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David Luby

ME 786 HW 5 10-18-2022

```
clear; clc;
```

No 4.1-a

```
E = 30E6; %psi
A = 2.1; %in^2

q = (10^-2)*[1.1; 0; 2.4; -.6; -1.8; 2.2];

x1 = 10; y1 = 10; z1 = -22;

x2 = 50; y2 = 40; z2 = 22;

dx = x2-x1; dy = y2-y1; dz = z2-z1;

len = sqrt(dx^2 + dy^2 + dz^2);

l = dx/len; m = dy/len; n = dz/len;

L = [l, m, n, 0, 0, 0; 0, 0, 0, l, m, n];

displacement = L*q

displacement =

    0.0225
    0.0028
```

No 4.1-b

```
% dl = p1/ae
% stress = p/a = dl*e/l
stress = (displacement(1)-displacement(2))*E/len

stress =
```

8.8458e+03

No 4.1-c

```
lmn = [1*1, m*1, n*1, -1*1, -m*1, -n*1];
stiffness = zeros(6);
for i = 1:1:6
    for j = 1:1:6
        if (i > 3)
            stiffness(i,j) = -1*E*A/len*lmn(j);
        else
            stiffness(i,j) = E*A/len*lmn(j);
        end
    end
end

stiffness

stiffness =

1.0e+05 *

    3.4117    2.5588    3.7529   -3.4117   -2.5588   -3.7529
    3.4117    2.5588    3.7529   -3.4117   -2.5588   -3.7529
    3.4117    2.5588    3.7529   -3.4117   -2.5588   -3.7529
   -3.4117   -2.5588   -3.7529    3.4117    2.5588    3.7529
   -3.4117   -2.5588   -3.7529    3.4117    2.5588    3.7529
   -3.4117   -2.5588   -3.7529    3.4117    2.5588    3.7529
```

No 4.1-d

```
strainEnergy = 1/2*q'*stiffness*q
```

```
strainEnergy =
```

```
206.3919
```

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