Exam 1

Table of Contents

Problem 1

```matlab
% Part a

Cib = findDCM(90,30,0,'213')

% part b

i3 = [0 0 1]';

i3b = Cib*i3

% part c

b3 = [0 0 1]';

b3i = Cib'*b3

% part d

qib = [0 0 0.3584 0.9336]'

eul = quat2axis(qib)

%part e

Cia = quat2dcm(qib)

% part f

a2 = [0 1 0]';

a2b = Cia*a2;

angle = angle3vec(a2b,[1 0 0])
```

Cib =

```
    0.8660         0    -0.5000
    0.5000         0     0.8660
```

```
         0    -1.0000            0


    i3b =

      -0.5000
       0.8660
            0


    b3i =

        0
       -1
        0


    qib =

            0
            0
       0.3584
       0.9336


    eul =

            0            0     1.0002     41.9937


    Cia =

       0.7137     0.6692            0
      -0.6692     0.7137            0
            0            0    -0.7137
```

problem 2

```
% part a

omeg = cross([3 0 0.3],[0 3 1])


omeg =

    -0.9000    -3.0000     9.0000
```

functions I wrote previously

```
function angle = angle3vec(u,v)
angle = rad2deg(atan2(norm(cross(u,v)),dot(u,v)));
```

```matlab
end

function [axis] = quat2axis(q)

theta = rad2deg(acos(q(4))*2);

axis(1:3) = q(1:3)./sind(theta/2);
axis(4) = theta;

end

function C = quat2dcm(q)

C(1,1) = q(1)^2-q(2)^2-q(3)^3+q(4)^4;
C(1,2) = 2*(q(1)*q(2)+q(3)*q(4));
C(1,3) = 2*(q(1)*q(3)-q(2)*q(4));
C(2,1) = 2*(q(1)*q(2)-q(3)*q(4));
C(2,2) = -q(1)^2+q(2)^2-q(3)^3+q(4)^4;
C(2,3) = 2*(q(2)*q(3)+q(1)*q(4));
C(3,1) = 2*(q(1)*q(3)+q(2)*q(4));
C(3,2) = 2*(q(2)*q(3)-q(1)*q(4));
C(3,3) = -q(1)^2-q(2)^2+q(3)^3-q(4)^4;

end

function DCM=findDCM(x,y,z,order)

Rx=[1      0           0;
    0    cosd(x)    sind(x);
    0    -sind(x)   cosd(x)];

Ry=[cosd(y)      0          -sind(y);
    0            1          0;
    sind(y)      0          cosd(y)];

Rz=[cosd(z)        sind(z)          0;
    -sind(z)       cosd(z)          0;
    0              0                1];

order = fliplr(order);

if order(1) == '1'
    DCM = Rx;
elseif order(1) == '2'
    DCM = Ry;
else
    DCM = Rz;
end

for i = 2:3

    if order(i) == '1'
        DCM = DCM*Rx;
    elseif order(i) == '2'
```

```
        DCM = DCM*Ry;
    else
        DCM = DCM*Rz;
    end

end


end


angle =

   46.8415
```

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