Sister Nibedita Government General Degree College for Girls
Department of Mathematics

Multiple Choice Questions : Select (a), (b), (c) or (d), whichever is correct.

1. An infinite subset of enumerable set is

a) countable b) uncountable c) finite d) none of the above

2. Derived set of (a,b) is

a) (a,b] b) Φ c) [a,b) d)[a,b]

3. ℝ-ℤ is

a) open set b) closed set c) clopen set d) none of the above

4. $I_n = [0, 1/n]$, where n is natural number. Then $\bigcap_{n=1}^{\infty} I_n$ is

a) (0,1/n) b) (0,1) c) Φ d) {0}

5. If $\{a_n\}$ is monotone increasing bounded sequence. Then $\{a_n\}$ is

a) always convergent b) always divergent c) oscillates finitely d) none of the above

6. $\lim_{n\to\infty} \frac{(n!)^{\frac{1}{n}}}{n}$ equals to

a) e b) 1/e c) 1 d) 0

7. Sum of two Cauchy sequence is

a) Cauchy b) not necessarily Cauchy c) never Cauchy d) bounded not necessarily

8. The limit of the sequence $\{x_n\}$, where $x_{n+1}=\sqrt{2+x_n}$,$x_1=\sqrt{2}$

a) √2 b) 2 c) 1 d) -1

Long Answer Type Questions:

1. Prove that a sequence cannot converge in more than one limit.
2. State and prove Cauchy Convergence criteria.
3. Let S be any non empty subset of R that is bounded above and let a be any real number then show that Sup(a+S)=a+SupS

4. Show that there exists a positive real number x such that $x^2=2$.
5. State completeness property of R
6. Let $\{x_n\}$ converges to x and $\{y_n\}$ be a sequence of non zero real numbers that converges to y and if $y \neq 0$,then show that $\{x_n/y_n\}$ converges to x/y.
7. Show that a convergent sequence is bounded. Is the converse true?
8. Find the limit of the sequence {sinn/n}.
9. State and prove Archimedean property of R.
10. Check whether the following sequences are Cauchy or not.
    a) $a_n=1+1/2!+1/3!+........+1/n!$
    b) $a_n=1+1/2+1/3+.....+1/n$
11. Using subsequence show that the sequence {cosn∏} is not convergent.
12. Let $a_n=1/(n+1)^2+1/(n+2)^2+.......+1/(n+n)^2$. Show that $\{a_n\}$ is monotone bounded and converges to 0.
13. Let $K=\{s+t^{1/2}: s,t \in \mathbb{Q}\}$.Show that K satisfies the following:
    a)x,y ε K then x+y ε K and xy ε K.
    b) for any non zero x and x ε K then 1/x ε K.
14. Show that union of infinite number of open set is open? Is it true for closed set?
15. Find the limit point of the set $\{1/m+1/n: m,n \in \mathbb{N}\}$.
16. Show that every infinite bounded set of real numbers has a limit point.
17. Intersection of two nbd of a point is nbd of that point.
18. Show that the set $S=\{x \in \mathbb{R} : 0<x<1\}$ is open but not closed.