**Neural Network Input Parameters:**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Test  Case |  |  |  |  |  |  |  |  |  | S  (Y/N) |  |  |  |  |  |  | Ply1 | Ply2 | Ply3 | Ply4 | No  Of points |
| 1 | 1140 | 570 | 35 | 114 | 35 | 114 | 72 | 72 | 72 | 0 |  |  |  |  |  |  | 0 |  |  |  | 16 |
| 2 | 1500 | 900 | 27 | 200 | 27 | 200 | 80 | 80 | 80 | 0 |  |  |  |  |  |  | 0 |  |  |  | 34 |
| 3 | 1280 | 800 | 40 | 145 | 40 | 145 | 73 | 73 | 50 | 0 |  |  |  |  |  |  | 85 |  |  |  | 21 |
| 4 | 1140 | 570 | 35 | 114 | 35 | 114 | 72 | 72 | 72 | 1 |  |  |  |  |  |  | 90 | +30 | -30 | 90 | 47 |
| 5 | 1140 | 570 | 35 | 114 | 35 | 114 | 72 | 72 | 72 | 1 |  |  |  |  |  |  | 90 | +30 | -30 | 90 | 44 |
| 6 | 1950 | 1480 | 48 | 200 | 48 | 200 | 79 | 79 | 79 | 1 |  |  |  |  |  |  | 0 | +45 | -45 | 90 | 43 |
| 7 | 1280 | 800 | 40 | 145 | 40 | 145 | 73 | 73 | 50 | 0 |  |  |  |  |  |  | +55 | -55 |  |  | 82 |
| 8 | 1550 | 965 | 40 | 200 | 40 | 200 | 80 | 80 | 80 | 1 |  |  |  |  |  |  | 0 | 90 |  |  | 43 |
| 9 | 1378 | 950 | 40 | 125 | 40 | 125 | 97 | 97 | 45 | 1 |  |  |  |  |  |  | 0 |  |  |  | 21 |
| 10 | 1378 | 950 | 40 | 125 | 40 | 125 | 97 | 97 | 45 | 1 |  |  |  |  |  |  | 90 |  |  |  | 21 |
| 11 | 1280 | 800 | 40 | 145 | 40 | 145 | 73 | 73 | 50 |  |  |  |  |  |  |  | 90 |  |  |  | 18 |
| 12 | 1700 | 1150 | 63 | 180 | 50 | 180 | 72 | 72 | 40 |  |  |  |  |  |  |  | 0 |  |  |  | 22 |
| 13 | 1990 | 1500 | 38 | 150 | 38 | 150 | 70 | 70 | 50 |  |  |  |  |  |  |  | 0 |  |  |  | 14 |
| 14 | 1280 | 800 | 40 | 145 | 40 | 145 | 73 | 73 | 50 | 1 |  |  |  |  |  |  | +35 | -35 |  |  | 11 |
| 15 | 2560 | 1590 | 73 | 185 | 63 | 185 | 90 | 90 | 57 | 1 |  |  |  |  |  |  | 0 | 90 | +45 | -45 | 14 |
| 16 | 2560 | 1590 | 73 | 185 | 63 | 185 | 90 | 90 | 57 | 1 |  |  |  |  |  |  | 0 | 90 |  |  | 8 |

**WWFE I**

***Test Case 1, Laminate 0, E-Glass,16 points loading***

|  |  |
| --- | --- |
| Axial | Shear |
| 40 | 0 |
| 26.9 | 36 |
| 30.7 | 32.3 |
| 34 | 12.8 |
| 18 | 51.3 |
| –137.8 | 0 |
| –142.0 | 0 |
| –132.3 | 0 |
| –104.6 | 46.7 |
| –134.6 | 28.9 |
| –99.4 | 64.5 |
| –70.5 | 96.6 |
| –122.0 | 54.6 |
| –44.1 | 81.9 |
| –133.3 | 20.7 |
| 0 | 61.2 |

