**MECH530 – Assignment 3**

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CHOSEN MATERIAL: graphite\_epoxy\_2 (AS/H3501)

================= MATERIAL PROPERTIES =================

Modulus Parameters

E\_x : 138000.000 MPa

E\_y : 8960.000 MPa

E\_s : 7100.000 MPa

nu\_x : 0.300 none

nu\_y : 0.019 none

m : 1.006 none

Strength Parameters

X\_t : 1447.000 MPa

X\_c : 1447.000 MPa

Y\_t : 51.700 MPa

Y\_c : 206.000 MPa

S\_c : 93.000 MPa

h\_o : 0.125 mm

rho : 1600.000 kg/m^3

================= GEOMETRY PARAMETERS =================

Layer Number Type Thickness (mm) Orientation (degrees)

-----------------------------------------------------------------

1 ply 0.125 0

2 ply 0.125 0

3 ply 0.125 20

4 ply 0.125 -20

5 ply 0.125 90

6 ply 0.125 45

7 ply 0.125 -45

8 ply 0.125 -45

9 ply 0.125 45

10 ply 0.125 90

11 ply 0.125 -20

12 ply 0.125 20

13 ply 0.125 0

14 ply 0.125 0

================= ON-AXIS MATRICES =================

Matrix [S] (in MPa^-1):

7.246e-06 -2.174e-06 0.000e+00

-2.174e-06 1.116e-04 0.000e+00

0.000e+00 0.000e+00 1.408e-04

Matrix [Q] (in MPa):

138811.140 2703.800 0.000

2703.800 9012.665 0.000

0.000 0.000 7100.000

================= Assignment 2, Question 1 =================

================= OFF-AXIS MATRICES PER LAYER =================

- NOT COMPUTED -

================= Assignment 2, Question 2 =================

Off-Axis Stress Vector (Given) (MPa):

9.990e+03

-3.100e+03

-4.400e+03

Off-Axis Strain Vector:

7.013e-01

-1.090e-01

-9.261e-01

On-Axis Stress Vector (MPa):

1.549e+03

5.341e+03

-7.655e+03

On-Axis Strain Vector:

-3.874e-04

5.927e-01

-1.078e+00

================= Assignment 3, PART 1 =================

A Matrix (in N/m):

1.503e+08 2.487e+07 0.000e+00

2.487e+07 6.812e+07 0.000e+00

0.000e+00 0.000e+00 3.257e+07

a Matrix (in m/N):

7.082e-09 -2.586e-09 0.000e+00

-2.586e-09 1.562e-08 0.000e+00

0.000e+00 0.000e+00 3.071e-08

================= Assignment 3, PART 2 =================

Off-Axis Stress Resultant Vector (Given) [N/m]:

8.800e+06

-4.800e+06

8.400e+06

Off-Axis Strain Vector:

7.473e-02

-9.775e-02

2.579e-01

================= Assignment 3, PART 3 =================

Ply Angle: 0 degrees

On-Axis Stress Vector [MPa]:

1.011e+04

-6.789e+02

1.831e+03

On-Axis Strain Vector:

7.473e-02

-9.775e-02

2.579e-01

Ply Angle: 0 degrees

On-Axis Stress Vector [MPa]:

1.011e+04

-6.789e+02

1.831e+03

On-Axis Strain Vector:

7.473e-02

-9.775e-02

2.579e-01

Ply Angle: 20 degrees

On-Axis Stress Vector [MPa]:

1.865e+04

-1.075e+03

6.158e+02

On-Axis Strain Vector:

1.375e-01

-1.605e-01

8.673e-02

Ply Angle: -20 degrees

On-Axis Stress Vector [MPa]:

-3.920e+03

-2.860e+01

2.190e+03

On-Axis Strain Vector:

-2.835e-02

5.330e-03

3.085e-01

Ply Angle: 90 degrees

On-Axis Stress Vector [MPa]:

-1.337e+04

4.092e+02

-1.831e+03

On-Axis Strain Vector:

-9.775e-02

7.473e-02

-2.579e-01

Ply Angle: 45 degrees

On-Axis Stress Vector [MPa]:

1.593e+04

-9.485e+02

-1.225e+03

On-Axis Strain Vector:

1.175e-01

-1.405e-01

-1.725e-01

Ply Angle: -45 degrees

On-Axis Stress Vector [MPa]:

-1.918e+04

6.788e+02

1.225e+03

On-Axis Strain Vector:

-1.405e-01

1.175e-01

1.725e-01