
qqbar

Computes the 3D reduced stiffness and transformed reduced stiffness matrices of each lamina

Inputs

moduliplies - Elastic moduli and Poisson's ratios of each lamina
 E1 - Longitudinal elastic modulus
 E2 - Transverse elastic modulus
 nu12 - Major Poisson's ratio
 G12 - In-plane shear modulus
nplies - Thickness of each ply

Outputs

[Qplies] - Reduced stiffness matrix of each lamina
[Qbarplies] - Transformed reduced stiffness matrix of each lamina

Calling the Function

```
[Qplies,Qbarplies]=qqbar(nplies,moduliplies,angleplies)
```

Testing File

Click [here](#) to see a testing file for using the function qqbar

Example

Inputs:

Number of plies: 4

For Ply: 1

Angle of Ply: 60

Angle Lamina Engineering Constants

| | | |
|------|--|----------|
| E1 | | 1.81E+11 |
| E2 | | 1.03E+10 |
| nu12 | | 0.28 |
| G12 | | 7.17E+09 |

For Ply: 2

Angle of Ply: 45

Angle Lamina Engineering Constants

| | | |
|------|--|----------|
| E1 | | 1.81E+11 |
| E2 | | 1.03E+10 |
| nu12 | | 0.28 |
| G12 | | 7.17E+09 |

For Ply: 3

Angle of Ply: 45

Angle Lamina Engineering Constants

| | | |
|------|--|----------|
| E1 | | 1.81E+11 |
| E2 | | 1.03E+10 |
| nu12 | | 0.28 |
| G12 | | 7.17E+09 |

For Ply: 4

Angle of Ply: 90

Angle Lamina Engineering Constants

| | | |
|------|--|----------|
| E1 | | 1.81E+11 |
| E2 | | 1.03E+10 |
| nu12 | | 0.28 |
| G12 | | 7.17E+09 |

Outputs:

For Ply: 1

Angle of Ply: 60

Reduced Stiffness Matrix

1.0e+11 *

| | | |
|--------|--------|--------|
| 1.8181 | 0.0290 | 0 |
| 0.0290 | 0.1035 | 0 |
| 0 | 0 | 0.0717 |

Transformed Reduced Stiffness Matrix

1.0e+11 *

| | | |
|--------|--------|--------|
| 0.2365 | 0.3246 | 0.2005 |
| 0.3246 | 1.0938 | 0.5419 |
| 0.2005 | 0.5419 | 0.3674 |

For Ply: 2

Angle of Ply: 45

Reduced Stiffness Matrix

1.0e+11 *

| | | |
|--------|--------|--------|
| 1.8181 | 0.0290 | 0 |
| 0.0290 | 0.1035 | 0 |
| 0 | 0 | 0.0717 |

Transformed Reduced Stiffness Matrix

1.0e+10 *

| | | |
|--------|--------|--------|
| 5.6658 | 4.2318 | 4.2866 |
| 4.2318 | 5.6658 | 4.2866 |
| 4.2866 | 4.2866 | 4.6591 |

For Ply: 3

Angle of Ply: 45

Reduced Stiffness Matrix

1.0e+11 *

| | | |
|--------|--------|--------|
| 1.8181 | 0.0290 | 0 |
| 0.0290 | 0.1035 | 0 |
| 0 | 0 | 0.0717 |

Transformed Reduced Stiffness Matrix

1.0e+10 *

| | | |
|--------|--------|--------|
| 5.6658 | 4.2318 | 4.2866 |
| 4.2318 | 5.6658 | 4.2866 |
| 4.2866 | 4.2866 | 4.6591 |

For Ply: 4

Angle of Ply: 90

Reduced Stiffness Matrix

1.0e+11 *

| | | |
|--------|--------|--------|
| 1.8181 | 0.0290 | 0 |
| 0.0290 | 0.1035 | 0 |
| 0 | 0 | 0.0717 |

Transformed Reduced Stiffness Matrix

1.0e+11 *

| | | |
|--------|--------|--------|
| 0.1035 | 0.0290 | 0 |
| 0.0290 | 1.8181 | 0 |
| 0 | 0 | 0.0717 |

Description

Outputs the reduced stiffness and transformed reduced stiffness matrices for each lamina: $Q_{plies}(i,j,k)$ and $\bar{Q}_{plies}(i,j,k)$ where i and j denote directions while k is the ply number