Project Planning & Control

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Lecture – 24

Lesson - 06

Review Network Analysis Concepts, Apply

Network Analysis to Two-Span Bridge (Contd.,)

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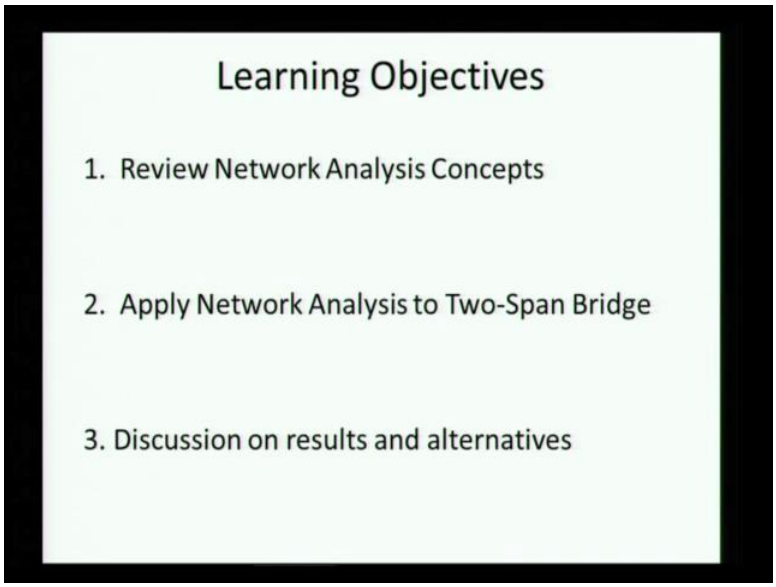

Today's lecture, we will cover concepts which we have already dealt with before which is network analysis. I will do an exercise on this, and then we will actually apply it to the two-span bridge problem. So, our objectives are basically to review network analysis concepts, we will apply network analysis to do two-span bridge. And then, I think there will be lot of discussion which should come out of this and we will take the discussion forward. Now, you remember this problem?, this was given to you when we did the network analysis and calculation of floats. What I want to do first is to take this and solve it. I assume that you have a solution to this and you can help me do this as we go through the process.

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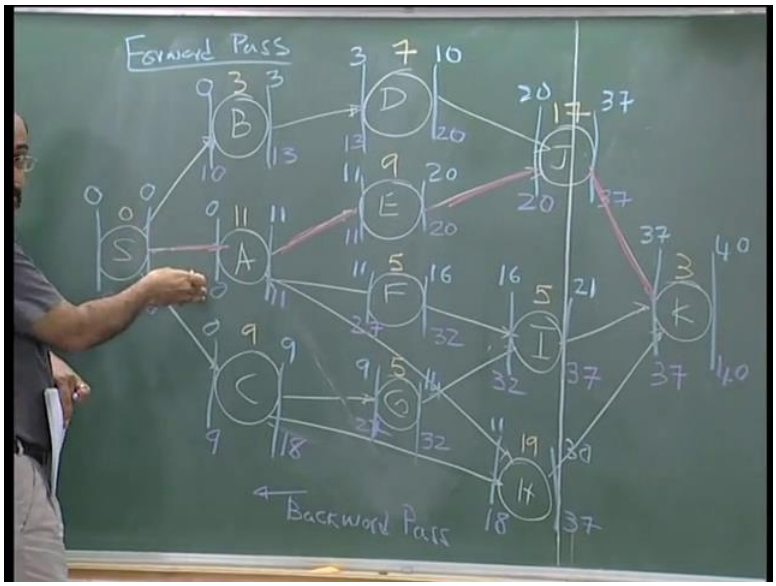

So, let us take the network first. So, as we draw an activity and node network. We have A with A, B, C. We have three activities. We have A, B, and C and it is when you have you can see that A, B and C had no predecessor other than start. So, these are activities, which these might be actually physical activities. It is always good to put a start which might be kind of a zero duration activity, which is the kind of dummy, which you will have in a o n. Remember, a o a had other kind of dummy, requirements for dummy activities. This is the only kind of dummy, you have activity, you will have for a o n. And from B, you will have D as a successor., E, F and G has.. C; G has C as the predecessor... And, when you go to H, you have two, …you have A and C. Moving to I, ..I has F and G; J ..has E and D. And finally, we have K, which have all three. So, sometimes, it is nice to have it aligned. So, I am going to move H a little further down here, so that we will connect it this way. And then will connect it from A this way. And then, all these together connect to K.

Now we will go ahead and add durations with this. So we have, so, the start is we are calling it dummy. So this zero duration, Ok, A is the duration of you can tell me the duration as we go. 11, B?

Student: B has 3

3, 9

Student: C has 9, D has 7

7

Student: E has 9

9

Student: F has 5

5

Student: G – 5, 19 - H 19 and J- 17, I- 5 and K-3.

