

EE 210

Nodal Analysis Example 1

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

Solution

At Node A

$$10 + \frac{V_B - V_A}{0.5} = 0 \text{ which simplifies to}$$
$$-2V_A + 2V_B = -10 \quad (1)$$

At Node B

$$\frac{V_A - V_B}{0.5} + \frac{V_C - V_B}{0.3} = 0 \text{ which simplifies to}$$
$$2V_A - 5.33V_B + 3.33V_C = 0 \quad (2)$$

At Node C

$$\frac{V_B - V_C}{0.3} - \frac{V_C}{2} + \frac{V_D - V_C}{2} = 0 \text{ which simplifies to}$$
$$3.33V_B - 4.33V_C + 0.5V_D = 0 \quad (3)$$

At Node D

$$V_D = 10 \quad (4)$$

In Matrix form equations 1, 2, 3, and 4 can be written as

$$\begin{bmatrix} -2 & 2 & 0 & 0 \\ 2 & -5.33 & 3.33 & 0 \\ 0 & 3.33 & -4.33 & 0.5 \\ 0 & 0 & 0 & 1 \end{bmatrix} * \begin{bmatrix} V_A \\ V_B \\ V_C \\ V_D \end{bmatrix} = \begin{bmatrix} -10 \\ 0 \\ 0 \\ 10 \end{bmatrix}$$

Putting this into a MATLAB® m-file we get

```
%NodalExmp.m
```

```
A = [-2 2 0 0; ...  
      2 -5.33 3.33 0; ...  
      0 3.33 -4.33 0.5; ...  
      0 0 0 1];
```

```
b = [-10; 0; 0; 10];
```

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

```
disp(x);
```

```
%Answer
```

```
% 23.0030
```

```
% 18.0030
```

```
% 15.0000
```

```
% 10.0000
```

