NPTEL

NPTEL ONLINE CERTIFICATION COURSE

Discrete Mathematics
Graph Theory - 1

Path and closed path

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Considering my same graph, this one
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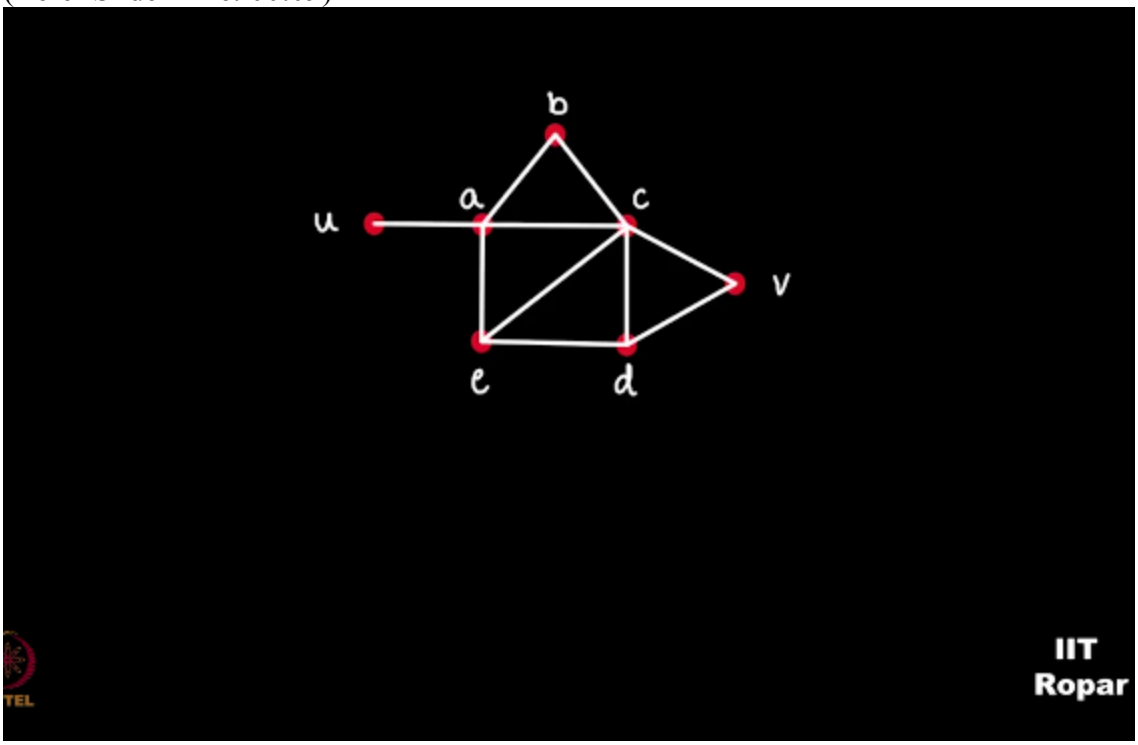

I am going to introduce a different constraint now, what if I say you should not repeat the vertices too, once you pass through vertex you cannot come back to with again, you cannot go through it again.
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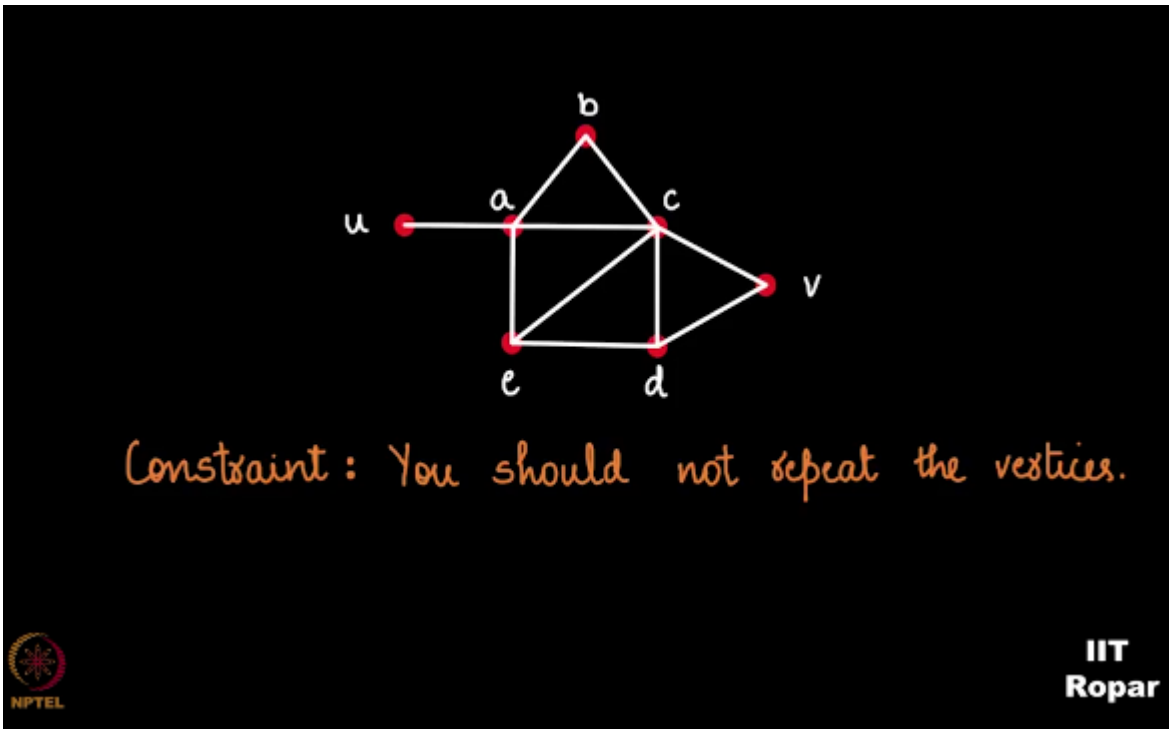

