NPTEL

NPTEL ONLINE CERTIFICATION COURSE

Discrete Mathematics
Graph Theory - 1

Havel Hakimi theorem - Part 1
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Remember the example that we saw for what I call a degree sequence, now look at this example
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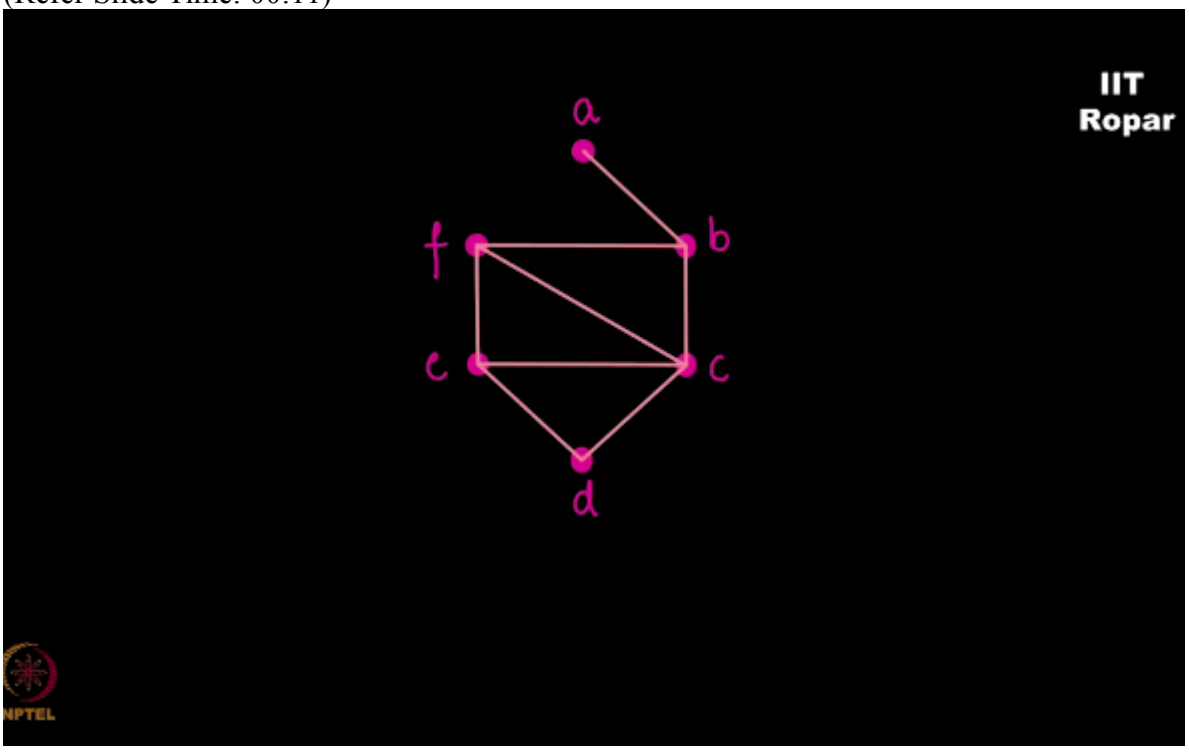

here is a graph with so many nodes and these are the degrees of nodes,
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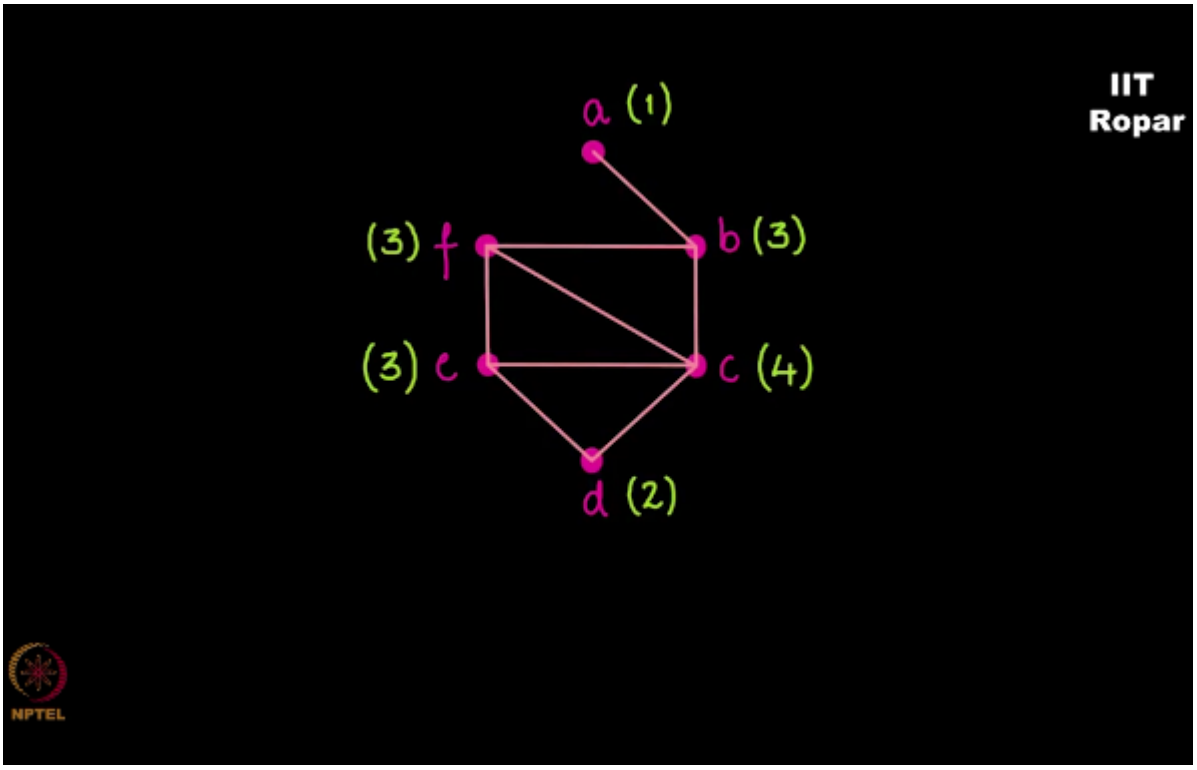

