.State and prove Taylor's Theorem.

22.(a) State and prove Cauchy integral formula .

(b) State and prove Argument principle.

(10+10)

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