Structural Reliability
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Lecture –23
Review of Random Variables (Part - 06)

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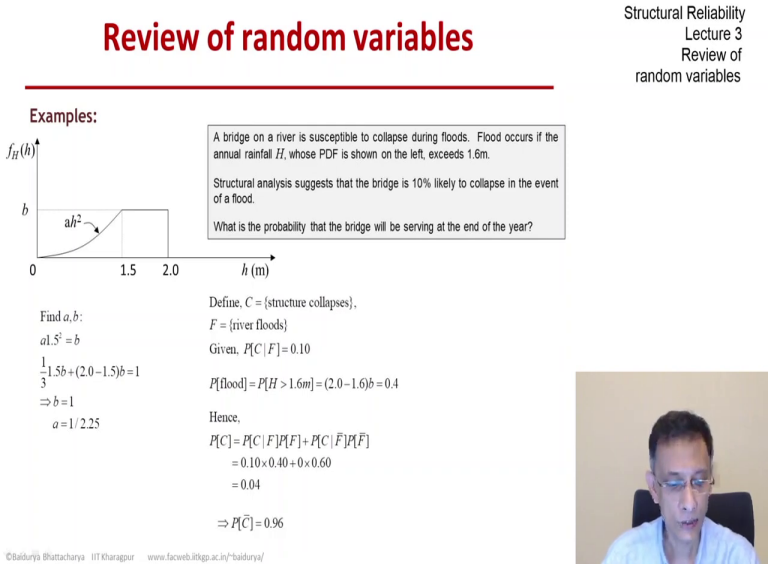

The next problem concerns the bridge and the river that floods we looked at in the previous lecture but with some interesting changes. So, let us read the problem for a minute and then we will start tackling it. So, as you can see the probability of flood which was given before as a number now we have to derive it from the probability information given in terms of the random variable h the annual rainfall.

So, what you see in the PDF on the left side of the screen is the density function of h it starts from 0 and ends at 2 meter and there are two constants a and b which we need to actually find out before we can fully solve the problem and then we will find the probability of flood and then use total probability as we did before to find the collapse probability. So, we need to find a and b as I said we can equate the value of the density function at 1.5 with b and get one equation involving a and b.

And the second equation we'll use is the area under the PDF curve is 1 which it must always. So, that gives me the second equation and when I solve that b is 1 and a is 1 divided by 1.5 squared. So, now I can find the; probability of a flood and as before we define our basic events C that the bridge collapses and f that the river floods and as I said f this time is given in terms of the random variable h.

So, P of flood is P of h greater than 1.6 meter and that would be simply the area to the right of 1.6 under the PDF curve. So, in effect that is 1.6 to 2 meter because 2 meter is the maximum possible value and that gives me a flooding probability of 0.4 as before P of C given f is 0.1. So, using total probability P of C is c given F times P of F and C given F bar times P of F bar and as before we assume that if there is no flood the bridge has no problem it is sure to stand. So, that gives me a collapsed probability of 0.05 and what is been asked is the bridge will keep standing at the end of the year. So, that is 96%.