and then finally you write the degree sequence

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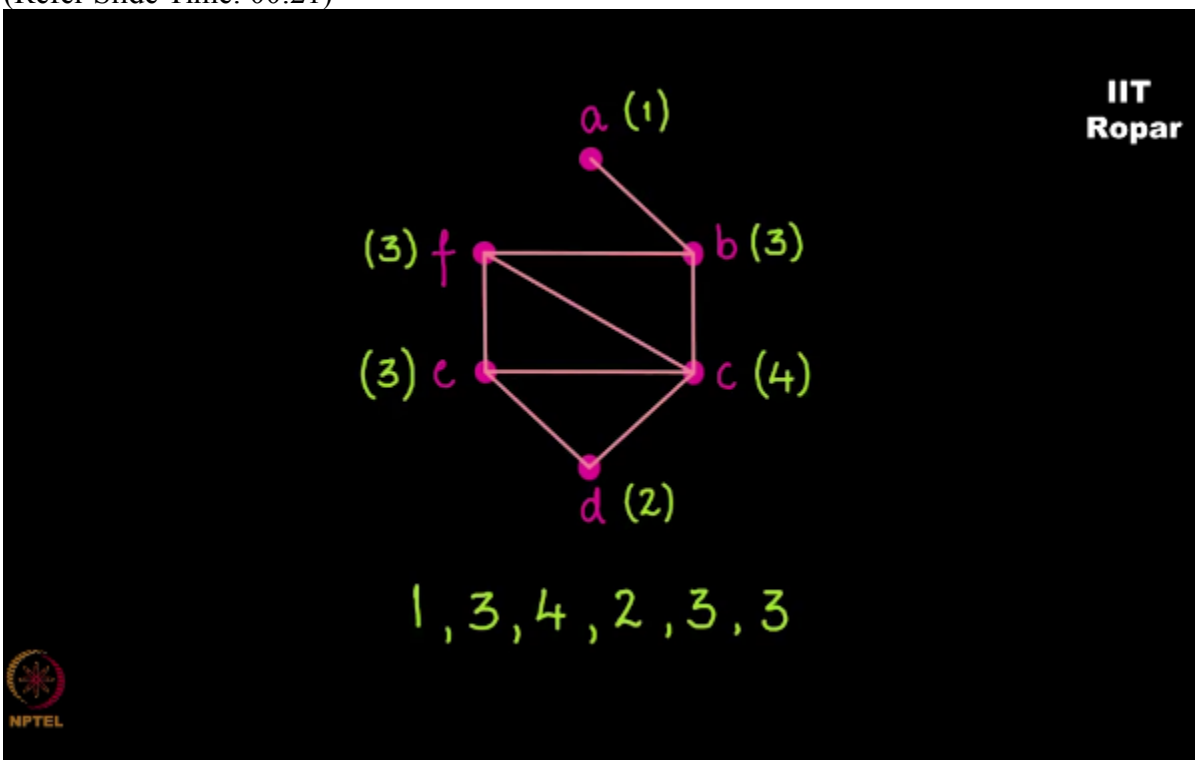

which is basically writing down the degrees of all the vertices, so the definition of degree, the definition of degree sequence is very clear to you, if you're wondering from where you should start for degree sequence you basically can start from anywhere, right, it doesn't matter, the

point is you should write all the degrees here if possible, a good nice way would be to write it in increasing order, so let's say 1, 1, 2, 2, and so on, right, this is actually not called increasing order it's called non decreasing order because two elements can be same, you see, fine, good, so far so good.

