



K25U 0159

Reg. No. :

Name :

**Sixth Semester B.Sc. Degree (CBCSS – OBE – Regular/Supplementary/
Improvement) Examination, April 2025
(2019 to 2022 Admissions)
CORE COURSE IN MATHEMATICS
6B11MAT : Complex Analysis**

Time : 3 Hours

Max. Marks : 48

PART – A

Answer **any 4** questions. **Each** question carries **1** mark.

1. Define a region in complex plane.
2. Evaluate $\oint_C e^z dz$ where C is the unit circle in counter clockwise direction.
3. State ML inequality for a complex function $f(z)$.
4. What do you mean by singular point of a complex function ?
5. Define residue of a function $f(z)$ at a singular point z_0 .

(4×1=4)

PART – B

Answer **any 8** questions. **Each** question carries **2** marks.

6. What do you mean by complex continuous function ? Give an example.
7. Show that $w = e^z$ is analytic everywhere.
8. Solve the equation $\cos z = 5$.
9. Evaluate $\oint_C \bar{z} dz$ where C is the unit circle in clockwise direction.

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10. Evaluate $\oint_C \frac{\cos z}{(z - \pi i)^2} dz$ where C is the circle $|z| = 4$ in counter clockwise direction.

11. Explain the idea of convergence of complex sequences. Give an example for a convergent complex sequence.

12. Prove that every absolutely convergent series is convergent.

13. Discuss the convergence of

$$\sum_{n=0}^{\infty} \frac{(100 + 75i)^n}{n!}.$$

14. Find the radius of convergence of the power series

$$\sum_{n=0}^{\infty} \frac{(2n)!}{(n!)^2} (z - 3i)^n.$$

15. State Laurent's theorem for a complex function $f(z)$.

16. Prove that the zeros of a non-zero analytic function $f(z)$ are isolated. **(8×2=16)**

PART – C

Answer **any 4** questions. **Each** question carries **4** marks.

17. Prove that an analytic function whose absolute value is a constant, is a constant function.

18. Prove that the function $w = \ln z$ analytic everywhere except at zero and on the negative real axis. Also find its derivative.

19. Evaluate $\int_C (z - z_0)^m dz$ where C is a circle with center at z_0 and radius r in counter clockwise direction.



20. If $f(z)$ is analytic in a simply connected domain D , then prove that the integral of $f(z)$ is independent of path in D .

21. Discuss the convergence of geometric series.

22. Find all the power series expansions of $\frac{1}{1-z}$ with center 0.

23. Integrate $f(z) = \frac{\sin z}{z^4}$ counter clockwise around the unit circle. **(4×4=16)**

PART – D

Answer **any 2** questions. **Each** question carries **6** marks.

24. State and prove the necessary condition for a function $f(z) = u(x, y) + iv(x, y)$ to be analytic at a point z_0 .

25. State and prove Cauchy's integral formula.

26. Find the Taylor's series for the function $f(z) = \frac{2z^2 + 9z + 5}{z^3 + z^2 - 8z - 12}$ at the point $z = 1$.

27. Find all Taylor and Laurent series of $f(z) = \frac{-2z + 3}{z^2 - 3z + 2}$ with center 0. **(2×6=12)**