Now what will such a walk B, let us check, again I'm starting from U and I have to go to V, so valid move will be U, A, C, V

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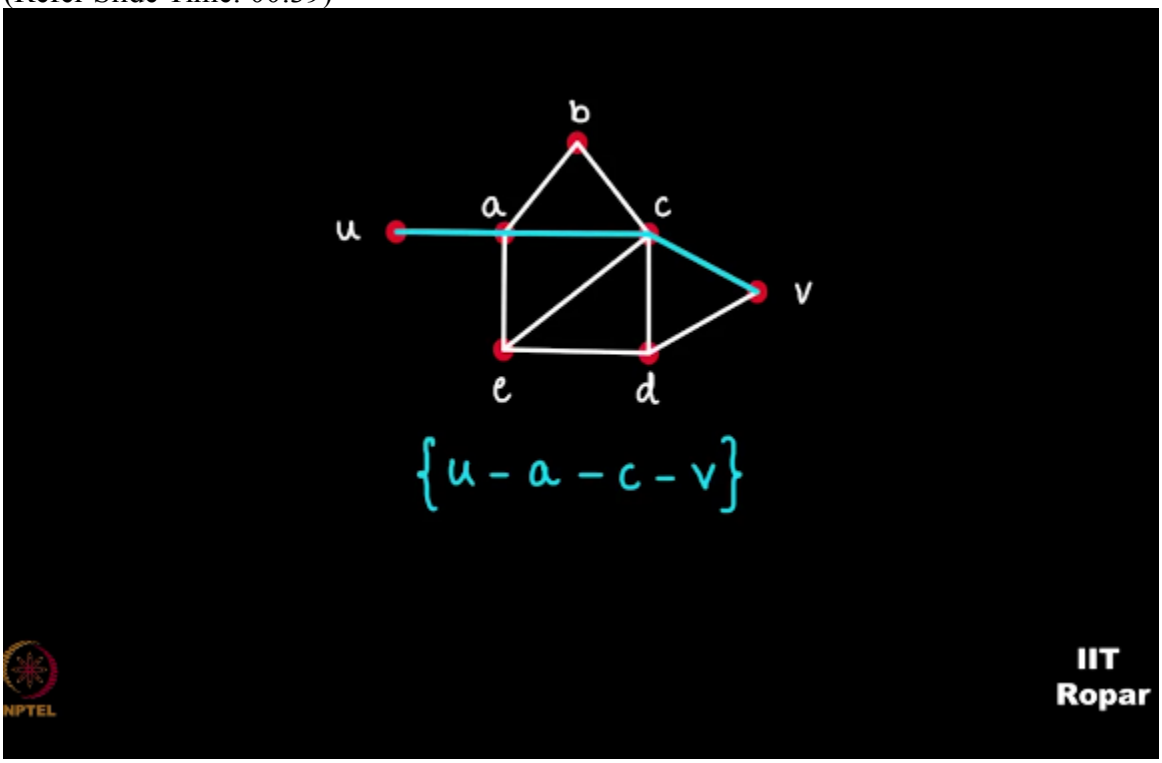

as and always this is valid, U, A, C, E, A, B, so here you see A

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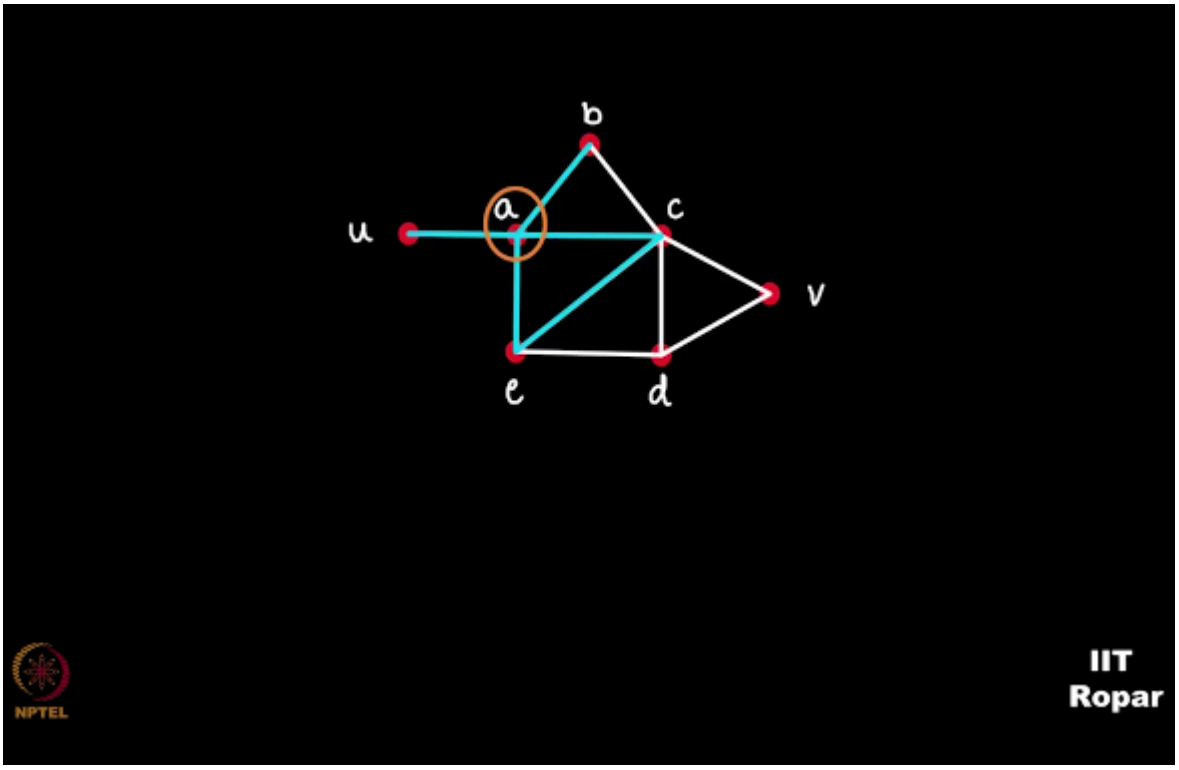

