Structural Reliability
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Lecture –14
Review of Probability Theory (Part -07)

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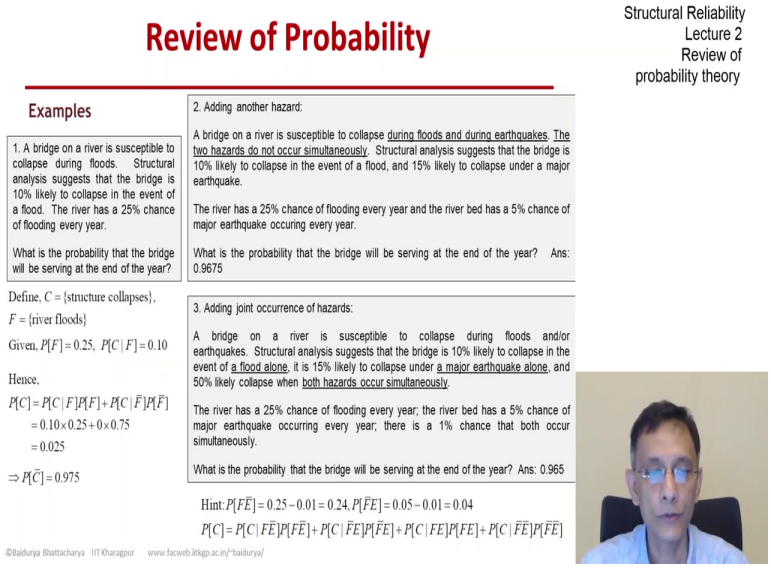

The next example is a structure subject to first one natural hazard and then we will add one more. So, let us read the problem the bridge is 10% likely to collapse in the event of a flood and the river has a 25% of flooding during the year. So, let us define the events carefully there are 2 basic events here C the structure collapses and F the river floods the information given for the 2 probabilities is P of F is 0.25 and P of C given F is 0.1.

So, we invoke the theorem of total probability. So, our partition is F and F bar and C given F is already known C given F bar we assume it is zero. So, there is no further information in the problem. So it is reasonable to assume that there is no other hazard and if there is no flood the structure does not collapse for sure. So, that gives us the answer of 0.025 for P of C. And what is being asked that the probability that bridge will serve at the end of the year.

So, that is the complement. So, the answer is 0.975. Now let us add one more hazard to the

problem. So, let us add earthquakes uh. So, as you see we have added the earthquakes in addition to the floods but there is a simplifying assumption is that the 2 do not occur simultaneously. So, we will proceed as before there will be 3 basic events. Now there will be C and there will be F and there will be E which is there is an earthquake during the year and if you proceed in the same way as before you will reach the answer 0.9675 that the bridge will not collapse.

Now let us add a little more complication to the problem here we admit the possibility that the flood and the earthquake can occur together it's not very likely the probability is only 1% but if they both occur together then the structure is rather likely to collapse. So, it is 50%. So, now let us carefully interpret the question and let us assign the probabilities. So, it would be reasonable to split our sample space into the partition of FE bar F bar E which means there is flooding alone there is earthquake alone FE.

So, there are both and F bar e bar. So, there is neither. Now what is the probability of FE bar my interpretation of this problem would be that P of F is 0.25 but it includes the case where F is F occurs alone and F occurs with earthquake. So, P of FE bar in my interpretation would be 0.24 likewise P of F bar E would be 0.05-0.01. So, that would be 0.04 and. Now if you apply that total probability the answer as I have already given is 0.965 for the bridge will not collapse.