Structural Reliability
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Lecture –50
Joint Probability Distributions (Part - 01)

We have reviewed the basics of random variables and discussed a number of discrete and continuous random variables that occur commonly in structural reliability those were univariate cases. Things become more interesting when random quantities vary together. For example the height and weight of some random individual the wave height and wave period at some location in the open seas the strength of cables manufactured from the same batch the 10 second gust pressures measured during a storm the soil properties measured in a grid and so, on and so, on. So, we are going to look at such things in this and the next lecture.

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And this is our plan we will start with the joint probability descriptions, the distribution function, the mass function, the density function and then the conditional counterparts. We will discuss joint moments particularly the covariance between a pair of random variables, the joint characteristic function, the joint moment generating function and then conditional moments. Then we will discuss independence between a pair of random variables and among a group of random variables.

And talk about the possible measures of dependence between a pair and then present some examples. Now in the univariate cases we discussed a number of named distributions in this joint case we are going to just look at the joint normal distribution and then discuss functions of random variables, derived distributions and linear combinations in particular and then end the lecture with the convergence of sequence of random variables and the law of large numbers.