

REAL ANALYSIS

Total marks: 100(Theory: 75, Internal Assessment: 25)

5 Periods (4 lectures +1 students' presentation),

(1st Week)

Algebraic and order properties of \mathbf{R} , Positive integers, Statement of well ordering principle, Least upper bound, Greatest lower bound, Completeness property of \mathbf{R}

Sections 1.3, 1.4 (Page 18), 1.5 (Pages 24 to 26, Statements of Theorem 1.5.10 and Corollary 1.5.11) [1]

(2nd Week)

Archimedean property, Denseness of the sets \mathbf{Q} and \mathbf{Q}^c in \mathbf{R} , Sequences, Convergence and divergence of sequence,

Sections 1.5 (From Theorem 1.5.12 onwards), 2.1 [1]

(3rd Week)

Limit theorems, Uniqueness of limit of a sequence, Bounded sequences, Algebra of limits of sequences, Monotonic sequence

Sections 2.2 (Statements of Theorem 2.2.5, Theorem 2.2.7 and Theorem 2.2.9), 2.3 [1]

(4th Week)

Subsequences, Nested interval theorem (without proof), Bolzano Weierstrass theorem, Cluster points

Section 2.5 (Pages 55 to 60) [1]

(5th Week)

Cauchy sequence, Infinite series: Sequence of partial sum, Convergence and divergence, Geometric series, Algebraic theory of series

Sections 2.6, 6.1(Pages 213 to 218) [1]

(6th Week)

Integral test (without proof), Comparison tests, Ratio test (without proof), Alternating series test, Absolute convergence and conditional convergence

Sections 6.1(Pages 219 to 222, Statements of Corollary 6.1.12) , 6.2 (Statement of Theorem 6.2.5) [1]

(7th Week)

Illustrations of Taylor's series &Maclaurin's series, Taylor's theorem (without proof)

Sections 6.4 [1]

(8thWeek)

Continuity, Removable discontinuity, Algebra of continuous functions, Sequential criterion of continuity

Section 3.4 (Statements of Theorem 3.4.11 and Theorem 3.4.16) [1]

(9thWeek)

Continuity at end points of $[a, b]$, Intermediate value theorem, Boundedness of a function, Uniform continuity

Sections 3.5 (Statement of Theorem 3.5.10), 3.6 [1]

(10thWeek)

Local maximum, Local minimum, Rolle's theorem, Mean value theorem, Monotonic function

Sections 4.3 [1]

(11thWeek)

Inverse function, Sequences and series of functions: Pointwise and uniform convergence,

Section 4.4 (Statements of Theorem 4.4.2 and Theorem 4.4.4), 7.1(Pages 258 to265) [1]

(12thWeek)

Weierstrass M -test (without proof), Consequences of uniform convergence
Section 7.1 (Pages 265 to 267), 7.2 (Statements of Theorem 7.2.3 and
Corollary 7.2.11) [1]

REFERENCE:

[1] Gerald G. Bilodeau, Paul R. Thie, G.E. Keough, An Introduction to Analysis, Jones and Bartlet India Pvt. Ltd., 2/e (2010)

SUGGESTED READING:

[2] Kenneth A. Ross, Elementary Analysis: The Theory of Calculus, Springer (2007)