***Test Case 7, Laminate +55/-55, E-Glass/MY750 ,82 points loading***

|  |  |
| --- | --- |
| Hoop  Stress | Axial  Stress |
| 69 | 92 |
| 106 | 106 |
| 137 | 116 |
| 134 | 103 |
| 197 | 124 |
| 209 | 122 |
| 300 | 151 |
| 271 | 135 |
| 302 | 151 |
| 268 | 134 |
| 491 | 196 |
| 615 | 205 |
| 852 | 257 |
| 775 | 234 |
| 820 | 234 |
| 736 | 133 |
| 605 | 0 |
| 362 | 0 |
| 410 | 0 |
| 321 | –17.0 |
| 318 | –17.0 |
| 191 | –47.0 |
| 64.7 | –129.0\* |
| 110.7 | –112.5\* |
| 0 | 69 |
| 0 | 76 |
| 0 | 74 |
| 0 | 62 |
| 107 | 143 |
| 198 | 198 |
| 331 | 280 |
| 374 | 288 |
| 525 | 332 |
| 599 | 349 |
| 723 | 365 |
| 736 | 368 |
| 741 | 370 |
| 717 | 358 |
| 750 | 375 |
| 835 | 334 |
| 803 | 321 |
| 914 | 305 |
| 939 | 283 |
| 867 | 262 |
| 921 | 263 |
| 817 | 148 |
| 761 | 138 |
| 676 | 67 |
| 516 | 0 |
| 594 | 0 |
| 638 | 0 |
| 622 | 0 |
| 544 | 0 |
| 492 | –27.0 |
| 256 | –65.0 |
| 114.3 | –115.5 |
| –680 | –347 |
| –709 | –365 |
| –715 | –366 |
| –798 | –409 |
| –836 | –430 |
| –807 | –417 |
| –888 | –457 |
| 2.5 | –152 |
| 2.5 | –149 |
| –94 | –195 |
| –269 | –273 |
| –260 | –267 |
| –403 | –329 |
| –540 | –320 |
| –520 | –352 |
| –693 | –406 |
| –557 | –235 |
| –588 | –249 |
| –769 | –312 |
| –705 | –282 |
| –476 | –174 |
| –549 | –186 |
| –384 | –96 |
| –289 | –57 |
| –276 | –42 |
| –339 | –53 |

***Test Case 6, Laminate (90/+-45/0), AS4/3501-6 ,43 points loading***

|  |  |
| --- | --- |
| Axial | Hoop |
| –305.82 | 0 |
| –328.40 | 0 |
| –368.43 | 0 |
| –393.06 | 0 |
| –281.19 | 161.97 |
| –369.45 | 203.73 |
| –264.77 | 243.46 |
| –281.19 | 312.73 |
| –213.46 | 387.1 |
| –248.35 | 399.32 |
| –300.69 | 405.43 |
| –232.96 | 514.44 |
| –87.23 | 777.26 |
| –28.73 | 644.83 |
| 428.7 | 857.4 |
| 423.5 | 847.1 |
| 38.7 | 721.9 |
| 220 | 677.1 |
| 202 | 730.5 |
| 18.1 | 677.6 |
| 46.9 | 667 |
| 172.2 | 790 |
| 35.8 | 718 |
| 124.8 | 696 |
| 54.5 | 723 |
| 254 | 774 |
| 450 | 849 |
| 442 | 813 |
| 504 | 908 |
| 728 | 969 |
| –733.0 | 0 |
| –537.0 | 0 |
| –640.0 | 0 |
| 0 | 652 |
| 0 | 761 |
| 0 | 752 |
| 0 | –404.0 |
| 0 | –329.0 |
| –418.0 | –304.0 |
| –638.0 | –190.0 |
| –275.0 | –301.0 |
| –187.0 | –334.0 |
| –188.0 | –338.0 |

***Test Case 3, Laminate (+85), E-Glass/MY750 ,21 points loading***

|  |  |
| --- | --- |
| 0 | 40.0\* |
| 1280.0\*\* | 0 |
| –800.0\*\*\* | 0 |
| 1170 | 35 |
| 1041 | 29 |
| 1134 | 34 |
| 1086 | 31 |
| 1181 | 36 |
| 1029 | 29 |
| 1200 | 37 |
| 1124 | 33 |
| 1249 | –4.0 |
| 1200 | –42.0 |
| 1138 | –59.0 |
| 1115 | –79.0 |
| 906 | –67.0 |
| 834 | –90.0 |
| 696 | –109.0 |
| 510 | –121.0 |
| 206 | –136.0 |
| 0 | –145.0\*\*\*\* |

