Question 1:

```
function [ABDmatrix,distances,Qbars,Sbars] =
laminateStiffnessMatrix(thicknesses,thetas,E1s,E2s,G12s,v12s)
    A=zeros(3);
    B=zeros(3);
    D=zeros(3);
    N=length(thicknesses);
    thickness=sum(thicknesses);
    distances=zeros(1,length(thicknesses)+1);
    distances(1)=-thickness/2;
    distances(end)=thickness/2;
    for i=2:N
        distances(i)=distances(i-1)+thicknesses(i-1);
    end
    Qbars{1}=[];
    Sbars{1}=[];
    for k=1:N
        Qbar =
transReducedStiffnessMatrix(E1s(k),E2s(k),G12s(k),v12s(k),thetas(k));
        Qbars{k}=Qbar;
    end

    for i=1:3
        for j=1:3
            for k=1:N
                A(i,j)=A(i,j)+(Qbars{k}(i,j)*(distances(k+1)-distances(k)));
                B(i,j)=B(i,j)+(Qbars{k}(i,j)*(1/2)*(distances(k+1)^2-
distances(k)^2));
                D(i,j)=D(i,j)+(Qbars{k}(i,j)*(1/3)*(distances(k+1)^3-
distances(k)^3));
            end
        end
    end
    ABDmatrix=[A,B;B,D];
end
```

MAIN:

```
clc;clear;
E1s=[140e9,140e9,140e9,140e9,140e9,140e9];
E2s=[10e9,10e9,10e9,10e9,10e9,10e9];
G12s=[7e9,7e9,7e9,7e9,7e9,7e9];
v12s=[0.3,0.3,0.3,0.3,0.3,0.3];
thicknesses=[0.0002,0.0002,0.0002,0.0002,0.0002,0.0002];
thetas=[0,30,-30,-30,30,0];

ABDmatrix1 = laminateStiffnessMatrix(thicknesses,thetas,E1s,E2s,G12s,v12s);

E1s=[140e9,140e9,140e9,140e9,140e9,140e9];
E2s=[10e9,10e9,10e9,10e9,10e9,10e9];
G12s=[7e9,7e9,7e9,7e9,7e9,7e9];
v12s=[0.3,0.3,0.3,0.3,0.3,0.3];
thicknesses=[0.0002,0.0002,0.0002,0.0002,0.0002,0.0002];
thetas=[30,-15,-75,20,-60,-30];
```

```
ABDmatrix2 = laminateStiffnessMatrix(thicknesses,thetas,E1s,E2s,G12s,v12s);
```

OUTPUT:

Part a:

	1	2	3	4	5	6
1	1.2538e+08	2.1163e+07	0	3.6380e-12	-7.3896e-13	4.5475e-13
2	2.1163e+07	2.0706e+07	0	-7.3896e-13	-5.6843e-13	2.2737e-13
3	0	0	2.5940e+07	4.5475e-13	2.2737e-13	-9.0949e-13
4	3.6380e-12	-7.3896e-13	4.5475e-13	17.9593	1.3702	1.3116
5	-7.3896e-13	-5.6843e-13	2.2737e-13	1.3702	1.9095	0.5014
6	4.5475e-13	2.2737e-13	-9.0949e-13	1.3116	0.5014	1.9435

Part b:

	1	2	3	4	5	6
1	8.8654e+07	2.2117e+07	-2.5920e+06	-4.1989e+03	972.3900	-6.6143e+03
2	2.2117e+07	5.5523e+07	-1.3413e+07	972.3900	2.2542e+03	-4.6584e+03
3	-2.5920e+06	-1.3413e+07	2.6894e+07	-6.6143e+03	-4.6584e+03	972.3900
4	-4.1989e+03	972.3900	-6.6143e+03	11.7950	3.2539	-0.7495
5	972.3900	2.2542e+03	-4.6584e+03	3.2539	4.3066	-0.8938
6	-6.6143e+03	-4.6584e+03	972.3900	-0.7495	-0.8938	3.8271

Problem 2:

```
function [ABDmatrixINV,distances,Qbars,Sbars] =
laminateStiffnessMatrixINV(thicknesses,thetas,E1s,E2s,G12s,v12s)

    [ABDmatrix,distances,Qbars,Sbars] =
laminateStiffnessMatrix(thicknesses,thetas,E1s,E2s,G12s,v12s);

    ABDmatrixINV=ABDmatrix^-1;
end
```

Part a:

	1	2	3	4	5	6
1	9.6387e-09	-9.8514e-09	1.9443e-41	-2.5553e-21	2.6473e-21	-6.1321e-23
2	-9.8514e-09	5.8364e-08	-5.6887e-40	4.1621e-21	1.3409e-20	-1.0792e-20
3	1.9443e-41	-5.6887e-40	3.8551e-08	-1.8735e-21	-8.9199e-21	2.1607e-20
4	-2.5553e-21	4.1621e-21	-1.8735e-21	0.0607	-0.0352	-0.0319
5	2.6473e-21	1.3409e-20	-8.9199e-21	-0.0352	0.5822	-0.1265
6	-6.1321e-23	-1.0792e-20	2.1607e-20	-0.0319	-0.1265	0.5687

Part b:

	1	2	3	4	5	6
1	1.4174e-08	-3.9382e-09	5.8764e-11	7.3647e-06	-2.3694e-06	2.0577e-05
2	-3.9382e-09	2.4143e-08	1.2420e-08	4.0915e-06	2.9358e-06	2.0912e-05
3	5.8764e-11	1.2420e-08	5.4721e-08	1.9257e-05	4.1178e-05	1.4704e-05
4	7.3647e-06	4.0915e-06	1.9257e-05	0.1179	-0.0679	0.0200
5	-2.3694e-06	2.9358e-06	4.1178e-05	-0.0679	0.3384	0.0547
6	2.0577e-05	2.0912e-05	1.4704e-05	0.0200	0.0547	0.3353