**Department of Mathematics**

M.Sc. (I Year/I Sem) Question Bank

**Paper –II** (102), Subject: **Real Analysis**

**Unit – I**

1. Let S : N →R is defined by S(n) = then find the terms of the

Sequence {Sn} = {S1, S2, ….. Sn…..} [ ]

A)

B) {1, 2, 3, …… n…..}

C) {0, 1, 2, 3…….n ……}

D) {1, 1, ……. 1, ……}

E) None of these

2. Let then the range of the sequence is [ ]

A) {-1, -1, -1, -1, ……}

B) {-1, 1}

C) {0, -1, 0, -1 ……}

D) {1, 1, 1, 1 …….}

E) None of these

3. Let then its two sub-sequences { and { converges to

A) Same limit

B) Different limits

C) Either Same Limit or different limits

D) both converges to zero

E) None of these

4. If a sequence converges to then all its sub-sequences [ ]

A) Diverges to

B) May or may not be convergent to

C) Convergent to

D) Diverges to and Convergent to

E) None of these

5. The series is called convergent series if and only if the sequence {Sn}

of nth partial sums is [ ]

A) Absolute convergent

B) Divergent

C) Conditionally convergent

D) Convergent

E) None of these

6. A subset E of a metric space (X, d) is said to be closed in X if it

contains all its \_\_\_ [ ]

A) Isolated point

B) Interior point

C) Limit points

D) Either Isolated point or Interior point

E) None of these

7. A set is open iff its compliment is [ ]

A) Open

B) Closed

C) both Open and Closed

D) either Open or Closed

E) None of these

8. Every closed subset of a compact set is [ ]

A) Closed Set

B) Open Set

C) Perfect Set

D) Compact Set

E) None of these

9. Let f be a real valued function on (a, b) is afunction then f is said tobe monotonically increasing on (a,b) if a<x<y<b ⇒\_\_\_ [ ]

A)

B)

C)

D)

E)

10. In a complete metric space every Cauchy sequence is [ ]

A) Divergent

B) Absolutely convergent

C) Conditionally convergent

D) Convergent

E) All of these

11. Range of sequence is \_\_\_\_ [ ]

A) Finite

B) Infinite

C) Either finite or Infinite

D) Bounded

E) None of these

12. Let then upper bound of the sequence is [ ]

A) 1

B)

C)

D) 0

E)

13. If the two sub-sequences and of converges to same limit

Then sequence is [ ]

A) Converges

B) Diverges

C) either converges or diverges

D) neither Converges nor diverges

E) None of these

14. Every Cauchy Sequence is [ ]

A) Bounded

B) Unbounded

C) Bounded below

D) Bounded above

E) None of these

15. Let then infimum of is [ ]

A) n

B) 1

C) 2

D) does not exits

E) None of these

16. A sequence is said to be increasing sequence if [ ]

A)

B)

C)

D)

E)

17. If then the series is [ ]

A) Convergent

B) Divergent

C) Conditionally convergent

D) Either convergent or divergent

E) None of these

18. If is convergent then is [ ]

A) Convergent

B) Divergent

C) Conditionally Convergent

D) Absolutely Convergent

E) None of these

19. Set of real numbers and empty set are always [ ]

A) Closed Set

B) Open Set

C) Closed and Open

D) Bounded

E) None of these

20. A subset E of a metric space ‘X’ is said to be a compact if every open cover

of contains a [ ]

A) Sub Cover

B) Finite Sub Cover

C) Infinite Sub Cover

D) Either finite & infinite Sub Cover

E) None of these

21. A Subset E of R is compact ⇔ it is [ ]

A) Closed

B) Bounded

C) Closed and bounded

D) Open

E) Open and bounded

22. Two sets A and B of a metric space are said to be separated if [ ]

A)

B)

C) both

D) either or

E) None of these

23. Every neighbourhood is an [ ]

A) Open Set

B) Closed Set

C) Null Set

D) Zero Set

E) Perfect Set

24. If R – A is open set then A is [ ]

A) Open Set

B) Closed Set

C) Open and Closed Set

D) Perfect Set E) None of these

25. A sequence {Sn} is defined by is [ ]

A) Null Sequence

B) Constant Sequence

C) Manotonic Sequence

D) Bounded Sequence

E) Cauchy Sequence

26. A sequence {Sn} is said to be a bounded sequence if there exits M>0 such that [ ]

A)