Now look at this, can you now I'll give you degree sequence, I'll not give you a graph, 2, 2, 2 is my degree sequence
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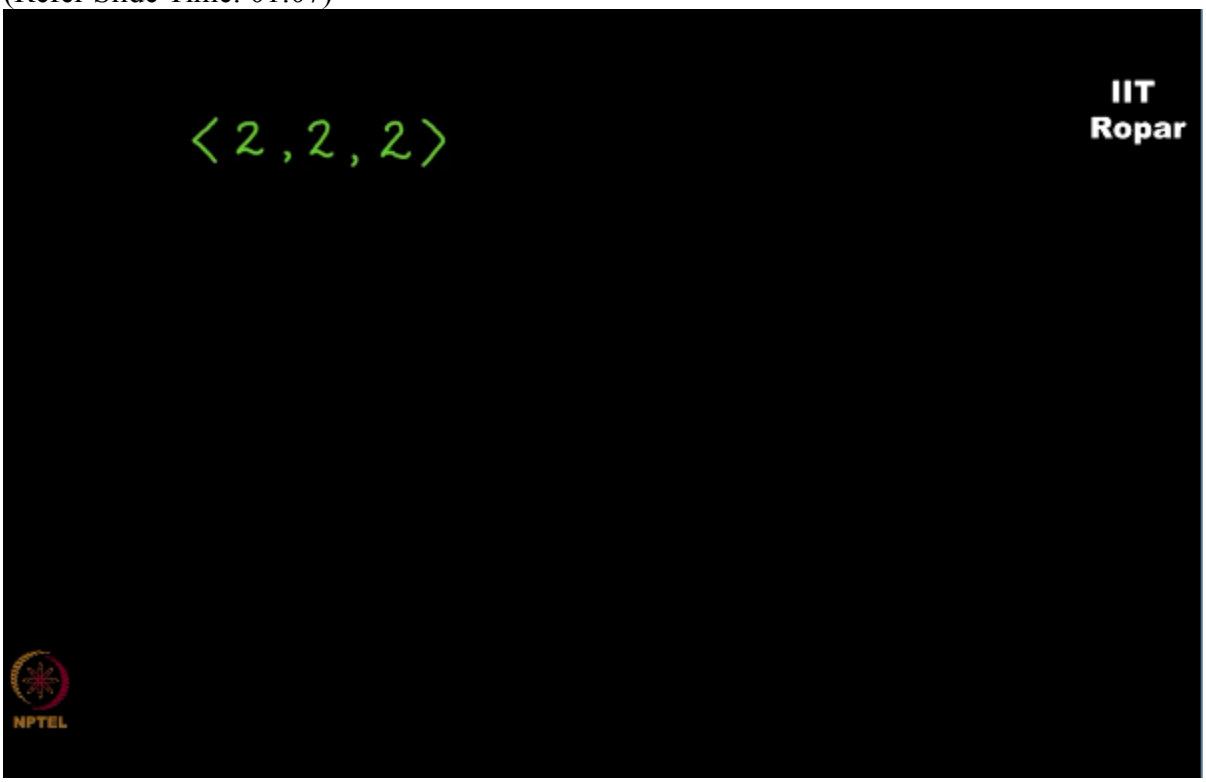

