Incident matrix.

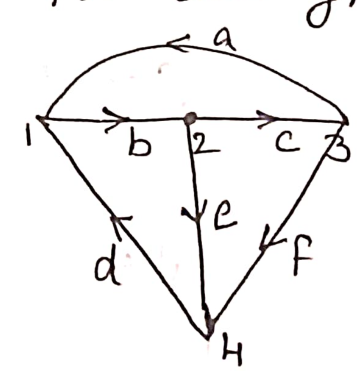
An incident matrix represents the graph of a given network.

Reduced incident matrix :-

If any row in the incident matrix is deleted, then it is reduced incident matrix.

$$A = \begin{cases} 1 & \text{Branch current leaving the node} \\ -1 & \text{Branch current entering the node} \\ 0 & \text{Branch current neithe enter nor leave.} \end{cases}$$

write the incident matrix for the graph



soln

Branches.

$$\text{incident matrix} = \begin{array}{c|cccccc} \text{Nodes} & a & b & c & d & e & f \\ \hline 1 & -1 & 1 & 0 & -1 & 0 & 0 \\ 2 & 0 & -1 & 1 & 0 & 1 & 0 \\ 3 & 1 & 0 & -1 & 0 & 0 & 1 \\ 4 & 0 & 0 & 0 & 1 & -1 & -1 \end{array}$$

To check the correctness of the matrix the sum of elements in each column is zero.

Reduced incident matrix

$$A = \begin{array}{c|cccccc} \text{node} \backslash \text{Branch} & a & b & c & d & e & f \\ \hline 1 & -1 & 1 & 0 & -1 & 0 & 0 \\ 2 & 0 & -1 & 1 & 0 & 1 & 0 \\ 3 & 1 & 0 & -1 & 0 & 0 & 1 \end{array}$$

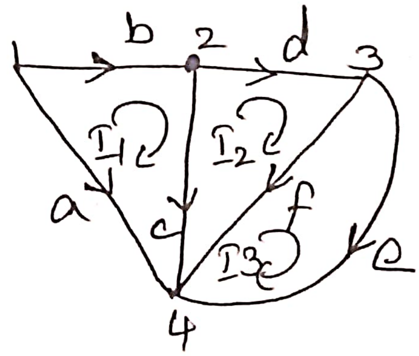
The set matrix (or) loop matrix

It is used to find the loop & branch current in a circuit.

$$B_{ij} = \begin{cases} +1 & \text{Direction of branch ct \& loop ct same} \\ -1 & \text{Direction of branch ct \& loop ct not same} \\ 0 & \text{Branch ct is not present in the loop.} \end{cases}$$

- write the tie set matrix and the branch current relation for the graph given.

$$B = \begin{array}{c} \begin{array}{cccccc} a & b & c & d & e & f \end{array} \\ \begin{bmatrix} -1 & 1 & 1 & 0 & 0 & 0 \\ 0 & 0 & -1 & 1 & 0 & 1 \\ 0 & 0 & 0 & 0 & 1 & -1 \end{bmatrix} \end{array} \begin{array}{c} \\ I_1 \\ I_2 \\ I_3 \end{array}$$



I_1, I_2, I_3 = Loop ct.

$I_a, I_b, I_c, I_d, I_e, I_f$ = branch ct

Relation B/w Branch & loop ct.

$$B_T = \begin{array}{cc} \begin{matrix} I_1 & I_2 & I_3 \end{matrix} & \\ \begin{bmatrix} -1 & 0 & 0 \\ 1 & 0 & 0 \\ 1 & -1 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \\ 0 & 1 & -1 \end{bmatrix} & \begin{matrix} I_a \\ I_b \\ I_c \\ I_d \\ I_e \\ I_f \end{matrix} \end{array}$$

$I_1 = -I_a$

$I_b = I_1$

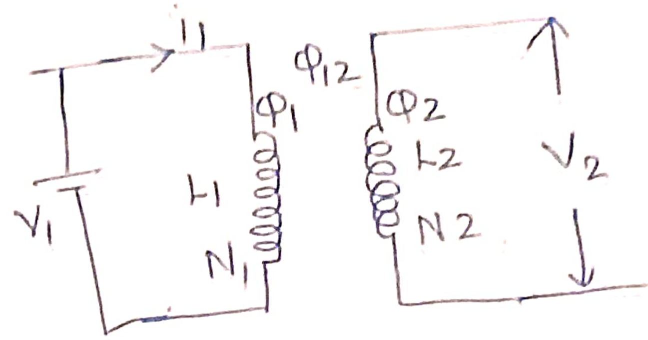
$I_c = I_1 - I_2$

$I_d = I_2$

$I_e = 1$

$I_f = I_2 - I_3$.

Derive the relationship between self inductance, mutual inductance and the co-efficient of coupling. [Apr/May 2022] (23)



The mutual inductance in the first coil due to second coil is,

$$M_{12} = \frac{K \varphi_1 N_2}{I_1} \quad \text{—— (1)}$$

The current I_1 flowing in the first coil having turn N_1, then thei produces a flux φ_1, self Inductance

$$L_1 = \frac{N_1 \varphi_1}{I_1} \quad \text{—— (2)}$$

The current I_2 flowing in the second coil produces a flux φ_2 having turn N_2, then the self Inductance,

$$L_2 = \frac{N_2 \varphi_2}{I_2} \quad \text{—— (3)}$$

The mutual inductance in second coil due to first coil is,

$$M_{21} = \frac{K \varphi_2 N_1}{I_2} \quad \text{—— (4)}$$

multiplying 1 and 4.

$$M_{21}M_{12} = \frac{K\varphi_1 N_2}{I_1} \quad \frac{K\varphi_2 N_1}{I_2}$$

if $M_{21} = M_{12} = M$

$$M^2 = K^2 \frac{\varphi_1\varphi_2 N_1 N_2}{I_1 I_2}$$

∵ By Faradays Law.

$$= K^2 \left(\frac{\varphi_1 N_1}{I_1}\right)\left(\frac{\varphi_2 N_2}{I_1}\right)$$

$$M^2 = K^2 L_1 L_2$$

$$K^2 = \frac{M^2}{L_1 L_2}$$

$$\boxed{K = \frac{M}{\sqrt{L_1 L_2}}}$$

COE

Exam TimeTable
Placement
Exam

An

Nov/dec 20/25 endsem exam 20-25

Result Time-table

aw - 20/25.

Exam - Notification - endsem
& link (TimeTable)

→ Reg 20-21
→ NOV/DEC 20-25.