Good, so now we will what is our first task?.

Student: The forward pass.

The forward pass... And we are familiar with the terminology. So this is calculating the zero is the early start, early finish. Now we go to the successor and remember the zero here and the zero here are different points of time, but one is finishing the other starting. So, here have a 0, 3, 0, 11, 0, 9 and move on to the next one D is 3, 10

Student: E is 11.

11

Student: 20

20

Student: F - 11

F is 11, 16

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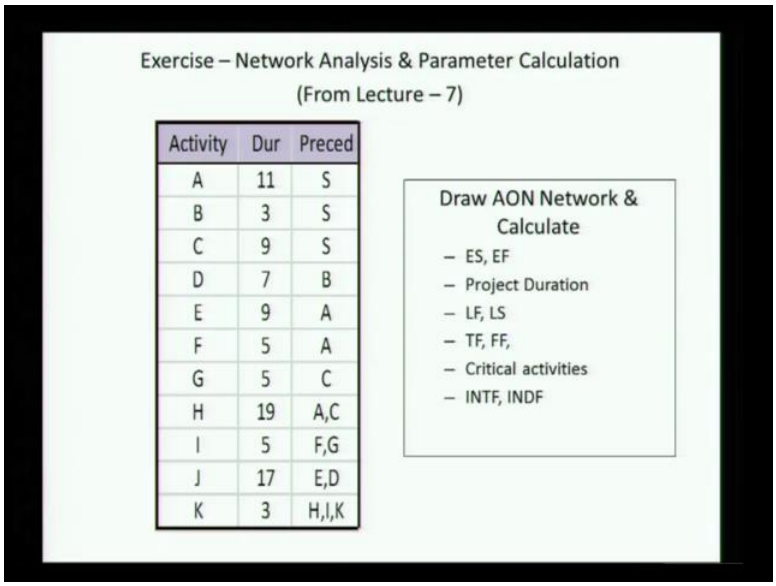

Student: G – 9

G is 9

Student: 14

14. Good, now we come to H; H has two predecessors; it is 11 and 9, we take eleven because it is later one finishing it. Now we come to I we have 16 and 21; J - we have two predecessors finish one finishes the other 20, we take 20 and 37. So, K has three predecessors J I H, and we would expect to take later value 37, finish is a 40. So, the project duration is 40. And the sequence of calculating going the forward pass, we have completed the forward pass. Now we will actually go to the backward. So, we start with 40 we are keeping this fixed and we make to 37. So, this is the late finish and the late start.

Now we need to go back as to, so when is late J K finish?

Student: 37

37

Student: 20

20

Student: I – 37

37, yes

Student: 32

37 minus 5 – 32

Student: Again 37

Again 37

Student: 18

So, this is the latest finish latest start.

Now we go back again. So, we can find E should not 20. So, what happens, if E exceeds 20?

Students: J gets delayed, project get delayed.

J gets delayed, project gets delayed, so that is the definition for us in order to for how late can the activity start or finish so that the project does not get delayed. So, D again will be here 20, 20 and 13. So, E now we come to now E is 20 and 11. We come now to F - 32, 27. G, now G has two successesors So, G has only one that is 32 and 27. Now we come to C, C has two successesors, one is 20, 27; one is 27, the other is 18. So, we take the least - the minimum value. So, we go to 18, 9. now A has three successor E, F and H; the least is 11, 0. Here we can really want successors 13, 10, and 0, 0. So, we have finished the backward pass.

So, now when we will look at critical path we have to identify the activities we can make this in a network like this quite simple we can see that it goes to A, E, J and K. And we can make out we know that from the analysis, if I early start and late start are the same then that would be the algorithmic way of finding the critical activity, and so all of these activities are critical. So, this we did the basic network analysis found out the early start early finish; late finish late start, we found of project duration we found the critical activity any questions on this I think this is fairly straight forward.

Now we come to the floats. So, remember how many floats you have to calculate, we have a total float, free float, interfering float and independent float. So, we have four float and let us see how so I mean in a network like this, it might be still be possible to be visualize especially total float and free float, but as you get in an interfering float is little more difficult to visualize, but easy to calculate; independent float requires quite a bit of looking through and finding out what is, what has what does not matter. Let us go through that exercise; I am not going to make a table and I am just going to see we have

all the numbers here. So, let us just work it out as per what we have here. So, we certainly know that all of these values A what is the float S, A, E, J, K? all zero, no total float, no free float, and none of the other floats.

When we come to C, let us start from this side, when we come let us take B of course, total float 10 days. So, we have a total float of 10 days for B. I am going to write the float here, does it have any free float?

Students: No, zero.

No, why does not have any free float?

