Mid-West University
Examinations Management Office

End Semester Exam-2082

B.Ed. Level / V Semester

Sub: Fundamentals of Real Analysis (MATH451)

Roll No. ....

Group 'A' **10×1=10**

Tick (✓) the Best Answer.

1. Which of the following sets is bounded?
   (a) $\left\{\frac{1}{n}: n\epsilon N\right\}$ (b) $\left\{\frac{(-1)^n}{n}: n\epsilon N\right\}$
   (c) $\{x: a < x < b\}$ (d) All of the above

2. Which of the following set contains it's supremum?
   (a) $\{x: a \leq x < b\}$ (b) $\{x: a < x < b\}$
   (c) $\{x: a < x \leq b\}$ (d) $\{x: x > 0 \in R\}$

3. The set $\{x: 0 \leq x \leq 1\}$ is ...
   (a) an open set (b) a closed set
   (c) neither open nor closed (d) all of the above

4. A set N is called a neighborhood of a point x if for any $\varepsilon > 0$.
   (a) $(x-\varepsilon, x+\varepsilon) \subset N$ (b) $N \subset (x-\varepsilon, x+\varepsilon)$
   (c) $[x-\varepsilon, x+\varepsilon] \subset N$ (d) $N \subset [x-\varepsilon, x+\varepsilon]$

5. Which of the following is not a bounded sequence?
   (a) $\langle 1+(-1)^n \rangle$ (b) $\langle n^2 \rangle$
   (c) $\langle (-1)^n + \frac{1}{n} \rangle$ (d) $\langle \frac{((-1)^n)}{(n-1)!} \rangle$

6. A sequence $\langle u_n \rangle$ is called monotonic increasing if,
   (a) $u_{n+1} \geq u_n \ \forall n \in N$ (b) $u_n \geq u_{n+1} \ \forall n \in N$
   (c) $u_{n+1} > u_n \ \forall n \in N$ (d) $u_n > u_{n+1} \ \forall n \in N$

7. If $\sum u_n$ is a positive term series and $\lim\limits_{x \to \infty} n\left[\frac{u_n}{u_{n+1}} - 1\right] = L$ then,
   (a) Comparison test (b) Cauchy's root test
   (c) Raabe's test (d) D'Alemberts ratio test

8. The series $\sum \frac{1}{n^p}$ is convergent if
   (a) $p = 1$ (b) $p < 1$
   (c) $p \leq 1$ (d) $p > 1$

9. If f is continuous and one-one on an interval I, which of the following is true?
   (a) F is constant on I
   (b) F is strictly monotonic on I
   (c) F is strictly increasing on I
   (d) F is strictly decreasing on I

10. The value of 'C' of Lagrange's mean value theorem for f(x)=x(x-1) in [1,2] is given by,
    (a) $\frac{3}{4}$ (b) $\frac{5}{4}$
    (c) $\frac{7}{4}$ (d) $\frac{11}{6}$

Mid-West University

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End Semester Exam-2082

Level: B.Ed. / V 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. Supremum and infimum of a set S if exist are unique.

2. Define closed set with example. The union of an arbitrary family of open sets is open.

3. Define boundedness of sequence. Every bounded sequence has at least one limit point.

Or

A monotonic sequence $\langle u_n \rangle$ is convergent iff it is bounded.

4. Show that the series. $\frac{n^{n^2}}{(n+1)^{n^2}}$ is convergent by Cauchy's root test.

5. Define limit. Use ε, δ definition Show that $\lim_{x \to 5}(2x + 10) = 20$.

6. If f is derivable at g(x) & g is derivable at x then (fog) is derivable at x and (fog)′(x)=f′(g(x)) g′(x).

Or

Define derivability at a point. If f is derivable at x and is one-one on some nbd of x then the inverse of f is derivable at f(x) and $(f^{-1})'(f(x)) = \frac{1}{f'(x)}$ provided $f'(x) \neq 0$.

Group 'C' $2 \times 10 = 20$

7. (a) The open interval]01[is uncountable.

(b) A sequence $\{a_n\}$ converge to a real number L iff $\underline{\lim} a_n = \overline{\lim} a_n = L$

8. Show that the series.

$$1 + \frac{2^2}{3^2} + \frac{2^2.4^2}{3^2.5^2} + \frac{2^2.4^2.6^2}{3^2.5^2.7^2} + \cdots + \frac{0^2.2^2.4^2 \ldots\ldots (2n-2)^2}{1^2.3^2.5^2 \ldots\ldots (2n-1)^2}$$ is

convergent by Gauss test.

Or

State and prove Darboux theorem.

THE END