

EE 210

Nodal Analysis Example 2

1. Use Nodal analysis and MATLAB® to find the voltages at nodes A, B, C, and D.

Solution

At Node A

$$V_A = 12 \quad (1)$$

Nodes B and C form a *Supernode*

At the Supernode BC

$$\frac{V_A - V_B}{2} - \frac{V_B}{2} - \frac{V_C}{6} = 0 \text{ which simplifies to}$$

$$0.5V_A - V_B - 0.167V_C = 0 \quad (2)$$

At this point we have 2 equations and three unknowns. We need another equation. We note that the source V_2 sits between V_B and V_C . This gives

$$V_B - V_C = 5 \quad (3)$$

In Matrix form equations 1, 2, and 3 can be written as

$$\begin{bmatrix} 1 & 0 & 0 \\ 0.5 & -1 & -0.167 \\ 0 & 1 & -1 \end{bmatrix} \begin{bmatrix} V_A \\ V_B \\ V_C \end{bmatrix} = \begin{bmatrix} 12 \\ 0 \\ 5 \end{bmatrix}$$

Putting this into a MATLAB® m-file we get

```
%NodalExmp2.m
```

```
A = [1 0 0; ...  
     0.5 -1 -0.167; ...  
     0 1 -1];
```

```
b = [12; 0; 5];
```

```
x = A^-1*b;
```

```
disp(x);
```

```
%Answer
```

```
% 12.0000
```

```
% 5.8569
```

```
% 0.8569
```

