OPTION (I) INFORMATION THEORY

(Questions will be set from each unit/section)

Units	Topics
I	Measure of Information - Axioms for a measure of uncertainity. The Shannon entropy and its properties. Joint and conditional entropies. Transformation and its properties.
	Noiseless coding - Ingredients of noiseless coding problem. Uniquely decipherable codes. Necessary and sufficient condition for the existence of instantaneous codes. Construction of optimal codes.
II	Discrete Memory less Channel - Classification of channels. Information processed by a channel. Calculation of channel capacity. Decoding schemes. The ideal observer. The fundamental theorem of Information theory and its strong and weak converses.
	Contifnuous Channels - The time - discrete Gaussian channel. Uncertainty of an absolutely continuous random variable. The converse to the coding theorem for time-discrete Gaussain channel. The time - continuous Gaussain Channel. Band-limited channels.
III	Some imuitive properties of a measure of entropy - Symmetry, normalization, expansibility, boundedness, recursivity maximality, stability, additivity, subadditivity, nonnegativity, continuity, branching etc. and interconnections among them. Axiomatic characterization of the Shannon entropy due to shannon and Fadeev.
IV	Information functions, the fundamental equation of information, information functions continuous at the origin, nonnegative bounded information functions, measureable information functions and entropy. Axiomatic characterizations of the Shannon entropy due to Tverberg and Leo. The general solution of the fundamental equation of information. Derivations and their role in the study of information functions.
V	The branching property. Some characterizations of the Shannon entropy based upon the branching property. Entropies with the sum property. The Shannon inequality. Subadditive, additive entropies.
	The Renji entropies. Entropies and mean values. Average entropies and their equality optimal coding and the Renji entropies. Characterization of some measures of average code length.