

Sir Gurudas Mahavidyalaya
B.Sc. (Hons.) Mathematics 2nd Semester
Internal Examination 2020

Paper : MTM-A-CC-3
(Attempt ALL questions and Justify your answers)

Time: 1 hour

Full Marks: 30+2 (Cleanliness)

- Q.1 Infimum of the set $(0, \infty)$ is
- (a) is a non-negative number.
 - (b) is a positive number.
 - (c) does not exist.
 - (d) none of these.
- Q.2 Which of the following is **not true** for a set in \mathbb{R} ?
- (a) any set not have an infimum in \mathbb{R} .
 - (b) Infimum of a set may not belong to the set.
 - (c) Infimum and supremum of a set may be equal.
 - (d) Supremum of a bounded below set always exists in \mathbb{R} .
- Q.3 Which of the following is **true** for a bounded below subset S of the set of real number \mathbb{R} ?
- (a) $\text{Sup}(cS) = c \text{Sup}(S)$ for $c \in \mathbb{R}$.
 - (b) $-\text{Inf}(S) = \text{Sup}(-S)$.
 - (c) $a \in S$ such that $a^2 > 0$ implies $a > 0$.
 - (d) none of these.
- Q.4 For $\epsilon = \frac{1}{8}$, the least natural number n such that terms of the sequence $\frac{1}{n} \in \epsilon$ - neighborhood of 0 is
- (a) 9
 - (b) 8
 - (c) ∞
 - (d) none of these.
- Q.5 Which of the following is **not true** for the following sequences?
- (a) $\lim_{n \rightarrow \infty} \left(\frac{n}{n^2+1} \right)$
 - (b) $\lim_{n \rightarrow \infty} \left(\frac{2n}{n+1} \right)$
 - (c) $\lim_{n \rightarrow \infty} \left(\frac{n^2}{n!} \right)$
 - (d) $\lim_{n \rightarrow \infty} (\sqrt{n^2 + 1} - n)$ does not exist.
- Q.6 Which of the following sequences is convergent?
- (a) $\{n\}$

- (b) $\{(-1)^n\}$
- (c) $\left\{\frac{\sin n}{n}\right\}$
- (d) none of these.

Q.7 Which of the following is **true**?

- (a) Every decreasing sequence of real number is convergent.
- (b) Every monotone sequence is convergent.
- (c) Constant sequence is not convergent.
- (d) $\left\{\frac{1}{\sqrt{n}}\right\}$ is convergent.

Q.8 $\text{Sup } \{\sqrt{n+1} - \sqrt{n}\}$ and $\text{Inf } \{\sqrt{n+1} - \sqrt{n}\}$ are

- (a) $\sqrt{2} + 1$ and 0 respectively.
- (b) $\frac{1}{\sqrt{2}+1}$ and 0 respectively.
- (c) both equal to 0
- (d) both equal to $\frac{1}{\sqrt{2}+1}$.

Q.9 Which of the following sets is countable?

- (a) The set $[0,1]$.
- (b) The set \mathbb{R} of all real numbers.
- (c) The set \mathbb{Q} of all rational numbers.
- (d) None of these.

Q.10 Which of the following series converges?

- (a) $\sum_{n=1}^{\infty} n$.
- (b) $\sum_{n=1}^{\infty} (-1)^{n+1}$.
- (c) $\sum_{n=1}^{\infty} (-1)^n \left(\frac{1}{n}\right)$.
- (d) $\sum_{n=1}^{\infty} \frac{1}{n}$.
