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NPTEL ONLINE CERTIFICATION COURSE

Discrete Mathematics
Graph Theory - 2

Incidence matrix representation

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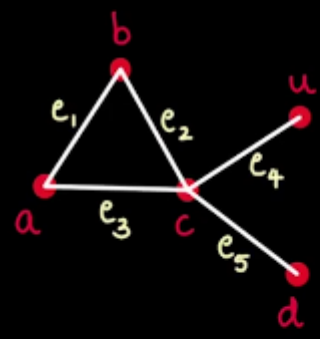
We have seen what is an adjacency matrix, now we'll be seeing something called as the incidence matrix, the word incidence has several meanings but what we mean here is a vertex will be addressing the vertex and the edges which it is connected to, what do I mean by that? Now look at this table, here I'm going to write all the nodes, vertices, (Refer Slide Time: 00:36)

The slide features a graph on the left with five vertices labeled a, b, c, d, and u. Edges are labeled e1, e2, e3, e4, and e5. Vertex a is connected to b (e1) and c (e3). Vertex b is connected to a (e1) and c (e2). Vertex c is connected to a (e3), b (e2), d (e5), and u (e4). Vertex d is connected to c (e5). Vertex u is connected to c (e4). To the right of the graph is a table structure with a vertical line on the left and a horizontal line at the top. The vertices a, b, c, d, and u are listed vertically along the left side of the table. The title 'INCIDENCE MATRIX' is circled in red at the top center. The IIT Ropar logo is in the top right corner. The NPTEL logo is in the bottom left corner.

and here in this row I'll write all the edges,
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INCIDENCE MATRIX

A vertex and the edges it is connected to



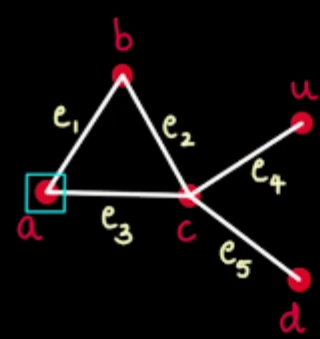
	e_1	e_2	e_3	e_4	e_5
a					
b					
c					
d					
u					



so look at the graph, A vertex A is connected to or it is incident to E1 and E3, but it's not incident to E2, so do you see what I mean by incidence
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INCIDENCE MATRIX

A vertex and the edges it is connected to



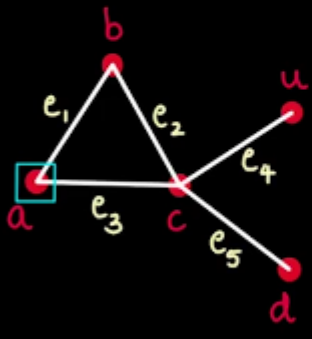
	e_1	e_2	e_3	e_4	e_5
a					
b					
c					
d					
u					



it E1 and E3 have an endpoint as A, right, so A in the table A E1, here it will be 1, A is incident to E1, as well as E3, so both of these places will get 1, whereas the rest will be 0.
 (Refer Slide Time: 01:22)

INCIDENCE MATRIX

A vertex and the edges it is connected to



	e_1	e_2	e_3	e_4	e_5
a	1	0	1	0	0
b					
c					
d					
u					

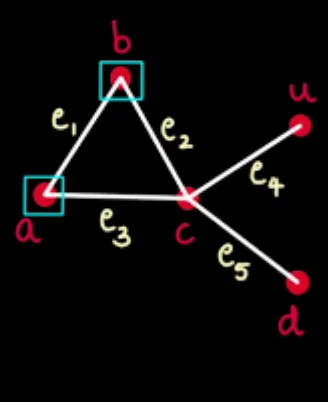
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Now let us come to B, the vertex B is incident to E1 and E2, so E1 and E2 get a 1 and the rest zeros,
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INCIDENCE MATRIX

A vertex and the edges it is connected to



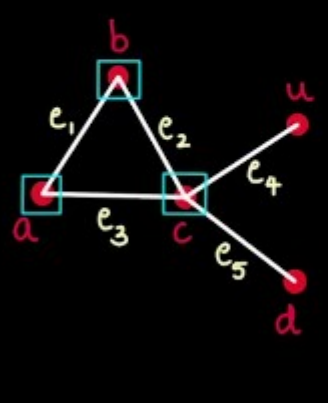
	e_1	e_2	e_3	e_4	e_5
a	1	0	1	0	0
b	1	1	0	0	0
c	0	1	1	1	1
d	0	0	0	0	1
u	0	0	0	1	0



now the vertex C is incident to E2 and E4, and E3 and E5, so all these are 1 except E1 which gets a 0,
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INCIDENCE MATRIX

A vertex and the edges it is connected to



	e_1	e_2	e_3	e_4	e_5
a	1	0	1	0	0
b	1	1	0	0	0
c	0	1	1	1	1
d	0	0	0	0	1
u	0	0	0	1	0

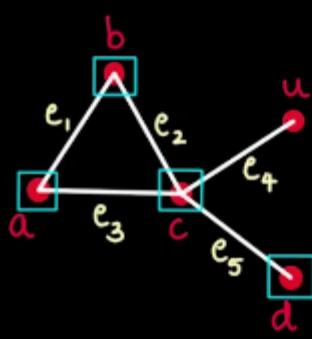


C is not incident to E1, the vertex D, let us take the vertex D, this is incident only to E5 rest are 0s, E5 and D this is 1,
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A vertex and the edges it is connected to



	e_1	e_2	e_3	e_4	e_5
a	1	0	1	0	0
b	1	1	0	0	0
c	0	1	1	1	1
d	0	0	0	0	1
u	0	0	0	1	0

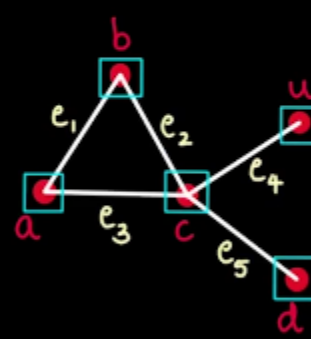
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and the vertex U is incident only to E4 and the rest are 0s,
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INCIDENCE MATRIX

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A vertex and the edges it is connected to



	e_1	e_2	e_3	e_4	e_5
a	1	0	1	0	0
b	1	1	0	0	0
c	0	1	1	1	1
d	0	0	0	0	1
u	0	0	0	1	0

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so this is called as an incidence matrix, again here it was written as a table but in the future we'll be writing it as a matrix.

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