can you write a graph with this degree sequence? Yes, pause and think, fine, the answer is simply a triangle like structure
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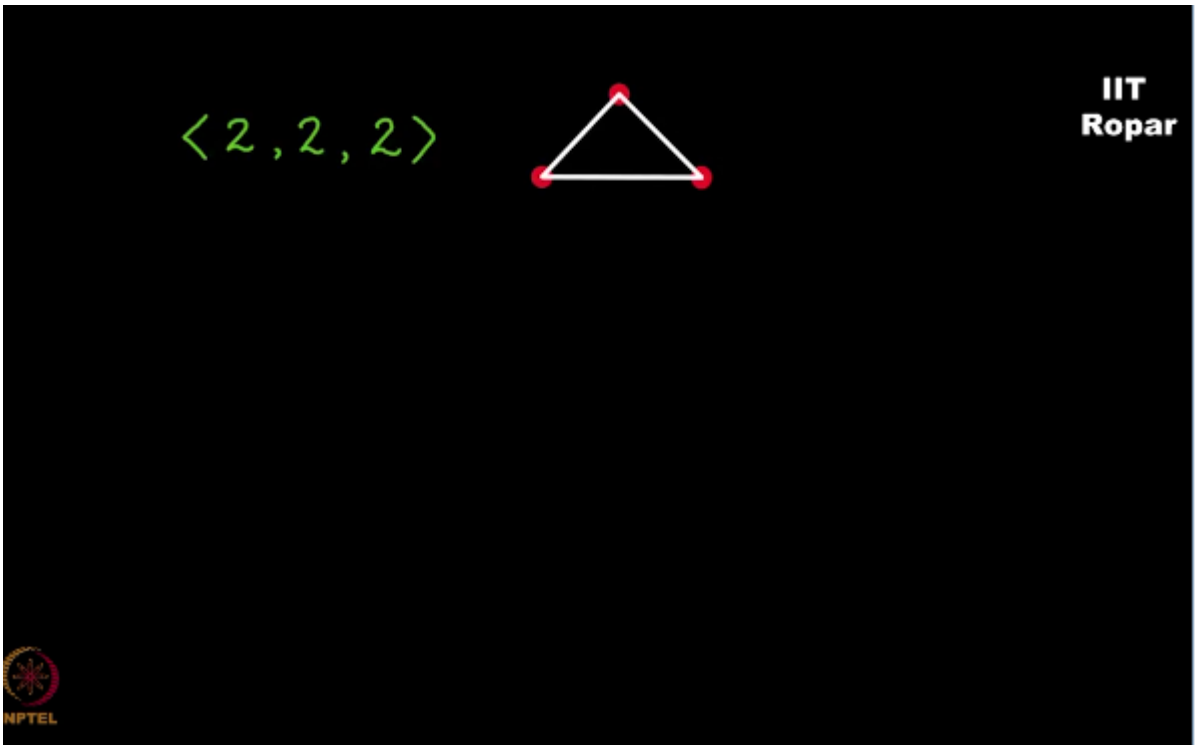

as you can see this is also K3 a complete graph on 3 nodes
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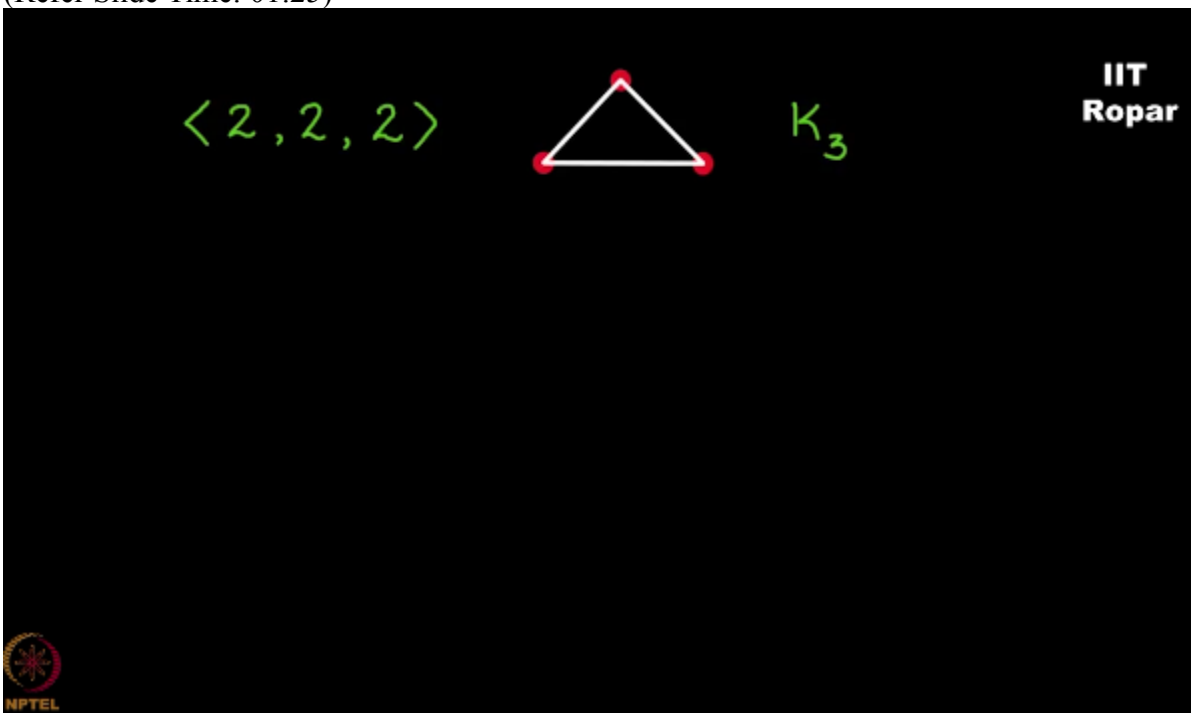

which has the degree sequence 2, 2, 2, okay.

