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Section: 17460

Assignment: Lab #7

ME 318 Lab #7

Please complete the following problems and turn in a nicely formatted pdf file. Include all material in a clear, ordered, and organized manner. You should include all m-files and code used to answer each problem.

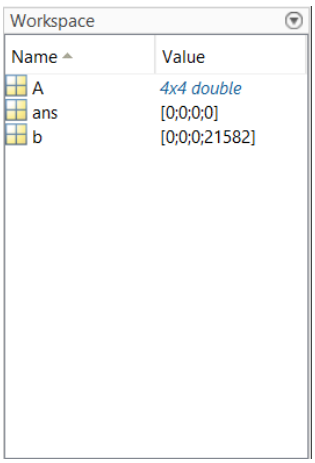
Problem 7.1 For element angles θ = 30˚ , 35˚ , 45˚ , 65˚ , mass of M = 2200 kg and the gravitational acceleration g = 9.81m/s^2 , find the tensions in the elements.

(a) Write the code for Gaussian Elimination and include it in the Results section.

```
function x = GaussElim(A, b)
M = [A b];
[row, col] = size(M);
tmp = M(3, :);
M(3, :) = M(1, :);
M(1, :) = tmp;

for i = 1:row-1     % for each diagonal element, last one doesn't count bc
its b!
    for j = i+1:row   % for each row under the diagonal element
        factor = M(j, i)/M(i, i);  %divide first element by diagonal
        M(j,:) = M(j, :) - factor*M(i, :); %replace the row with factor*row -
diagonal element
    end
end
%back substitution
x = zeros(row, 1); %make array x that holds the solution
for i=row-1:-1:1
    x(i) = (M(i,col) - M(i, i+1:row)*x(i+1:row))/ M(i,i);
%parts 1 and 2 of lab put together into one equation
end
```

(b) Copy-paste the results from your program.




```
>> A = [0 -cosd(30 + 35) -cosd(45) cosd(65);
0 -sind(30+35) -sind(45) sind(65);
-cosd(30) 0 0 -cosd(65);
-sind(30) 0 0 -sind(65)];
>> b = [0; 0; 0; 2200*9.81];
>> GaussElim(A, b)

ans =

     0
     0
     0
     0
```

Please refer to the set of linear equations described in *Section 6.2 Case Study – Static Forces in a Crane Boom* of "Lab7_2020.pdf"

Problem 7.2 Repeat Problem 7.1 using MATLAB routines.

```
>> x = A\b

x =

   1.0e+04 *

    1.5902
   -3.2586
   -0.0000
   -3.2586
```

Problem 7.3 Use MATLAB to solve the system of equations shown above. (MATLAB will get the correct solution because it can deal with this kind of ill-conditioning.) Show your commands and MATLAB's response.

```
>> C = [1.001 1; 1 1];
>> k = [2; 1];
>> ans = C\k

ans =

   1.0e+03 *

    1.0000
   -0.9990
```
