function Qbar = transReducedStiffnessMatrix(E1,E2,G12,v12,theta)

%This function finds the transformed reduced stiffness matrix at angle theta

v21=(v12/E1)\*E2;

Q11=E1/(1-v12\*v21);

Q12=(v12\*E2)/(1-v12\*v21);

Q21=Q12;

Q22=E2/(1-v12\*v21);

Q66=G12;

Q=[Q11 Q12 0; Q21 Q22 0; 0 0 Q66];

stressTrans=[cosd(theta)^2 sind(theta)^2 2\*cosd(theta)\*sind(theta);...

sind(theta)^2 cosd(theta)^2 -2\*cosd(theta)\*sind(theta);...

-cosd(theta)\*sind(theta) cosd(theta)\*sind(theta) (cosd(theta)^2)-(sind(theta)^2)];

strainTrans=[cosd(theta)^2 sind(theta)^2 cosd(theta)\*sind(theta);...

sind(theta)^2 cosd(theta)^2 -cosd(theta)\*sind(theta);...

-2\*cosd(theta)\*sind(theta) 2\*cosd(theta)\*sind(theta) (cosd(theta)^2)-(sind(theta)^2)];

Qbar = (stressTrans)\Q\*strainTrans;

end

Main test code:

clc;clear;

%AS/3501 graphite/epoxy

E1=138e9;

E2=9e9;

G12=6.9e9;

v12=0.3;

theta = [0 90 30 45 -45];

for i=1:length(theta)

Qbar = transReducedStiffnessMatrix(E1,E2,G12,v12,theta(i));

display(Qbar)

end

Output:

Qbar =

1.0e+11 \*

1.3881 0.0272 0

0.0272 0.0905 0

0 0 0.0690

Qbar =

1.0e+11 \*

0.0905 0.0272 0

0.0272 1.3881 0

0 0 0.0690

Qbar =

1.0e+10 \*

8.4843 2.4248 4.0526

2.4248 1.9962 1.5663

4.0526 1.5663 2.8432

Qbar =

1.0e+10 \*

4.5225 3.1425 3.2440

3.1425 4.5225 3.2440

3.2440 3.2440 3.5609

Qbar =

1.0e+10 \*

4.5225 3.1425 -3.2440

3.1425 4.5225 -3.2440

-3.2440 -3.2440 3.5609