Structural Reliability
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Lecture –61
Joint Probability Distributions (Part - 12)

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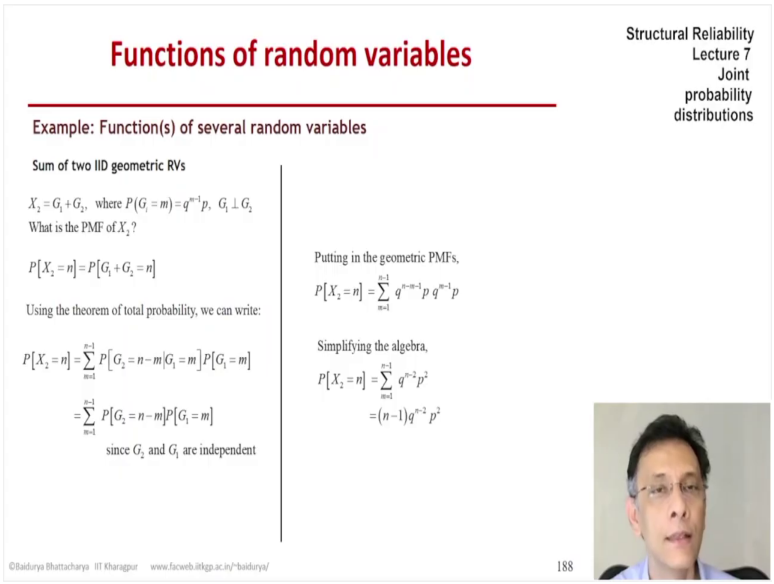

Our first example on functions of several random variables involves the sum of two discrete random variables. We are interested in the sum of G 1 + G 2 where G 1 and G 2 are IID geometric random variables with parameter P. So, we write the PMF of x2 simply in terms of G 1 + G 2. And now say we fix the value of G2 at any particular number m, so, then G2 is equal to n - m. So, with this idea we invoke the theorem of total probability and express the PMF of x2 as G 2 fixed at a particular m and G 2 equals n - m and we sum this over m from 1 to n - 1.

Now G 1 and G 2 are independent of each other. So, that conditional probability simplifies to the products as you see and then we can just substitute the geometric PMF for G 1 and G 2 and express the PMF of x 2 simply as the sum that you see on the screen. And going through the algebra we come up to the solution that the PMF of x 2 is n - 1 times q to the power n - 2 times p squared which is the well-known Pascal PMF for x 2.

So, here we showed that the sum of IID geometric random variables is the Pascal or the negative binomial distribution and here we had the example of the sum of two geometric random variables.