B)

C)

D)

E)

27. A series of non-negative terms converges if and only if the sequence of

nth partial sums of the series is [ ]

A) Bounded above

B) Bounded below

C) Bounded Sequence

D) Unbounded sequence

E) Convergent

28. The product of two convergent series is [ ]

A) Convergent

B) Absolutely convergent

C) Conditionally convergent

D) Divergent

E) None of these

29. If f and g are real functions and if f(x) ≥ g(x) x then [ ]

A) f = g

B) f > g

C) f ≤ g

D) f < g

E) f ≥ g

30. Let X and Y are two metric spaces and E is subset or equal to X and let f maps E into Y

If p is a limit point of E then f is continuous at p iff\_\_\_\_ [ ]

31. Let = \_\_\_\_\_ [ ]

A)

B)

C)

D) f(v)

E) None of these

32. Every finite set is [ ]

A) Isolated Set

B) Infinite point Set

C) Compact Set

D) Non-Compact Set

E) None of these

33. Suppose ‘f’ is continuous mapping of a compact metric space ‘X’ into metric

space Y then f(X) is [ ]

A) Non-Compact

B) Closed

C) Open

D) Compact

E) None of these

34. The connected set in Real line R is [ ]

A) Closed B) Open

C) Compact D) Non- Compact

E) Interval

35. The set of all discontinuities of a monotonic function is [ ]

A) At least countable

B) Countable

C) Uncountable

D) Either Countable or Uncountable

E) None of these

36. For any metric space ‘X’ P/T the set (x) of all continuous bounded complex

valued function defined on X form [ ]

A) Metric Space

B) Complete Metric Space

C) Normed Space

D) Inner Product Space

E) Euclidean Space

37. Let f and g be two complex valuedcontinuous functions on a metric space X then [ ]

A) f + g is continuous

B) f.g is continuous C) f/g is continuous

D) All f+g, f.g, f/g are continuous

E) fg is bounded

**UNIT – II**

1. A partition of {a, b} has \_\_\_\_\_ points [ ]

A) n points

B) n+1 points

C) n-1 points

D) either n points or n+1 points

E) None of these

2. Suppose f is a real valued bounded function defined on [a, b] and

P = {a = xo, x1, ….xi-1, xi …… xn=b} a partition of [a,b] then Mi = [ ]

A) Sup {f(x) / x [xi-1, xi]}

B) Inf {f(x) / x [xi-1, xi]}

C) Either Sup {f(x) / x [xi-1, xi]} or Inf {f(x) / x [xi-1, xi]}

D) Sup {f(x) / x [xi-1, xi]} and Inf {f(x) / x [xi-1, xi]} E) None of these

3. The lower Riemann integral [ ]

A) Sup {U(P,f) / P

B) Inf {L(P,f) / P

C) Sup {L(P,f) / P

D) Inf {U(P,f) / P

E) None of these

4. Suppose f: [a, b] → R is a bounded function and is monotonically

increasing function if P1 and P2 are two partitions of [a, b] such that P1 P2 then [ ]

A)

B)

C) and

D) either or

E) None of these

5. Let f: [a,b]→R is a bounded function and is a monotonically increasing function and P be a partition of [a, b] then f is R.S. integrable if [ ]

A) Lower and Upper integral exists but not equal

B) Differentiable

C) Lower and Upper integral exists and equal

D) Lower integral does not exists

E) None of these

6. Let f: [a, b] → R is a bounded function and is a monotonically increasing function and P be a partition of [a, b] and if then there is a relation of upper integral and upper sum is [ ]

A) B)

C) D)

E)

7. The n+1 points of a partition of [a, b] has\_\_\_\_ number of sub- intervals [ ]

A) n+1 intervals

B) n-1 Sub intervals

C) n Sub intervals

D) either n+1 intervals or n sub intervals

E) None of these

8. If f(x) = 3 for all rational x and f(x)=4 for all irrational x then [ ]

A)

B)

C)

D) 2

E) None of these

9. If on [a, b] then is [ ]

A)

B)

C)