Now look at this, how about 2, 2, 2 and 2, again a structure like this
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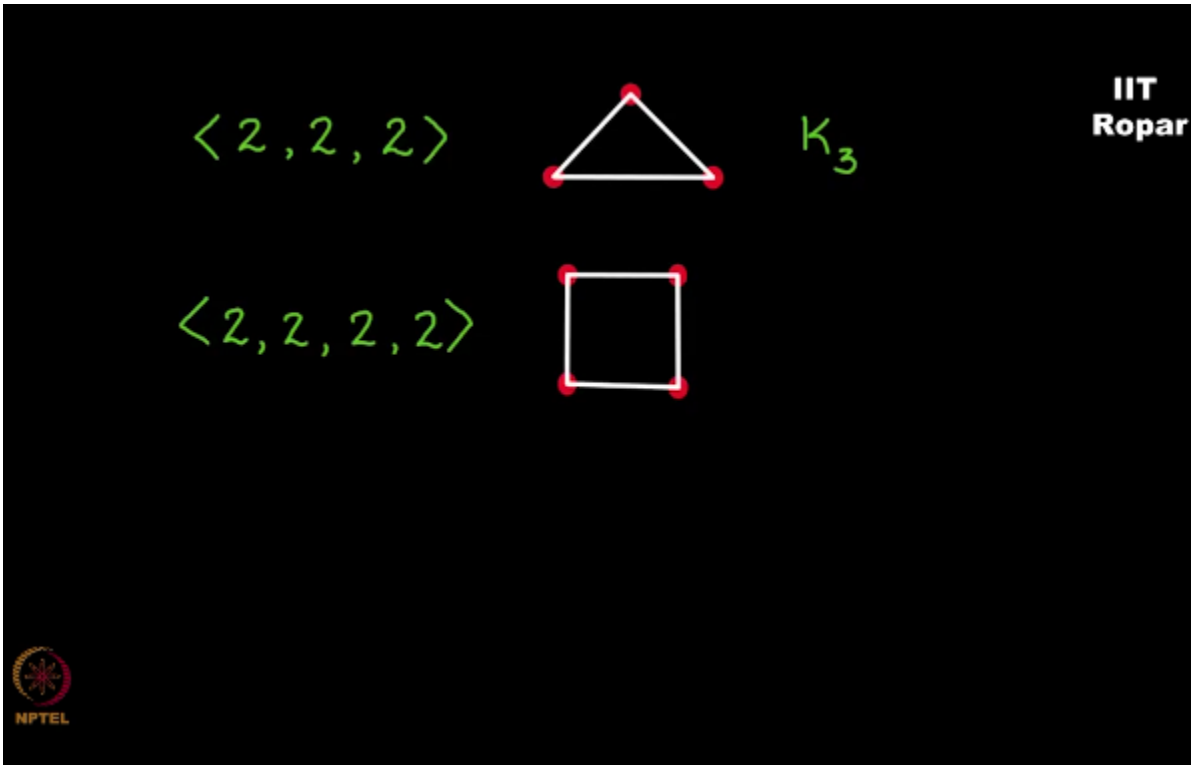

basically a square like thing, quadrilateral like thing will give you this degree sequence 2, 2, 2 and 2, is this the only possibility? Can you think of another graph with degree sequence 2, 2, 2, 2, now the question is given a degree sequence can you always construct a graph?

