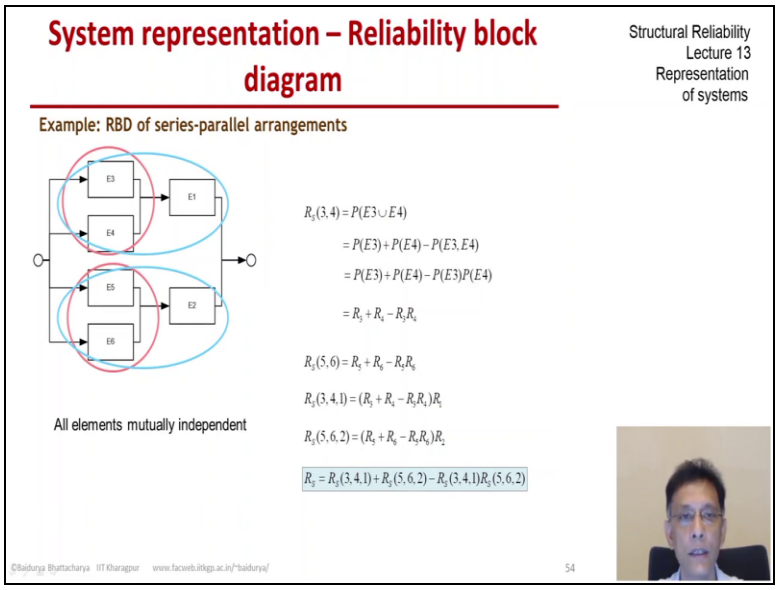
Structural Reliability
Prof. Baidurya Bhattacharya
Department of Civil Engineering
Indian Institute of Technology, Kharagpur

Lecture –104
Representation of Systems (Part -08)

(Refer Slide Time: 00:31)



In the next few slides let us take a look at how reliability block diagrams can be used to compute system reliability. So, what you see on the screen is a simple series parallel arrangement and as long as we have such arrangements of mutually independent elements that is a series arrangement of parallel subsystems or parallel arrangement of series subsystems it is fairly straightforward to compute the system reliability.

So, let us see how we can compute the system reliability for this example there are six elements they're mutually independent. So let us solve this step by step. We will first tackle the group E3 E4. So, the subsystem reliability of 3 and 4 would be by definition that either one or both works. So, it is E3 union E3 being the third element works and E4 being the fourth element works and so on.

And we will use the basic formula for the union and using the independence of the elements this

simplifies to R 3 + R 4 - R 3 R 4 where our i is the reliability of element i we can do the similar thing for the group 5, 6. So our subsystem 5, 6 is R 5 + R 6 – R 5 R 6 and then we combine the arm the upper arm involving 1, 3 and 4 and they are in series. So, because they are independent we can just multiply the survival probabilities.

So, the reliability of the group one three and four would be the product of the reliability of one times that of subsystem 3, 4. We can proceed similarly for the bottom arm. So, that is elements 2, 5 and 6 that group. So, likewise that is the product that you see on the screen and finally we now have two subsystems in parallel. The one on the top involving 1, 3 and 4 and the 1 in the bottom involving 2, 5 and 6.

And we can combine them into one single expression and that involves the union of the two reliable of the two events two survival events. So, that is the system reliability is R s of 3, 4, 1 + R s of 5, 6, 2 minus the product because they are mutually independent.