TELANGANA UNIVERSITY
S.S.R. DEGREE COLLEGE, NIZAMABAD (C.C:5029)
III SEMESTER INTERNAL ASSESSMENT I EXAMINATIONS
MATHEMATICS (REAL ANALYSIS) QUESTION BANK

I. Multiple choice questions.

1. The sequence $\left[\frac{(-1)^n}{n}\right]$ is [a]

a. Convergent b. Divergent c. Oscillatory d. None of these

2. Every monotonically increasing sequence which is not bounded above diverges to [b]

a. $-\infty$ b. $+\infty$ c. 0 d. ε

3. If <f_n> and <S_n> are Cauchy sequences. Then [d]

a. <$f_n + S_n$> is a Cauchy sequence b. <$f_n - S_n$> is a Cauchy sequence

c. <$f_n S_n$> is a Cauchy sequence d. All the above

4. If lim s_n = k and lim t_n = l then [d]

a. $\lim(s_n - t_n) = k - l$ b. $\lim(s_n t_n) = k1$ c. $\lim\left(\frac{s_n}{t_n}\right) = \frac{k}{l}$ d. All the above

5. The sequence $(1+(-1)^n/n)$ is [a]

a. Convergent b. Divergent c. Oscillatory d. None of these

6. For a sequence of positive real numbers S_n, limS_n = $+\infty$ if and only if [a]

a. lim (l/s_n)=0 b. lim (l/s_n)= $+\infty$ c. lim(l/s_n) = $-\infty$ d. lim (l/s_n) = a,(a is finite)

7. If s_n be a sequence, then lim sup s_n is define as [b]

a. $\lim_{n\to\infty} \sup\{s_n : n < N\}$ b. $\lim_{n\to\infty} \sup\{s_n : n > N\}$ c. $\lim_{n\to\infty} \inf\{s_n : n < N\}$ d. $\lim_{n\to\infty} \inf\{s_n : n > N\}$

8. If sn be a sequence then, lim inf $\left|\frac{s_n+1}{s_n}\right|$ __________ lim inf $|s_n|^{\frac{1}{n}}$ [a]

a. $\leq$ b. $\geq$ c. = d. $\neq$

9. For p > 0, $\lim_{n\to\infty}\left[\frac{1}{n^p}\right] =$ [b]

a. 1 b. 0 c. $+\infty$ d. $-\infty$

10. For a sequence s_n in R, if S is a set of sub sequential limits of 's_n' then [c]

a. sup s = lim sup s_n b. inf s = lim inf s_n c. Both a & b d. Neither a nor b

11. The natural domain of f(x) = $\sqrt{4-x^2}$ is [b]

a. $\{x \in R : x \neq 0\}$ b. [-2,2] c. [0,1] d. [-1,1]

12. If f and g are real valued functions then, max (f,g)(x) = [d]

a. f(x)+g(x) b. f(x)g(x) c. $\frac{f(x)}{g(x)}$ d. max {f(x),g(x)}

13. If and g are real-valued functions then min (f,g) = [a]

a. $\frac{1}{2}(f+g) - \frac{1}{2}|f-g|$ b. –max(-f, -g) c. $\frac{1}{2}(a+b) + \frac{1}{2}|a-b|$ d. None

14. If (s_n) and (t_n) are sequences in (a,b) that converges to 'a' then [a]

a. lim f(s_n) = lim f(t_n) b. f(a) = lim f(s_n) c. lim f(s_n) $\neq$ limf(t_n) d. None

15.If f(x) = $\frac{1}{x^2}$ then f'(x) = [d]

a. $\frac{-1}{x^2}$ b. $\frac{1}{x}$ c. 0 d. $\frac{-2}{x^3}$

16. The domain of f(x) = $\frac{x^2-4}{x-2}$ is [a]

a. $(-\infty, 2) \cup (2, \infty)$ b. R c. s = ($-\infty$, b) d. (∞ , 2)

17. The domain of gof is [b]

a. {x$\in$dom(f) $\cap$ x$\in$dom(g)} b. {x$\in$dom(f);f(x)x$\in$dom(g)} c. dom(f) $\cap$ dom(g) d. R

18. Mean value theorem is given as [d]

a. f(x) = y b. $f'(x) = \frac{f(x)}{g(x)}$ c. f(x) = g(x) d. $f'(x) = \frac{f(b)-f(a)}{b-a}$

19. $\lim_{x\to 1} \frac{\sqrt{x}-1}{x-1} =$ [d]

a. 1 b. $\frac{-1}{2}$ c. 0 d. $\frac{1}{2}$

20. The function $f(x) = x^2$ is uniformly continuous on [a]

a. [-7,7] b. [7,7] c. (0,7) d. (-7,7)

II. Fill in the blanks

1. Every convergent sequence is bounded
2. Every Cauchy sequence is bounded
3. A sequence converges if and only if it is a Cauchy sequence
4. lim s_n = k and lim t_n = l then lim $(s_n + t_n)$ = k + l
5. If $<s_n>$ = l and $<f_n>$ = m, then lim $<s_n + f_n>$ = l+m
6. If s_n is unbounded increasing sequence then lim s_n = $+\infty$
7. If s_n converges to s_n then its subsequence s_{nk} converges to same limit i.e., s
8. $\sum \frac{1}{n} = +\infty$
9. If $(s_n) \to s$ and (t_n) is any sequence then lim sup $s_n t_n$ = s.lim sup t_n
10. Every bounded sequence has convergent subsequence
11. The set on which f is defined is called the domain
12. The function f is said to be continuous if it is continuous on dom(f)
13. If f and g are continuous at x_0 in R. Then max(f,g) is continuous at x_0
14. A real valued function f is said to be bounded if {f(x): $x \in$ dom(f)} is a bounded set
15. If f is uniformly continuous on a closed and bounded set S, then f is uniformly continuous
16. A function f is continuous in dom(f) = s if and only if $\lim_{x\to a^S} f(x) = f(a)$
17. If f is uniformly continuous on a set S and (s_n) is a Cauchy sequence in S then $(f(s_n))$ is a Cauchy sequence
18. A function $\overline{f}$ is an extension of a function f
19. If f and g are real-valued functions, then min(f,g)(x) = min{f(x), g(x)}
20. The domain of $\frac{f}{g}$ is the set $dom(f) \cap \{x \in dom(g) : g(x) \neq 0\}$

III. Short Answers.

1. Define Convergent sequence.
2. Define Monotone sequence.
3. Define Cauchy sequence.
4. State Alternating series theorem.
5. State Integral test.
6. Define Continuous function.
7. Define Uniform continuous function.
8. Define Sub sequence.
9. Define Limit of a function.
10. Define Limit Inferior and Limit superior.