Students: because B affects D

Right, any delay in B will affect D, so there is no free float; I am putting free float is zero. What about interfering?

Students: 10

10, any independent float?

Students: 0

0, because B any change here will affect D, if you want to apply formula for independent float what is it?

Students: Minimum of ES if successors - Maximum LF of predecessors - Duration

Late finish of the previous activity, predecessors and early start of the successors, yeah minus duration I take 3 - s 0 - minus 3. So, it has no independent. So, similarly let us go to C down total float

Students: 9

9, free float?

Students: 0

0, interfering?

Students: 9

Independent?

Students: 0

0. We go to D

Students: D has 10.

10, free float is 10. Now let us how does do we have free float of ten,

Students: because it won't affect the next activity

Yeah any delay in D will not affect J. So, this is the characteristics; and the characteristic of the network is you find D is immediately preceding a critical activity and it is not critical. So, there is even if D gets delayed, my critical path is what is the controlling the network. So, it will not delayed J; it has free float. And does so if D has free float, how come B doesn't have free float?

Students: Late finish and the…

Yes, whenever I move B, D. So, free float belongs to only the activity. So, the total float, so remember when we talked about total float B has 10 days, D also has 10 days. A minute as start using up the total float of B what happens to D?

Students: D float gets ..

Yes D's total float also gets compromised used. So, total float like we discuss last time is a shared float free float is not shared . So, D has a free float of 10; interfering float?

Students: 0

0, independent?

Students: 0

Yeah, 20 13 7 0. Let us go to F, you know actually where are we. Now E is of course, critical let us go to F. 16 now any delay and F will delay I 0, interfering is 16, independent 0. We can see in fact, we have two successors, we take the minimum 11. We have only one predecessor. And in fact you will have a look at independent is a when you algebraic computation what value you get?

Students: Negative value

It goes into negative value, but you would say 0. G?

Students: 18

18, any free float, two days of free float. So, we have now 14, even two days will not delay I, so that is two days of free float. Now notice here we have D having free float, because it was converging into a critical path. How is g having free float, it is conversing

into a path that is more critical than the path through G. So, there is a buffer that is how it has two days of free. So, interfering 16, independent 0, so that is again 0. We come to H

Students: 7

7, say free float is 7, 0, 0. I?

Students: 16

16, free float 16 0 0. So, the through this, we have solved all the parameters we are looking for we have solved other any questions. So, this was basically to refresh what we had done on the float and the network analysis. We would really like to apply this in to the bridge. So, we just did this as a review. Any questions? Yeah

Students: What is the influence of negative float …?

Yeah, basically what if we look at what that means, it means that algebraically it is negative, effectively zero. Now actually looking at a physical meaning of what it means is at least as far as the application concerned it means zero; as far as what do you say the concept of zero float means that there is something in this network which is if I start pushing back on this, this will require to go even for the back on what is happening . So, from a what you say project managemer applying zero negative float is just zero.

Student: Sir what if a predecessor activity is finishing late and a succeeding activity starting early, then we don't have enough space for duration.

Right

Student: So, if that is the case the activity has not got anything to do, when,

No, then the activity will suffer itself, what you mean by suffer?

Student: Suffer, in the sense it would not be getting finished.

No that will delay the project, yeah. So, we are going to assign it a zero independent float. So, it is it is independent numerical values zero what you are saying is we cannot afford to have that happen, but might be the point you are saying is that even if that is zero So, even if I take it as a value of zero is going to run in the problem right?. Concept like independent float and not used in this perspective in the application perspective, but what would probably have to do is to analyze. So, let us take one of these with independent float with the negative independent that G has how many days?

Students: G has 9 days

No, no G goes to if we take the numerical value, it goes to minus

Students: minus 5

minus 5, is it minus 5? Where are we? We are 32 plus 16 minus 18

Students: minus 7

minus 7, so how would be physically interpret. I mean it is even more negative than the duration which means if I just so all have to doing that I cannot a effort c to go to the latest and I to start at the earlier that would be the most general interpretation ((Refer Time: 19:08)).

Student: It does not show up as a critical activity.

It does not show critical activity.

Student: So it is not an important thing.

So, in fact that is interesting we should probably it see I mean you look up a on papers you know research in this area there is not that much written on independent float. So, might be this is something we should do and perhaps of looking at networks with independent float, crashing and see what happens in the real life situation. But as far as most applications go independent float is not even calculated . So in fact, this is something one of you could take as look up for your term paper on how does independent float affect the project. So, this is what we had wanted to fill up, and you will find that all the calculation we are done or in these slides, I am not going to go through in to detail it is therefore, the record. And we have gone through the critical activities, and all of the calculations which are associated. Now what I would encourage you to do is to use a bar chart, to draw these, not now, I don't want to do It in class, but you will have draw this and see we can visualize various float we are talking about.