Subject : Mathematics

Teacher Name : Archana Semester 3rd

Name of the Paper : Paper 1

Class: MSc. (Mathematics)

November 2020

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| Normed linear spaces, Banach spaces and examples, subspace of a Banach space, completion of a normed space, quotient space of a normed linear space and its completeness, product of normed spaces, finite dimensional normed spaces and subspaces, equivalent norms, compactness and finite dimension, F.Riesz’s lemma. Bounded and continuous linear operators, differentiation operator, integral operator, bounded linear extension, linear functionals, bounded linear functionals, continuity and boundedness, definite integral, canonical mapping, linear operators and functionals on finite dimensional spaces, normed spaces of operators, dual spaces with examples. (Scope of this section is as in relevant parts of Chapter 2 of ‘Introductory Functional Analysis with Applications’ by E.Kreyszig)  |

December 2020

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| Hahn-Banach theorem for real linear spaces, complex linear spaces and normed linear spaces, application to bounded linear functionals on C[a,b], Riesz-representation theorem for bounded linear functionals on C[a,b], adjoint operator, norm of the adjoint operator. Reflexive spaces, uniform boundedness theorem and some of its applications to the space of polynomials and fourier series. (Scope of this section is as in relevant parts of sections 4.1 to 4.7 of Chapter 4 of ‘Introductory Functional Analysis with Applications’ by E.Kreyszig) 9.6 of Chapter 9 of ‘Introductory Functional Analysis with Applications’ by E.Kreyszig. |

January2021

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| Strong and weak convergence, weak convergence in l p , convergence of sequences of operators, uniform operator convergence, strong operator convergence, weal operator convergence, strong and weak\* convergence of a sequence of functionals. Open mapping theorem, bounded inverse theorem, closed linear operators, closed graph theorem, differential operator, relation between closedness and boundedness of a linear operator. (Scope of this section is as in relevant parts of sections 4.8, 4.9, 4.12 and 4.13 of Chapter 4 of ‘Introductory Functional Analysis with Applications’ by E.Kreyszig) Inner product spaces, Hilbert spaces and their examples, pythagorean theorem, Apolloniu’s identity, Schwarz inequality, continuity of innerproduct, completion of an inner product space, subspace of a Hilbert space, orthogonal complements and direct sums, projection theorem, characterization of sets in Hilbert spaces whose space is dense  |

February 2021

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| Orthonormal sets and sequences, Bessel’s inequality, series related to orthonormal sequences and sets, total(complete) orthonormal sets and sequences, Parseval’s identity, separable Hilbert spaces.Representation of functionals on Hilbert spaces, Riesz representation theorem for bounded linear functionals on a Hilbert space, sesquilinear form, Riesz representation theorem for bounded sesquilinear forms on a Hilbert space. Hilbert adjoint operator, its existence and uniqueness, properties of Hilbert adjoint operators, self adjoint, unitary, normal, positive and projection operators |