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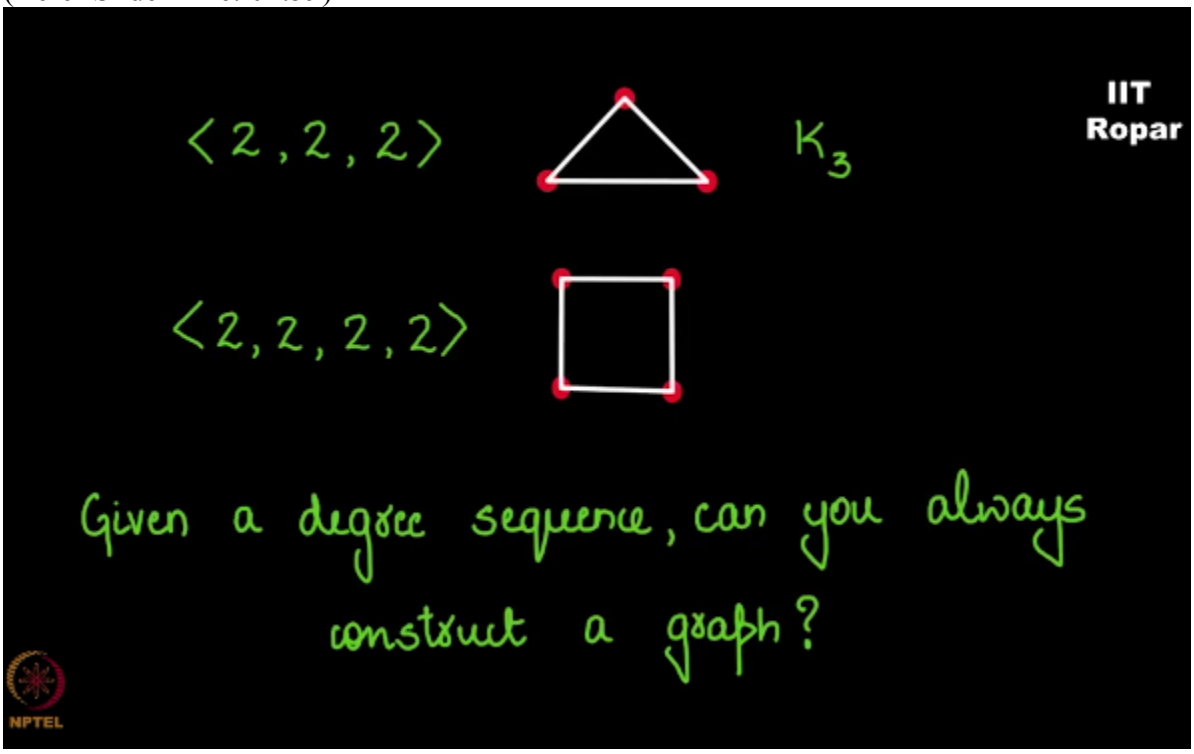

How about 1, 1, 1?

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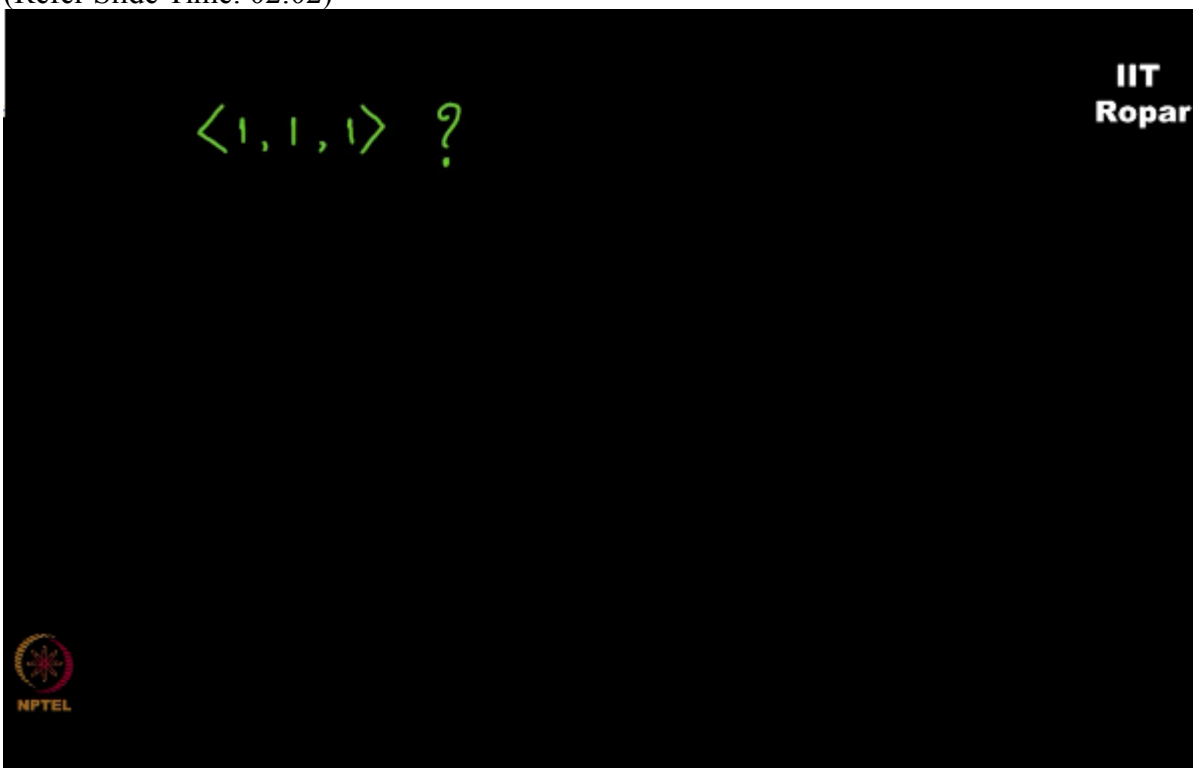

