Question Bank (2023-24)

Subject –Mathematics I (Sem IV)

(Real Analysis)

Unit-I

1) Define-Closed Interval ,Open Interval, Semi Closed and semi open interval.

2) Define- Bounded Set ,Unbounded Set,Bounded Above,Bounded Below.

3) Theorem- Let X be a non-empty subser of R which is bounded above.Then a real number M is the supremum of X if and only if

(a) $x \leq M$, for all $x \in X$

(b) For each real number **$\varepsilon > 0$,there is a real number** $x \in X$ such that $x > M - \varepsilon$.

4) Let $X<Y \subseteq R$ be non empty bounded sets and $\alpha \in R$. Then

a)sup(X+Y)=Sup X +SupY

b)Inf(X+Y)=Inf X +InfY

5) Define Neighbourhoods. Prove that an open interval is a nbd of each of its pair.

6) Prove that a finite set is not a nbd of any of its points.

7) Define Open set.The union of an arbitrary collection of open set.

8) Theorem- Every Infinite bounded subset of R has a limit point.

9) Derived set of a set X is closed.

Unit-II

1) Theorem on Convergent Sequence.
2) Every convergent sequence has a unique limit.
3) Show that the sequence <xn>,Where Xn $=\frac{1}{2n}$ converges to 0.
4) Define-Operation on sequence, constant sequence.
5) Algebraic properties of convergent sequence.
6) Theorem-sandwich Theorem.
7) Theorem-A Monotonic increasing sequence is convergent, if and only if it is bounded.
8) Theorem on Cauchy sequence.

Unit-III

1) Theorem –Necessary and sufficient condition of a series
2) The Series $1+\frac{1}{2}+\frac{1}{3}+$......................$+\frac{1}{n}$ is not convergent.
3) The series $1+\frac{1}{3}+\frac{1}{5}+$.....................$+\frac{1}{2n-1}+$.....................is not convergent.
4) Theorem-If $\sum$ xn and $\sum yn$ be two given positive term series such that $\frac{Xn}{Yn}$ =l ≠0,where l is finite, then the two series $\sum$ Xn & $\sum$Yn are either both convergent or divrergent.
5) Theorem- Cauchy's Root Test.

6) Theorem- D’Alembert’s Ratio Test.

Unit-IV

1) Properties of Integeal equation.
2) If M and m be the supremum and infinite of a bounded function f on [a,b]then m(b-a)≤ L (p,f) ≤U(p,f) ≤M (b-a).
3) Theorem (Darboux’s theorem)
4) A bounded monotonic function f defined on [a,b]is integrable on[a,b].
5) Mean –Value Theorem for integral.