I'm repeating though the edges are different, this is not allowed in this constraint,
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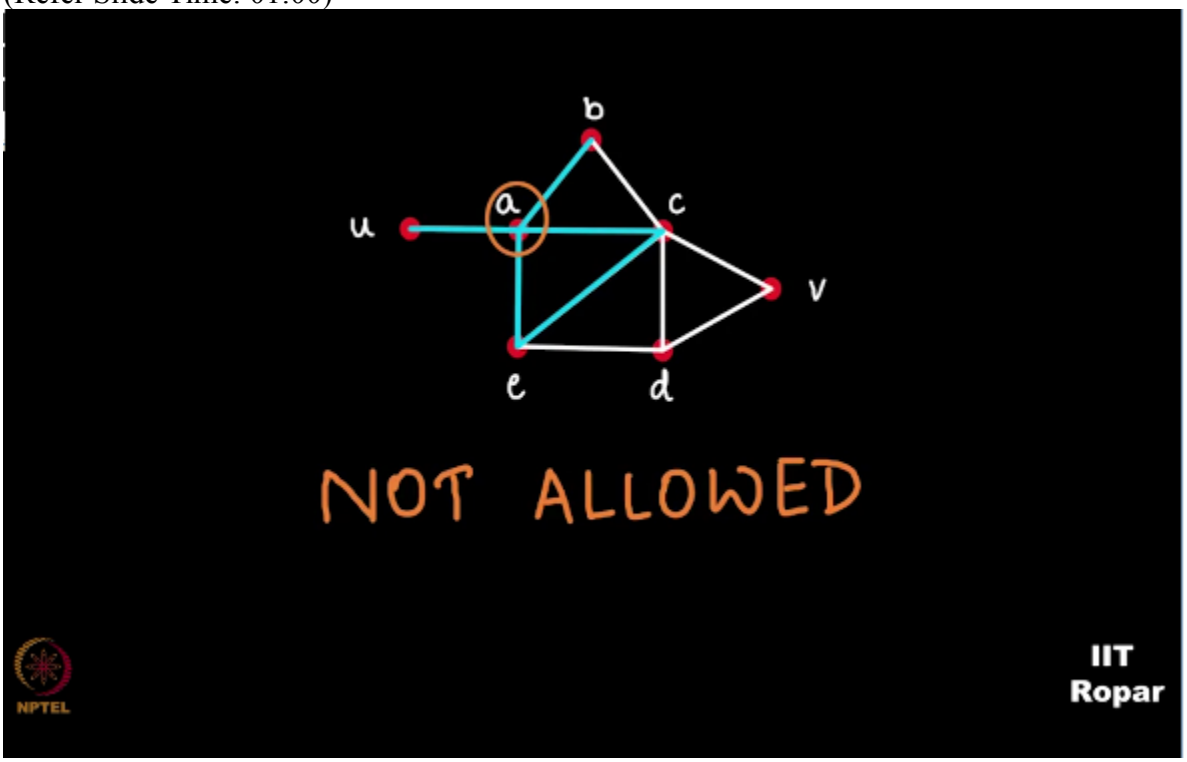

what is the constraint? I cannot repeat the vertices, this is not allowed, this is not a valid move, so U, A, E, D, V, this is a valid move,
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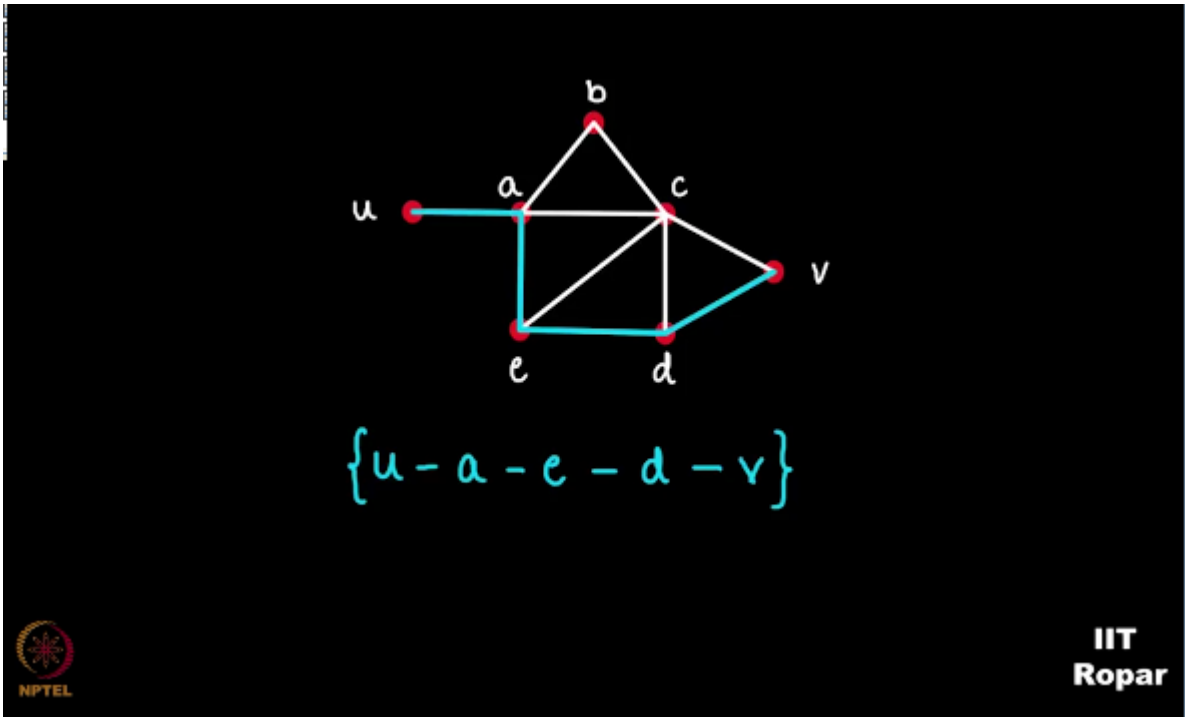