The point is you cannot construct a any graph with this degree sequence 1, 1, and 1,

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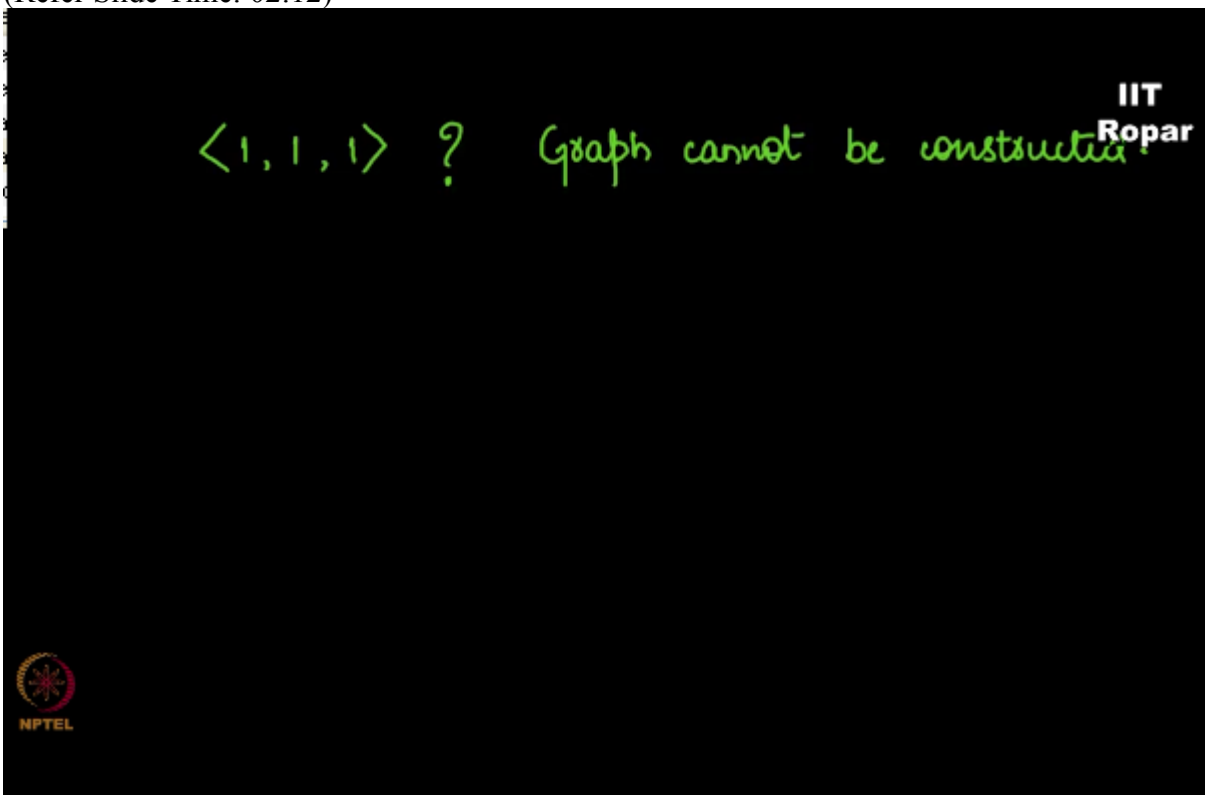

maximum you can construct 1, 1, but for another node to be 1 you must put an edge and that's impossible

