1/Starting with the stress tensor given in Problem 2.1 from Budynas, 2nd ed.



The stress cube was first rotated 45° about the x-axis and then -45° about the z-axis. The resulting stress tensor is



Given the material is steel (E=200GPa, υ=0.3), determine the initial engineering strain tensor and the engineering strain tensor after transformation.

SOLUTION:

>> Sig=[0 -40 10 -15 25 -30]'\*1e6  
Sig =  
 0  
 -40000000  
 10000000  
 -15000000  
 25000000  
 -30000000

>> Sig\_xyz=[-11.46 -18.54 0 45.18 9.82 15]'\*1e6  
Sig\_xyz =  
 -11460000  
 -18540000  
 0  
 45180000  
 9820000  
 15000000

>> Scomp=[1/200e9 -.3/200e9 -.3/200e9 0 0 0;  
 -.3/200e9 1/200e9 -.3/200e9 0 0 0;  
 -.3/200e9 -.3/200e9 1/200e9 0 0 0;  
 0 0 0 2\*(1+.3)/200e9 0 0;  
 0 0 0 0 2\*(1+.3)/200e9 0;  
 0 0 0 0 0 2\*(1+.3)/200e9]

Scomp = 1.0e-010 \*  
 0.0500 -0.0150 -0.0150 0 0 0  
 -0.0150 0.0500 -0.0150 0 0 0  
 -0.0150 -0.0150 0.0500 0 0 0  
 0 0 0 0.1300 0 0  
 0 0 0 0 0.1300 0  
 0 0 0 0 0 0.1300

>> e=Scomp\*Sig  
e = 1.0e-003 \*  
 0.0450  
 -0.2150  
 0.1100  
 -0.1950  
 0.3250  
 -0.3900



>> e\_xyz=Scomp\*Sig\_xyz  
e\_xyz = 1.0e-003 \*  
 -0.0295  
 -0.0755  
 0.0450  
 0.5873  
 0.1277  
 0.1950