such a walk where vertices are not repeated is called a path.

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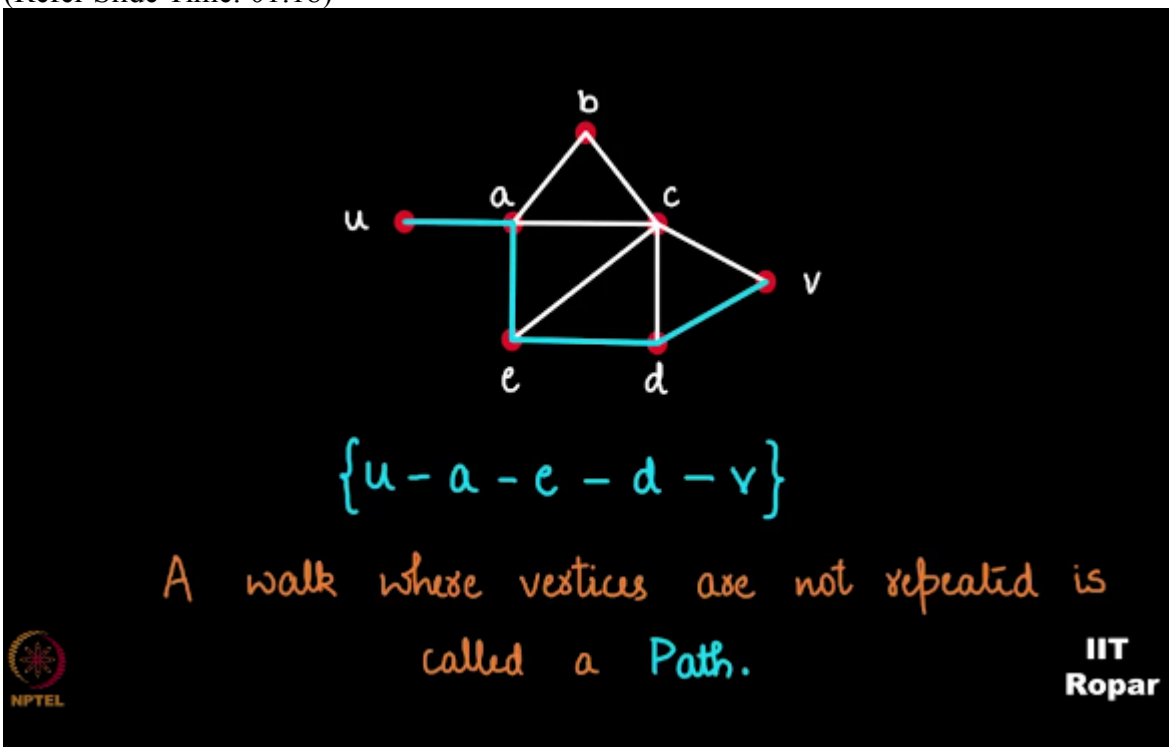

Do you observe that if you do not repeat the vertices you are indeed not repeating the edges, take a moment and look at it, see you went through A initially from U, then to E, then to D, then to V, do you observe that you are not repeating any edge here, if you are passing through all

distinct vertices it implies that you are passing through all distinct edges such a walk where all the vertices are distinct is called a path.

Let me make a neat observation here, if I'm going to tell you that you have to start from U and come back to U again, you have to make a walk and come back to U again with the constraint
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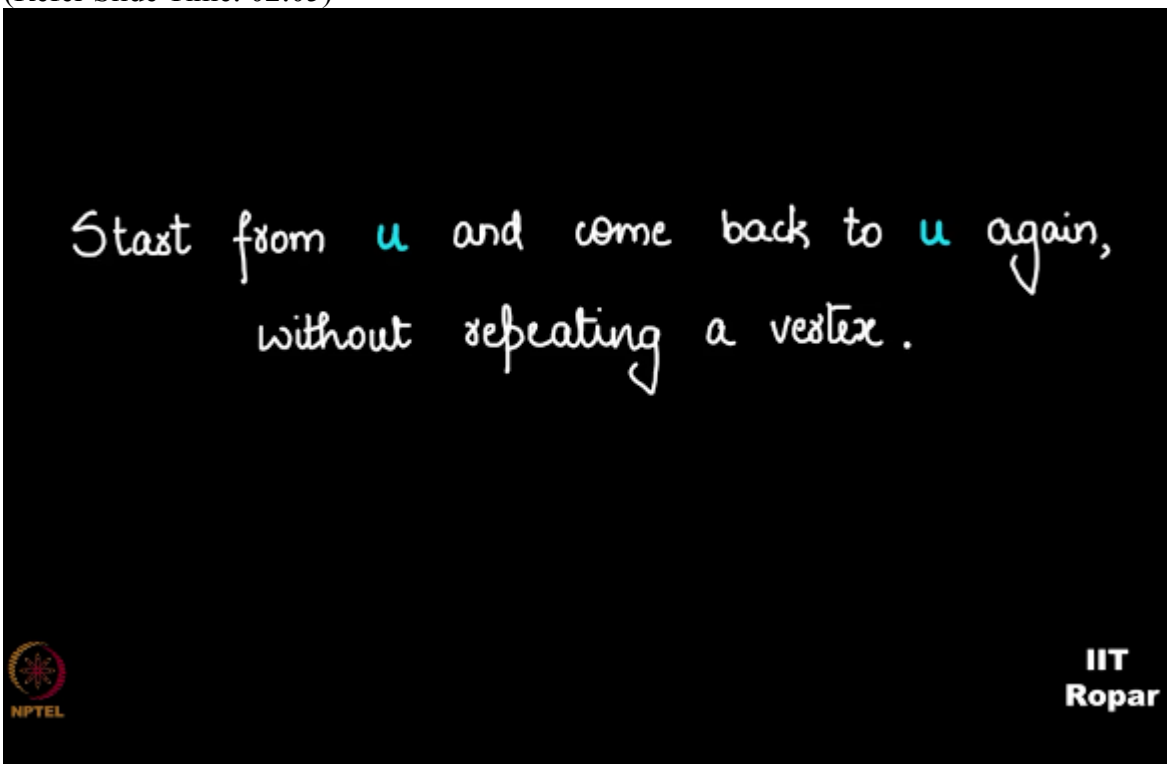

