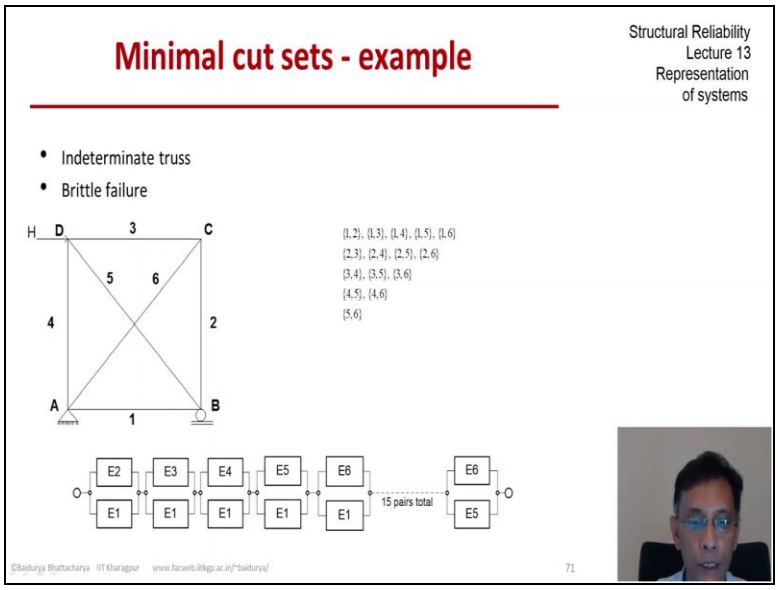
Structural Reliability
Prof. Baidurya Bhattacharya
Department of Civil Engineering
Indian Institute of Technology, Kharagpur

Lecture –110
Representation of Systems (Part -14)

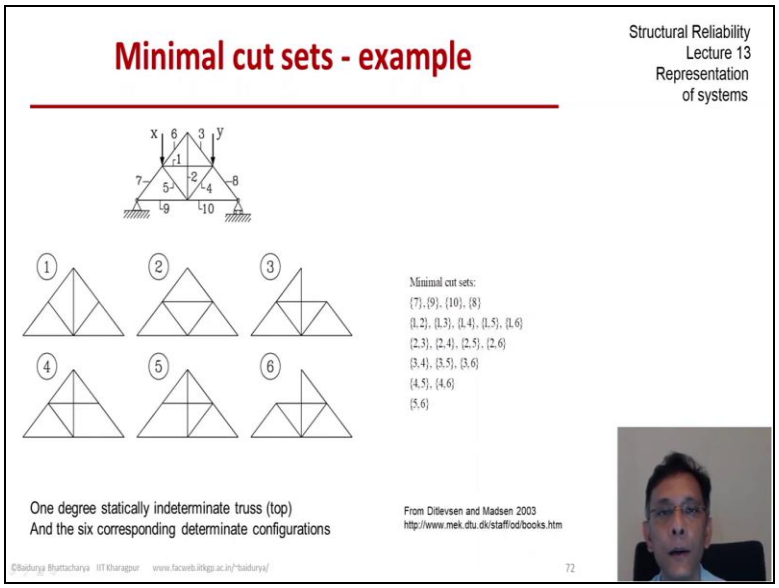
(Refer Slide Time: 00:27)



In this and the next slide we look at a couple of examples involving structures. So, we have looked at this square truss earlier in this lecture there are 6 elements and we concluded that this is one degree statically indeterminate. So, it would be logical to say that any 2 members would constitute a minimal cut set of this trust structure and so, here they are we select 2 out of 6. So, there are 15 such combinations.

So, each of these is a minimal cut set for this truss structure. We could draw the reliability block diagram equivalently involving these cut sets these minimal cut sets and they would be they would look like this. Earlier, we showed the RBD involving the 5 out of 6 approach now we have the RBD coming out of the minimal path set consideration. So, this leads into our next problem and that is an additional few truss members around this square truss with 2 diagonals.

(Refer Slide Time: 02:10)



So, this problem is taken from Ditlevesen and Madsen's book. So, you see the truss it is quite similar to what we had before except that there are 4 additional truss members built around the square truss that we had in the previous slide. So, there would be we need to find out how the structure fails or how the structure becomes unstable. So, obviously we have looked at the; we have looked at the square part of it before which involves members 4, 5, 6, 3, 1 and 2.

So, 1, 2, 3, 4, 5, 6 is that substructure which we have already looked at. Now we have 4 additional elements 7, 9, 10 and 8 and we need to find out the minimal cut sets. So, there are 6 determinate configurations that come out of this. So, you can see that it only involves elements from the square substructure no such determinant structure is created by removing any of the 4 new elements 7, 8, 9 and 10.

So, let us identify the minimal cut sets. So, obviously 7, 8, 9 and 10 each would be a minimal cut set because if they fail then the structure becomes unstable the whole structure. So, 7, 9, 10 and 8 these are the 4 minimal cut sets by themselves and then we have all the 15 that we had before in the previous slide. So, one has to be careful when identifying minimal cut sets for a structural system. One has to be careful that no unnecessary simplification or unnecessary pattern is used when none exists.