D) Lower and Upper Integrals exists but not equal

E) None of these

10. Suppose f: [a, b] → R is bounded function and is monotonic increasing

function on [a, b] and Let P = {a = x0, x1, . . . xn=b} be a partition of [a, b] and mi denote the

infimum of f(x)then L (P,f,) is defined as [ ]

A)

B)

C)

D)

E) None of these

11. For the function f(x)=0 for all irrational x & f(x)=1 for all rational x, then [ ]

A) f is Riemann integrable

B) f is not Riemann integrable

C) f(x) is differentiable

D) f is continuous

E) None of these

12. If f(x)=3 rational x and f(x) = 4 irrational x then [ ]

A)

B)

C)

D)

E) None of these

13. If P1, P2 be two partitions of [a, b] and PP\* and suppose f: [a, b]→R is bounded function

and monotonically increasing function then = [ ]

A)

B) C)

D)

E)

14. A function which is monotonic and bounded on a closed interval is [ ]

A) Differentiable

B) Continuous

C) R – integrable

D) not R – integrable

E) None of these

15. Suppose f is bounded and monotonically increasing on [a, b] then

on [a, b] ⇔ to each a partition such that [ ]

A)

B)

C)

D)

E)

16. If f, g on [a, b] then \_\_\_\_ on [a, b] [ ]

A) f g R(

B) f g R(

C) either f g R(f g R(

D) f g is differentiable

E) None of these

17. Suppose f ,g on [a,b] such that f(x) then [ ]

A)

B)

C)

D)

E)

18. If on [a, b] and on [a, b] then [ ]

A)

B)

C)

D)

E)

19. Let f : [a, b]→R be a continuous function then [ ]

A) f is differentiable on [a,b]

B) f is an increasing function [a,b]

C) f is Riemann integrable on [a,b]

D) f is decreasing function on [a, b]

E) f is not Riemann integrable on [a,b]

20. If f : [a, b]→R is bounded and : [a, b]→R is monotonic increasing then [ ]

A) exists

B) exists

C) and exists

D) does not exists

E) f is differentiable on [a, b]

21. Suppose f : [a, b]→R is defined by f(x)=k and if : [a, b]→R

is monotonically increasing function then on [a, b] and [ ]

A)

B)

C)

D)

E)

22. Suppose f is a bounded real valued function on [a, b] and has finite number of

discontinuities in [a, b] then [ ]

A) f is R - integrable

B) f is not R- integrable

C) f is differentiable

D) Lower and upper Integrals exist but not equal

E) None of these

23. If on [a,b] then [ ]

A) f2 is differentiable

B) f2 is R – integrable

C) f2 is not Riemann integrable

D) f2 is continuous

E) f2 is monotonic

24. Suppose on [a, b] and for any define then [ ]

A) F is continuous

B) F is differentiable

C) F is continuous and differentiable

D) Either continuous or differentiable

E) None of these

25. Suppose on [a, b] and assume that there is a differentiable function F

such that then [ ]

A) F (b) - F (a)

B) F (a) – F (b)

C) F(a) / F(b)

D) F(b)/F(a)

E) None of these

26. If P1, P2 be two partitions of [a,b] and P1 P2 then the partition P2 is

called as [ ]

A) Subset of P1

B) finer than P1

C) Proper subset of P1

D) Refinement of P1

E) finer than P1 or Refinement of P1

27. f:[a, b] is said to be R-integrable if [ ]

A)

B)

C)

D)

E) =

28. Every constant function defined on [a, b] is [ ]

A) Riemann integrable

B) Not Riemann Integrable

C) Differentiable

D) Lower and Upper integral exists but not equal

E) None of these

29. f is bounded and monotonically on [a, b] and if P, P\* are partitions of [a, b] P\*

then L(P,f, [ ]

A)

B)

C)

D)

E)

30. Suppose f:[a,b]→R is bounded function and is monotonically increasing

if m, M respectively denotes the Sup & Inf of f(x) on [a,b] then for any partition

P [ ]

A)

B) U(P, f, M (

C) L

D)

E) m(

31. Every Continuous function f on [a, b] is [ ]

A) B)

C) f is R-integrable D) but not equal

E) None of these

32. Every monotonic function defined on [a, b] is \_\_\_\_ where is continuous monotonic

increasing function [ ]