that you must not repeat any vertex, what am I telling here? You must start from U take a path and comeback to U though graph here and take path which I'm talking off, and comeback to U again, what do I mean by that? You have to take a walk, not repeat any vertex and again comeback to U itself, than will you be able to do it? Let us check, U, A, C, E, A, U, did you observe
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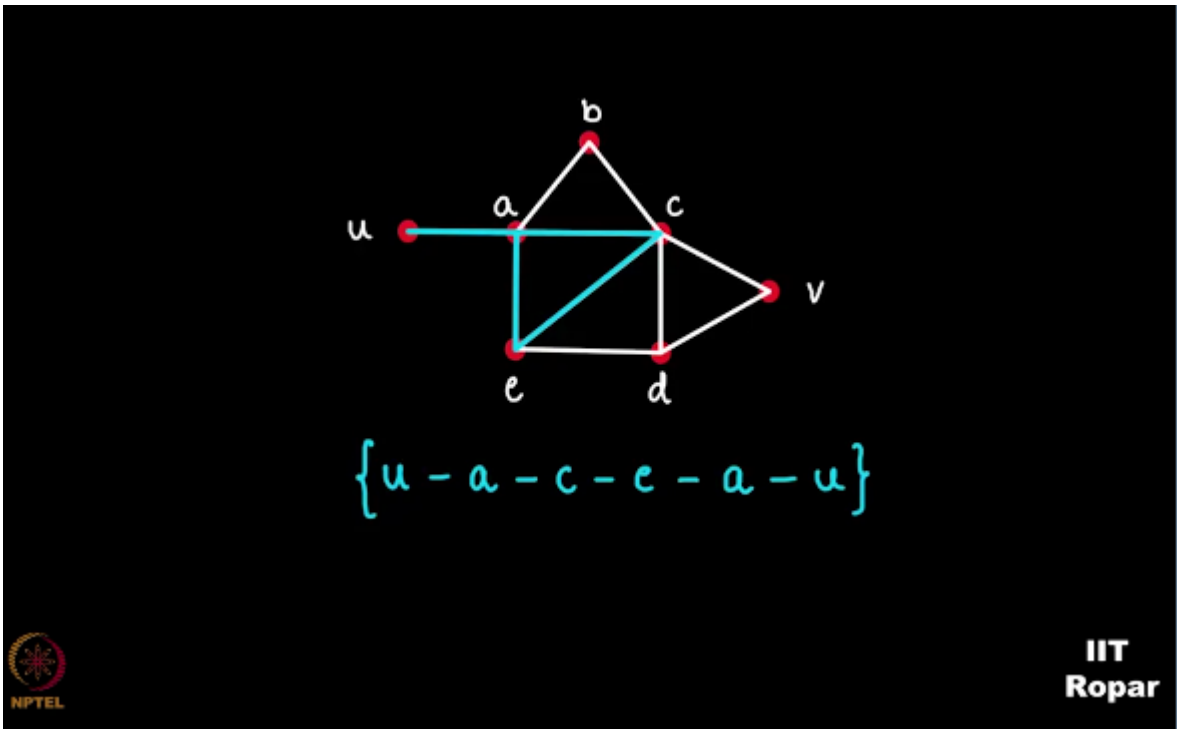

that I have to cross A in order to comeback to U, well will this be a valid walk with that constraint?

