University of Waterloo

Department of Mechanical and Mechatronics Engineering

MTE 204 - Numerical Methods

Project 1a

Group #16

Mitchell Catoen ID: 20563284

Danyon Chu ID: 20563165

Devon Copeland ID: 20553468

Ross Duquette ID: 20553972

David Ferris ID: 20553578

Justin Lim ID: 20555755

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MTE 204 – Project 1a Submission Document
Group #16
Name Student 1: Mitchell Catoen ID: 20563284
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Name Student 6: Justin Lim ID: 20555755

```
///*****************************************************
/// SOLUTIONS TO Problem 1a - 2016
///*****************************************************
/// Calculated Forces (N)
FA = 2630.000000, FB = 600.000000
FC = 380.000000, FD = 3550.000000

/// NODAL POSITIONS (mm)
U1x  =    0.00000, U1y  =    0.00000
U2x  =    0.00117, U2y  =   -0.00235
U3x  =    0.00263, U3y  =    0.00000
U4x  =    0.01183, U4y  =   -0.00145

/// NODAL FORCES (Newtons)
F1x = -2330.00000, F1y = -2017.77238
F2x = -300.00000, F2y = -519.61524
F3x =   -0.00000, F3y = 2537.38762
F4x = 2630.00000, F4y =   -0.00000

/// Element Stresses (MPa)
/// ID, Node 1, Node 2, STRESS[MPa]
-------------------------------------------------------
1, 1, 2, 0.466004 [Tension]
2, 1, 4, 0.931988 [Tension]
3, 2, 4, 0.207861 [Tension]
4, 2, 3, 0.586004 [Tension]
5, 3, 4, 1.171972 [Compression]
```

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```
///*****************************************************
/// SOLUTIONS TO Problem 1b - 2016
///*****************************************************
/// Calculated Forces (N)
FA = 2630.000000, FB = 600.000000
FC = 380.000000, FD = 3550.000000

/// NODAL POSITIONS (mm)
U1x  =   -0.00024, U1y  =    0.00000
U2x  =    0.00000, U2y  =    0.00000
U3x  =   -0.00252, U3y  =    0.00359
U4x  =   -0.00131, U4y  =    0.00000
U5x  =    0.00000, U5y  =    0.00000
U6x  =   -0.00060, U6y  =   -0.00035
U7x  =   -0.01435, U7y  =    0.00829
U8x  =   -0.00229, U8y  =   -0.00031
U9x  =   -0.00436, U9y  =    0.00176
U10x  =   -0.01895, U10y  =    0.00967
U11x  =   -0.01204, U11y  =    0.00161

/// NODAL FORCES (Newtons)
F1x =    0.00000, F1y =  208.68040
F2x = 1379.83211, F2y = -977.65153
F3x = -173.20508, F3y = -100.00000
F4x =    0.00000, F4y = -259.46531
F5x = 1583.54142, F5y = -1604.17026
F6x =    0.00000, F6y =    0.00000
F7x =   -0.00000, F7y =    0.00000
F8x =  -70.71068, F8y =   70.71068
F9x =    0.00000, F9y =    0.00000
F10x = -2719.45777, F10y = 2281.89601
F11x =    0.00000, F11y =  380.00000

/// Element Stresses (MPa)
/// ID, Node 1, Node 2, STRESS[MPa]
-------------------------------------------------------
1, 1, 2, 0.048194 [Tension]
2, 1, 6, 0.096386 [Compression]
3, 2, 6, 0.000056 [Compression]
4, 2, 3, 0.503967 [Compression]
5, 2, 7, 0.000431 [Tension]
```

6, 6, 10, 0.096370 [Compression]
7, 7, 10, 0.698998 [Tension]
8, 10, 11, 0.690415 [Tension]
9, 3, 8, 0.652606 [Compression]
10, 8, 4, 0.044244 [Tension]
11, 3, 4, 0.241031 [Tension]
12, 11, 9, 0.741158 [Tension]
13, 11, 8, 0.640829 [Compression]
14, 4, 9, 0.000429 [Tension]
15, 4, 5, 0.262938 [Tension]
16, 5, 9, 0.740941 [Tension]
17, 2, 10, 0.390764 [Tension]
18, 3, 7, 0.698797 [Tension]
19, 4, 11, 0.065101 [Tension]