

MM-06
INTEGRATION THEORY AND
FUNCTIONAL ANALYSIS

(Questions will be set from each unit/section)

Units	Topics
Integration Theory	
I	Signed measure. Hahn decomposition theorem, mutually singular measures. Radon-Nikodym theorem. Lebesgue decomposition. Riesz representation theorem. Extension theorem (Caratheodory), Lebesgue-Stieltjes integral, product measures, Fubini's theorem.
II	Baire sets. Baire measure, continuous functions with compact support. Regularity of measures on locally compact spaces. Integration of continuous functions with compact support, Riesz-Markoff theorem. (Unit I & II - As given in Real Analysis by H.L. Royden)
Functional Analysis	
III	Normed Linear Spaces, Banach Spaces with examples, Quotient space of normed linear space and its completeness, bounded linear transformations, normed linear space of bounded linear transformations, dual (conjugate) spaces with examples, natural imbedding of a normed linear space in its second dual, open mapping theorem, closed graph theorem, uniform boundedness principle and its consequences. (As given in G.F. Simmon's book)
IV	Finite dimensional normed spaces and subspaces, Equivalent norms, finite dimensional normed linear spaces and compactness, Riesz lemma, Hahn Banach theorem for real linear space, complex linear space, and normed linear space, Adjoint operators, Reflexive spaces, Weak convergence, weak* Convergence. (As given in E. Kreyszig's book)
V	Inner product space, Hilbert space, Orthogonal complements, Orthonormal sets, Bessel's inequality, complete orthonormal sets and Parseval's identity, conjugate space H^* and reflexivity of Hilbert space, Adjoint of an operator on a Hilbert space, self - adjoint operators, positive, projection, normal and unitary operators. (As given in G.F. Simmoris book)