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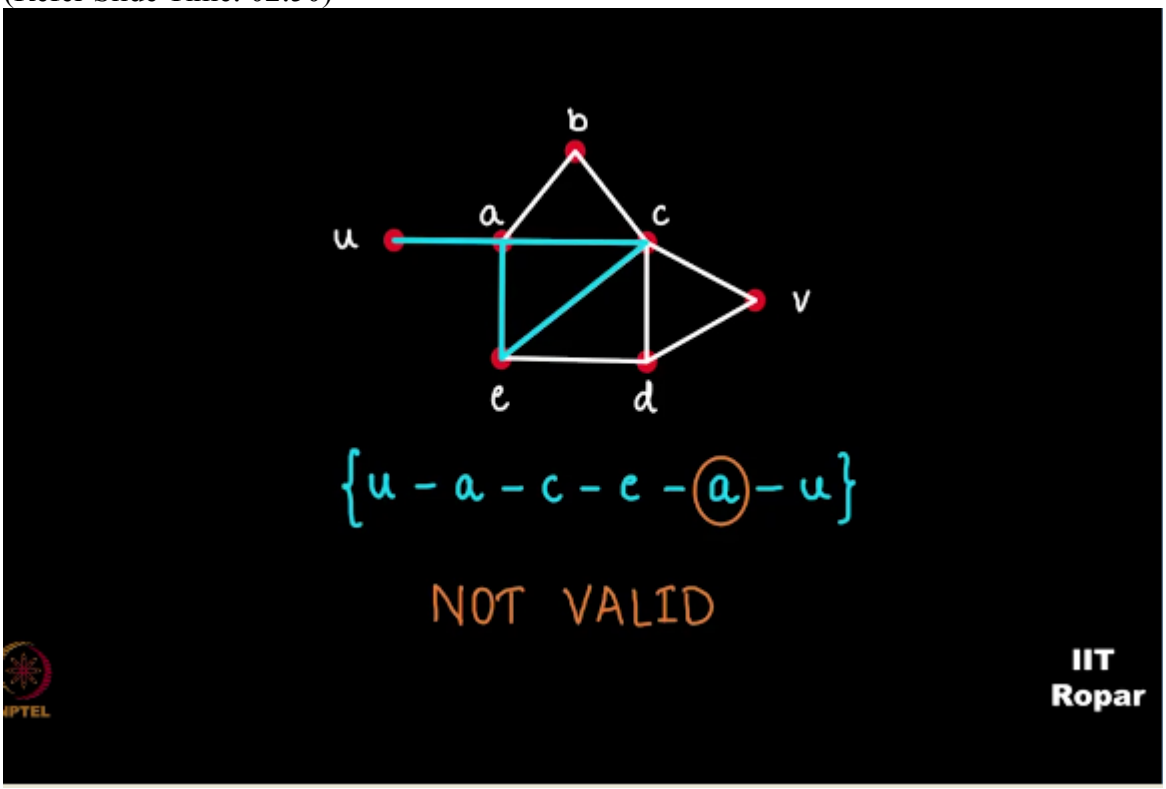

No, this is not the path because I'm repeating this vertex A, hence this is not a path.

A closed path is a path where you start from vertex and comeback to the same vertex by taking a path,
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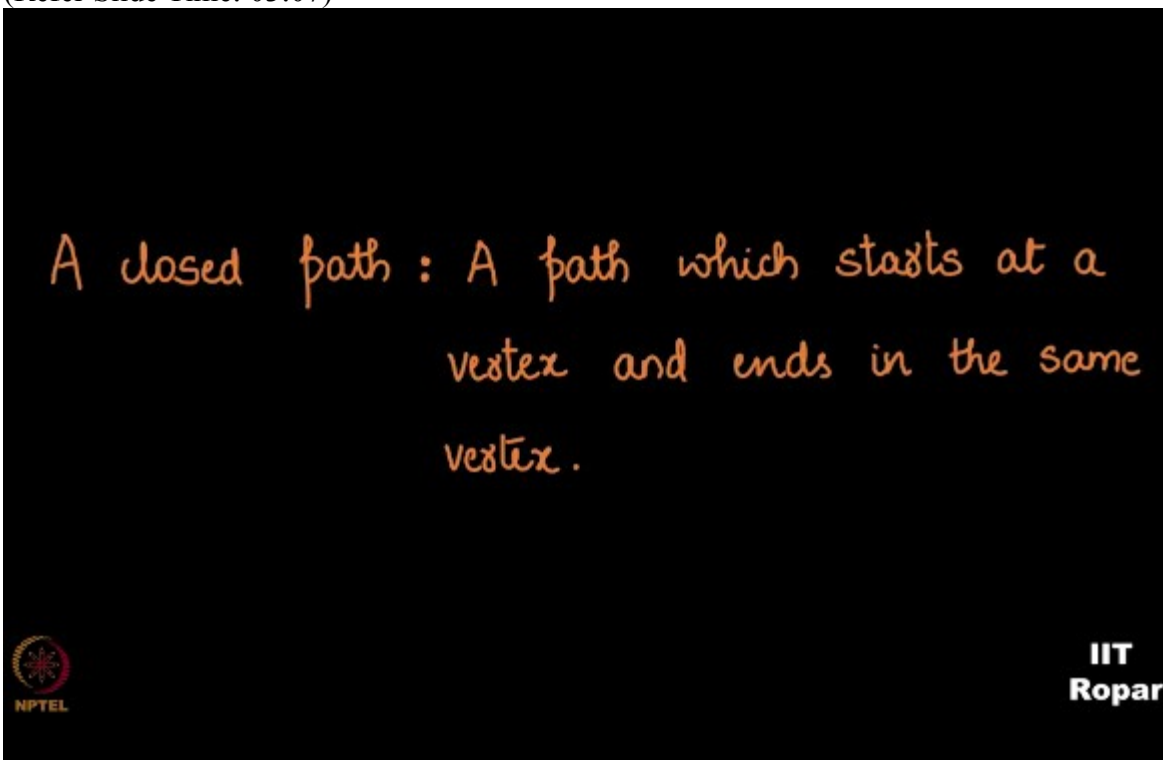