A) f is R-integrable

B) f is not R-integrable

C) f is differentiable

D) Lower integral exists

E) Upper integral exists

33. Suppose f is R-integrable on [a,b], mf(x) M x∈[a, b] and →R

is continuous then h: : [a, b]→R is such that [ ]

A) hR(

B) hR(

C) h is differentiable

D) h is not differentiable

E) None of these

34. Suppose f and g are function on [a, b] fR(, gR( on [a, b] where is monotonically increasing and cR then f+g on [a,b] and [ ]

A)

B)

C)

D)

E) None of these

35. Suppose then [ ]

A)

B)

C) either or

D)

E) m(

36. Suppose

and [ ]

A)

B)

C)

D)

E) None of these

37. Suppose are monotonic increasing functions both defined on [a, b]

and f is a function also defined on [a, b] then and on

[a, b] (c>0) & also is [ ]

A)

B)

C)

D)

38. Suppose is a monotonically strictly increasing continuous function defined on [A,B] onto [a, b] and f : [a, b]→R is such that fR ( on [a, b] where is monotonically increasing . If g = fo and = then on [A, B] and also is [ ]

A)

B)

C)

D)

E) None of these

39. Suppose F and G are differentiable functions such that F1=f and G1=g are

Riemann integrable on [a, b] then is [ ]

A)

B)

C)

D)

E) None of these

40. Suppose f 0 and f is continuous on [a, b] such then

we have [ ]

A)

B)

C)

D) either f(x)

E) f(x) = 0

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**UNIT – I ANSWERS KEY**

|  |  |  |
| --- | --- | --- |
| 1 | A |  |
| 2 | B | {-1,1} |
| 3 | B | Different limits |
| 4 | C | Convergent to |
| 5 | D | Convergent |
| 6 | C | Limit points |
| 7 | B | Closed |
| 8 | D | Compact set |
| 9 | D |  |
| 10 | D | Convergent |
| 11 | C | Either finite or infinite |
| 12 | A | 1 |
| 13 | C | converges |
| 14 | A | Bounded |
| 15 | B | 1 |
| 16 | A |  |
| 17 | D | Either convergent or divergent |
| 18 | D | Absolutely convergent |
| 19 | C | Both closed & open |
| 20 | B | Finite sub cover |
| 21 | C | Closed &bounded |
| 22 | C | both |
| 23 | A | Open set |
| 24 | B | closed |
| 25 | A | Null sequence |
| 26 | B |  |
| 27 | C | bounded |
| 28 | D | diverges |
| 29 | E | f ≥ g |
| 30 | A |  |
| 31 | B |  |
| 32 | C | Compact set |
| 33 | D | f(X) is compact |
| 34 | E | Intervel |
| 35 | A | At least countable |
| 36 | B | Complete metric space |
| 37 | D | All f+g, f.g, f/g are continuous |

**UNIT – II ANSWERS KEY**

|  |  |  |
| --- | --- | --- |
| 1 | B | n+1 points |
| 2 | A | Sup {f(x) / x [xi-1, xi]} |
| 3 | C | Sup {L(P,f) / P |
| 4 | C | and |
| 5 | C | Lower &upper integrals exists and equal |
| 6 | D |  |
| 7 | C | n- sub intervals |
| 8 | A |  |
| 9 | B | is R.S integrable |
| 10 | A |  |
| 11 | B | F is not R- integrable |
| 12 | A |  |
| 13 | C |  |
| 14 | C | R- integrable |
| 15 | B |  |
| 16 | A |  |
| 17 | A |  |
| 18 | D |  |
| 19 | C | f is Riemann integrable on [a b] |
| 20 | C | and exists |
| 21 | D |  |
| 22 | A | f is R- integrable |
| 23 | B | f2 is R-integrable |
| 24 | C | F is continuous & differentiable |
| 25 | A | F (b) - F (a) |
| 26 | E | finer than P1 or Refinement of P1 |
| 27 | B |  |
| 28 | A | Riemann integrable |
| 29 | D |  |
| 30 | D |  |
| 31 | C | R- integrable |
| 32 | A | R- integrable |
| 33 | B | hR( |
| 34 | C |  |
| 35 | D |  |
| 36 | A |  |
| 37 | B |  |
| 38 | D |  |
| 39 | C |  |
| 40 | E | f(x) = 0 |