Mid-West University

Examinations Management Office

Chance Exam-2082

M.Ed. Level / III Semester

Sub: Complex Variable and Numerical Analysis (MATH535)

Roll No. ....

Group 'A' **10×1=10**

Tick (✓) the Best Answer.

1. Real part of the complex number $f(z) = \frac{1}{1-z}$ is equals to ....
   a) $\frac{1-x}{(1-x)^2+y^2}$ b) $\frac{1+x}{(1-x)^2+y^2}$
   c) $\frac{1-x}{(1-x)^2-y^2}$ d) $\frac{1}{(1-y)^2-x^2}$

2. Which of the followings is true?
   (a) Differentiability does not imply continuity
   (b) Differentiability implies continuity
   (c) Continuity implies differentiability
   (d) There is no relation between continuity and differentiability.

3. If a sequence of functions $f_n(z)$ converges at every point of D then which is correct?
   a) $f_n(z)$ converges uniformly
   b) $f_n(z)$ converges absolutist
   c) $f_n(z)$ may or may not converges uniformly
   d) Both (b) and (c)

4. Every absolutely convergent series is ...
   a) Convergent conditionally
   b) Convergent
   c) Convergent uniformly
   d) Divergent

5. If f(z) is analytic within and on the boundary C of a simply connected region R and z_0 is any point within C then f(z_0) is given by
   a) $\frac{1}{2\pi i}\int \frac{f(z)}{(z-z_0)^2}$
   b) $\frac{1}{2\pi i}\int \frac{f(z)}{(z-z_0)}$
   c) $\frac{1}{2\pi}\int \frac{f(z)}{(z-z_0)^2}$
   d) $\int \frac{f(z)}{(z-z_0)^2}$

6. In Cauchy- Gaursat' s theorem, if f(z) is analytic within and on the closed contour C then the $\int f(z)dz$ is...
   a) 0 b) 1
   c) Infinite d) None of the above

7. Cauchy integral formula is concerned with...
   a) Annular region b) Closed disk
   c) Connected region d) Open disk

8. If $f(z)$ is an analytic function whose real part is constant, then $f(z)$ is...
   a) function of z b) function of x only
   c) function of y only d) constant

9. A function which is analytic everywhere in a complex plane is known as...
   a) Harmonic function b) differentiable function
   c) regular function d) entire function

10. The converse of Cauchy- integral theorem is ...
    a) Euler's theorem b) Liouville's theorem
    c) Morera's theorem d) Goursat's theorem

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Level: M.Ed. / III Semester — FM: 60

Time: 3 hrs. — PM: 30

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Candidates are requested to give their answers in their own words as far as practicable.

Attempt All the Questions.

Group 'B' — $6 \times 5 = 30$

1. Construct the analytic function f(x), where $u = e^{-x}\{(x^2 - y^2)Cosy + 2xy\ Sin\ y\}$.

2. Define with examples:
   (i) Rectifiable arc.
   (ii) Limit of a complex number z.

3. If a function $f(z)$ is analytic within and on a closed contour C. If z_0 be any point within C, then prove that $f^{/}(z) = \frac{1}{2\pi i}\int \frac{f(z}{(z-z_0)^2}dz$.

   Or

   Show that the series $\sum Z_n = \frac{n}{n+1}$ is not convergent.

4. Let $f(z)$ be an analytic and $f^{/}(z) \neq 0$ in a region R. Then the mapping $w = f(z)$ is conformal at all points of R. Prove it.

5. Using Newton's backward difference formula, construct an interpolating polynomial of degree 3 for the data: $f(-0.75) = -0.0718125, f(-0.5) = -0.02475, f(-0.25) = 0.3349375,$ $f(0) = 1.10100$. Hence find $f\left(-\frac{1}{3}\right)$.

6. State and prove Cauchy's Residue Theorem.

   Or

   If f(z) has a pole of order m at $z = z_0$ then the function $\emptyset(z) = (z - z_0)^m . f(z)$ has a removable singularity at z_0. Prove it.

Group 'C' — $2 \times 10 = 20$

7. State and prove Laurent's series for any analytic function $f(z)$.

8. If the function f(z) is analytic at all points interior to (within) and on a simple closed contour C then $\int f(z)dz = 0$.

   Or

   State Cauchy-Riemann equation and prove it.

THE END