a path which starts from a vertex and ends in the same vertex is called a closed path. So did you observe that here there is no closed path starting from U and ending in U.
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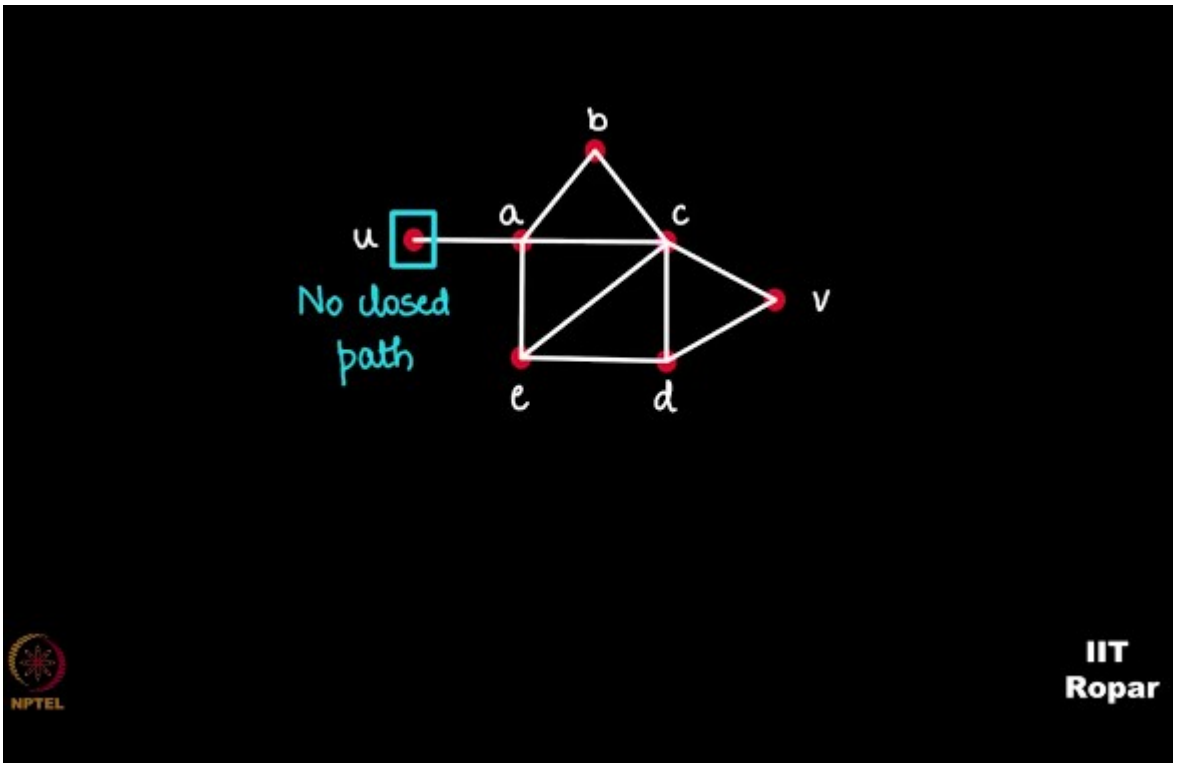

Let us try for some other vertex, let me consider the vertex E now, I start from E and I have to come back to E by taking closed path, is that possible? E, A, B, C, E,
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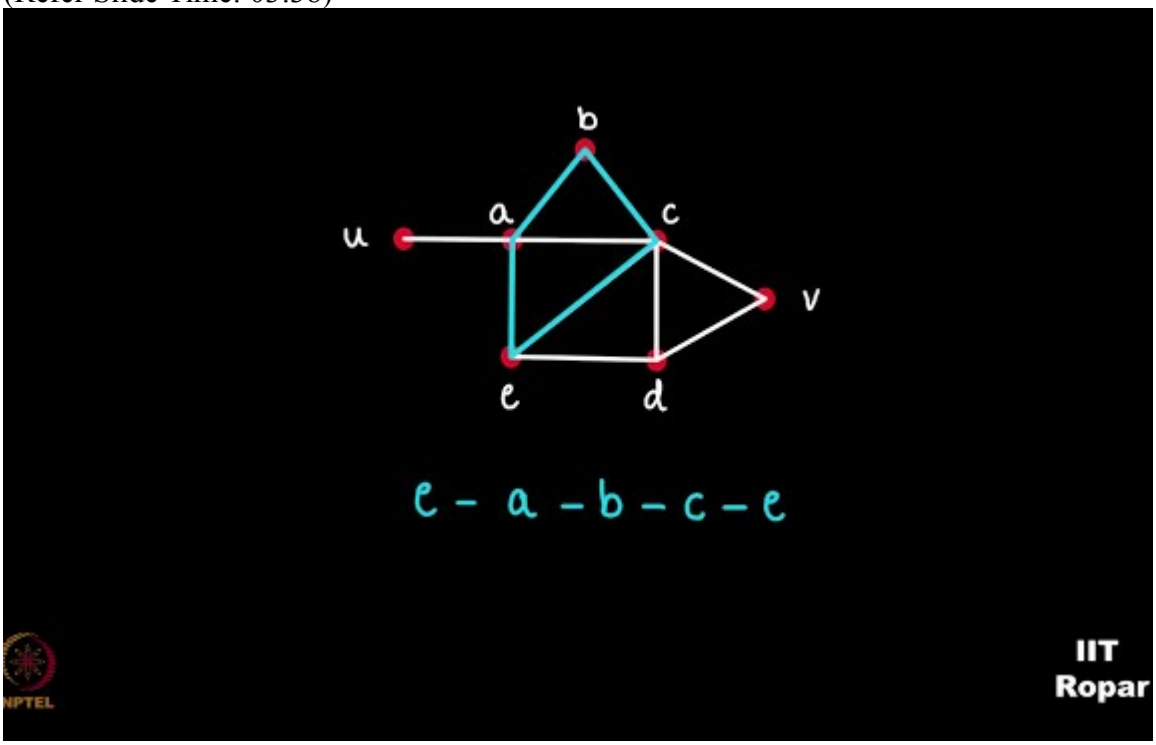