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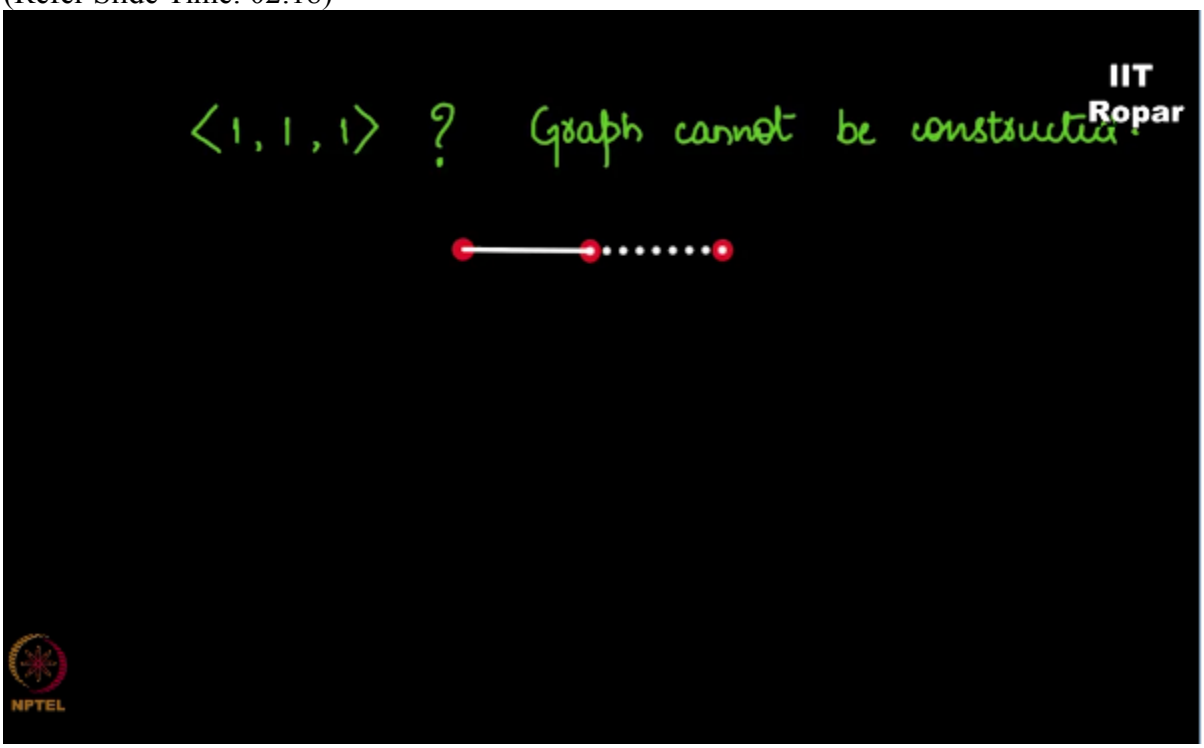

right? Perfect, so now you know what is degree sequence given a graph you can always write a degree sequence but given a degree sequence you may not have a graph with that degree sequence,

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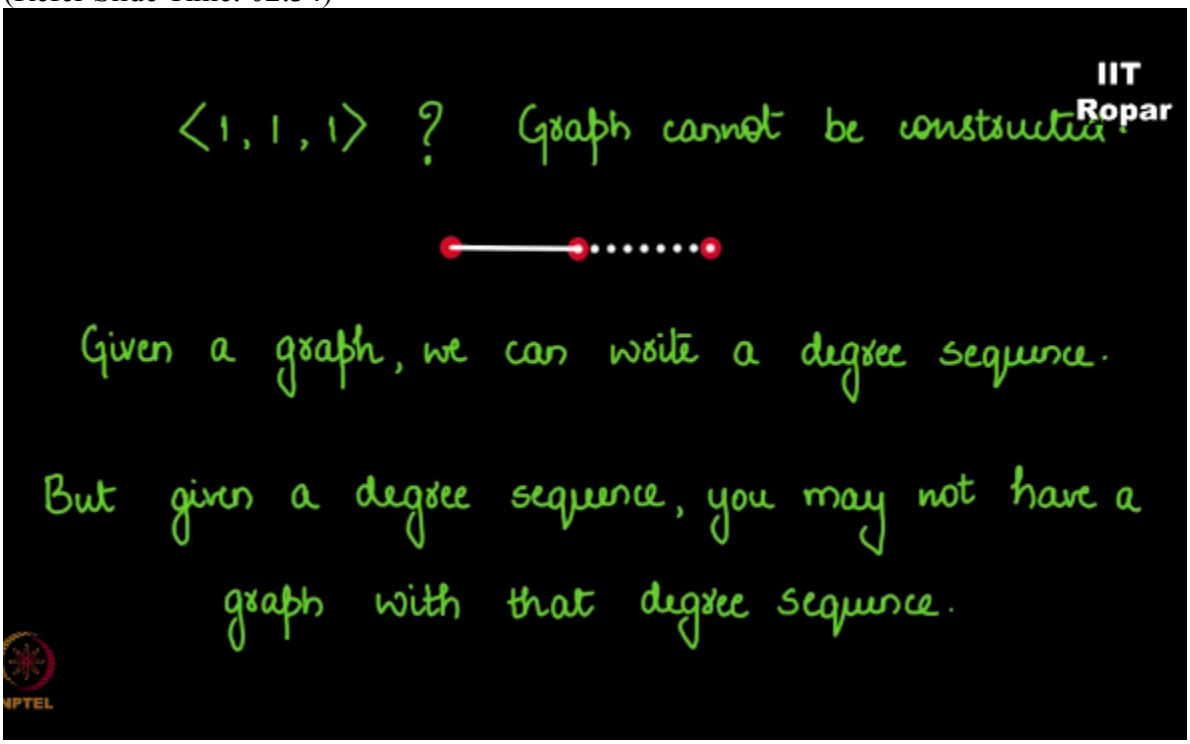

now this is an important concept, think about it.

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