Let – set of adjacent to nodes.   
Let – slack buses set. ,

|  |  |
| --- | --- |
|  | (1) |

|  |  |
| --- | --- |
|  | (2) |

|  |  |
| --- | --- |
|  | (3) |

|  |  |
| --- | --- |
|  | (4) |

Combine equations in matrix form

|  |  |
| --- | --- |
|  | (5) |

where:

– admittance matrix with exception of equations of slack buses;

– bus voltage vector;

– injection vector at bus;

– slack bus voltage vector ;

– submatrix of admittance matrix consisting of columns of slack bus admittances.

By resolving from (5) one can use (2) to obtain flows through the edges.

% 1 2 3 4 5

Y=[

3, -1, 0, -1, -1; % 1

-1, 3, -1, 0, -1; % 2

0, -1, 3, -1, -1; % 3

-1, 0, -1, 3, -1; % 4

-1, -1, -1, -1, 4; % 5

];

Y = -Y;

Ys = Y(1:4, 1:4);

Vs = 6;

S = [1;

2;

3;

4

];

Sp = -S - Vs;

Vx = Ys^-1 \* Sp

S12 = Vx(2) - Vx(1)

S14 = Vx(4) - Vx(1)

S15 = Vs - Vx(1)

S23 = Vx(3) - Vx(2)

S25 = Vs - Vx(2)

S34 = Vx(4) - Vx(3)

S35 = Vs - Vx(3)

S45 = Vs - Vx(4)

S1 = S12 + S14 + S15 + S(1)

S2 = -S12 + S23 + S25 + S(2)

S3 = -S23 + S34 + S35 + S(3)

S4 = -S14 - S34 + S45 + S(4)

S5 = -S15 - S25 - S35 - S45