yeah I'm done, this is a closed path, I've got it or it can also be E, A, B, C, D, E,
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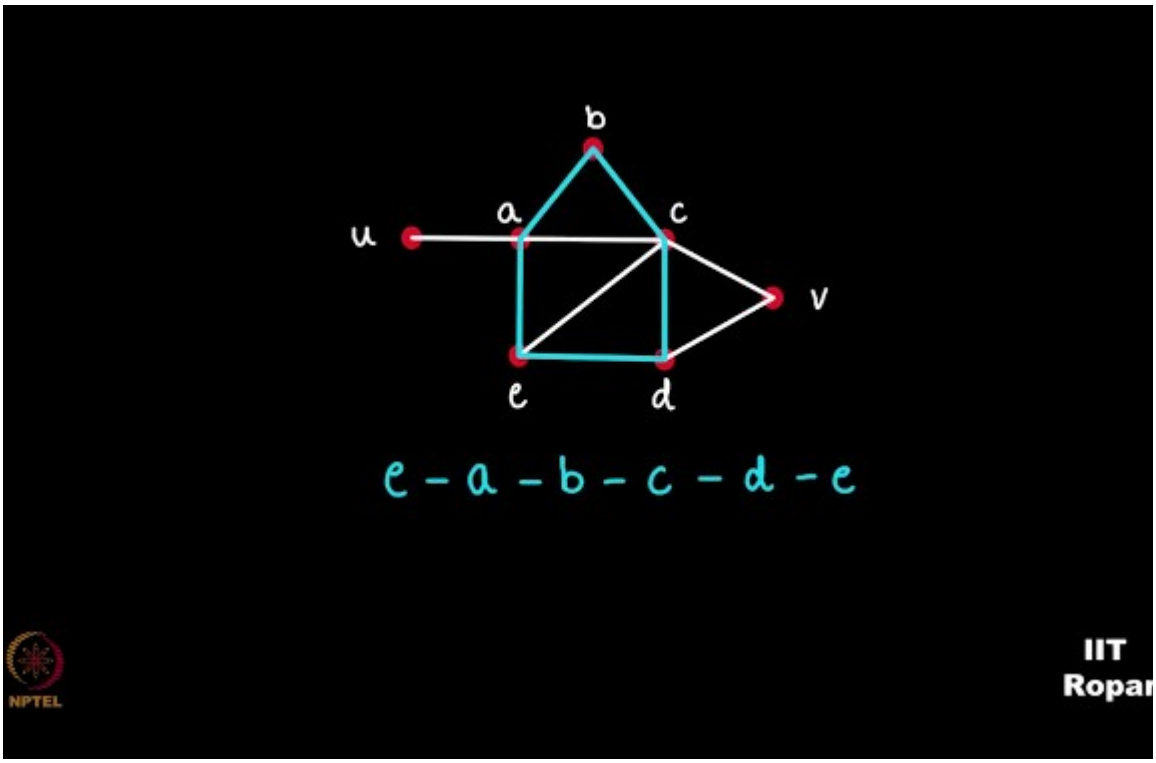

this is yet another valid path, so as an always, as it the path in the closed path also all the vertices are distinct which implies that all the edges will indeed be distinct, so in this video you've seen what is the path and what is the closed path.

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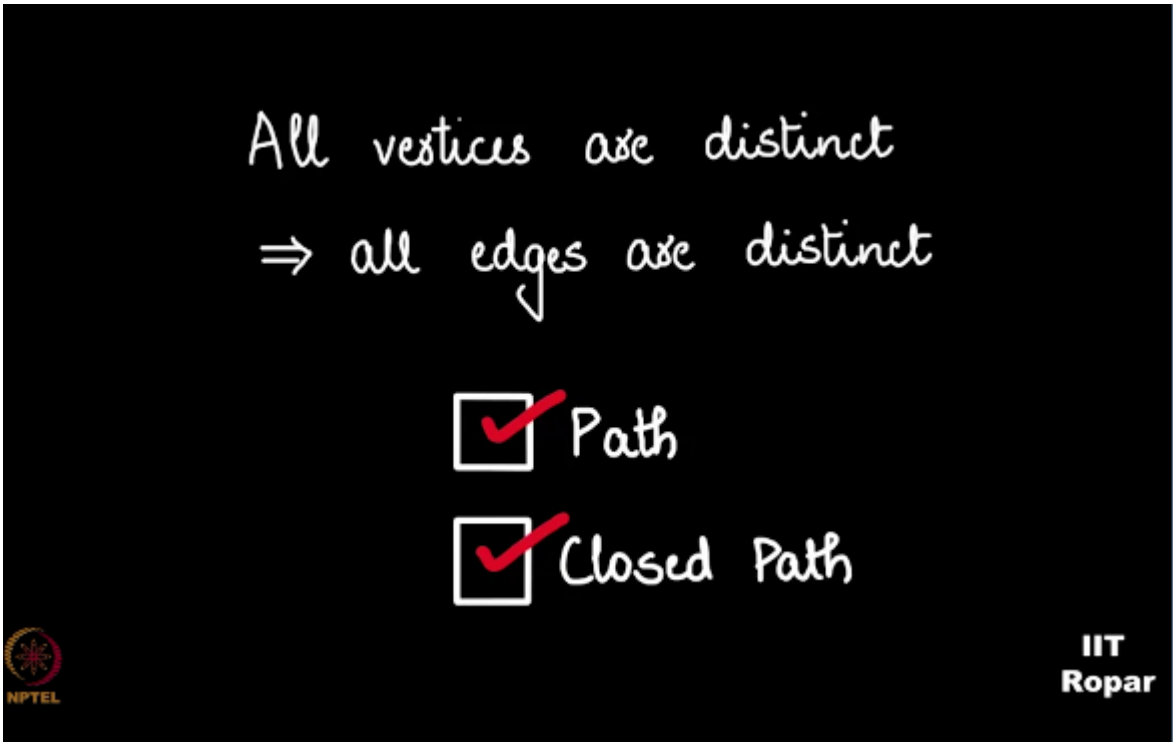

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