***Test Case 4, Laminate (+-30/90), E-Glass/LY556 47 points, loading***

|  |  |
| --- | --- |
| AXIALM | HOOP |
| 292.3 | 312 |
| 592.3 | 157.5 |
| 730.8 | 385.5 |
| 557.7 | 269.3 |
| 720.5 | 384 |
| 548.7 | 405 |
| –266.7 | 67.5 |
| –268.0 | 66 |
| –264.6 | 36 |
| 628.2 | 277.5 |
| 605.1 | 222 |
| 664.1 | 102 |
| 39.9 | –107.2 |
| –179.2 | –82.4 |
| 223.8 | –78.4 |
| 110.3 | –91.2 |
| –183.3 | –78.4 |
| –348.5 | –40.0 |
| 483.7 | –44.8 |
| 144.4 | 299 |
| 61.6 | 335.4 |
| 667.3 | 344.1 |
| 148.8 | 315.6 |
| 616 | 129.6 |
| 471 | 336 |
| –164.2 | 195 |
| –195.1 | 138 |
| –115.5 | 247.5 |
| 48.7 | 301.5 |
| 633.9 | 157.5 |
| 577.5 | 202.5 |
| 385 | 351 |
| 474.8 | 312 |
| 577.2 | 0 |
| 535.2 | 0 |
| 531.3 | 0 |
| 559.5 | 0 |
| 605.7 | 0 |
| 531.3 | 0 |
| 559.5 | 0 |
| –346.5 | 0 |
| –354.2 | 0 |
| 0 | 291 |
| 0 | 267 |
| 0 | 289.5 |
| 0 | –113.6 |
| 0 | 312 |

***Test Case 5, Laminate (+-30/90), E-Glass/LY556 44 points, loading***

|  |  |
| --- | --- |
| 577.2 | 0 |
| 531.3 | 0 |
| 282.3 | 228.9 |
| 436.3 | 140.1 |
| 513.3 | 100.8 |
| 462 | 173.4 |
| 410.7 | 251.2 |
| 64.2 | 199.9 |
| 128.3 | 222.1 |
| 128.3 | 248.6 |
| 192.5 | 274.2 |
| 256.7 | 284.5 |
| –346.5 | 0 |
| –354.2 | 0 |
| 0 | 233.2 |
| 320.8 | 258.9 |
| 320.8 | 261.4 |
| 38.5 | 231.5 |
| 256.7 | 278.5 |
| 102.6 | 198.2 |
| 154 | 211 |
| 205.3 | 218.7 |
| 308 | 283.6 |
| 359.3 | 206.7 |
| 359.3 | 216.2 |
| 410.7 | 159.8 |
| 462 | 120.5 |
| 513.3 | 15.4 |
| 535.2 | 0 |
| –256.7 | 194.8 |
| 0 | 265.7 |
| –64.2 | 271.7 |
| –154.0 | 240.9 |
| –308.0 | 138.4 |
| –333.7 | 75.2 |
| –38.5 | 238.4 |
| –102.7 | 269.1 |
| –154.0 | 227.3 |
| –192.5 | 223.8 |
| –282.3 | 162.3 |
| –308.0 | 145.2 |
| 531.3 | 0 |
| 559.5 | 0 |
| 605.7 | 0 |

**LEE at. al.**

***Test Case 8, Laminate (0/90), T300/epoxy, 43 points, loading***

|  |  |  |  |
| --- | --- | --- | --- |
|  | biaxial load | Axial | Tors. |
| s003 | 0 | 0 | 102 |
| s004 | 0 | 0 | 81 |
| s007 | 0 | 0 | 85 |
| s008 | 0 | 0 | 89 |
| s009 | 0 | 0 | 87 |
| s00d | 0 | 0 | 81 |
| t011 | 1.05 | 119 | 113 |
| t012 | 1.04 | 111 | 107 |
| t013 | 1.05 | 118 | 112 |
| t014 | 1.04 | 105 | 101 |
| t015 | 1.05 | 116 | 110 |
| t021 | 1.99 | 249 | 125 |
| t023 | 2.02 | 228 | 113 |
| t024 | 2.03 | 307 | 151 |
| t025 | 2.07 | 284 | 137 |
| t026 | 2.03 | 264 | 130 |
| t052 | 5.07 | 573 | 113 |
| t053 | 5.03 | 523 | 104 |
| t054 | 5.06 | 552 | 109 |
| t055 | 5.4 | 551 | 102 |
| t057 | 5.03 | 573 | 114 |
| t102 | 10.06 | 644 | 64 |
| t103 | 10.13 | 628 | 62 |
| t104 | 10.06 | 664 | 66 |
| t105 | 10.14 | 720 | 71 |
| t106 | 9.97 | 628 | 63 |
| t201 | 20.46 | 716 | 35 |
| t202 | 20.21 | 687 | 34 |
| t203 | 20.34 | 712 | 35 |
| t205 | 20.26 | 709 | 35 |
| txx2 |  | 692 | 0 |
| txx3 |  | 749 | 0 |
| txx4 |  | 708 | 0 |
| txx5 |  | 732 | 0 |
| txx6 |  | 737 | 0 |
| c021 | -2.06 | -134 | 65 |
| c022 | -2.05 | -152 | 74 |
| c023 | -5.12 | -233 | 46 |
| c052 | -10.17 | -305 | 30 |
| c101 | -9.97 | -309 | 31 |
| c102 |  | -311 | 0 |
| cxx1 |  | -312 | 0 |

*WWFE II Test case 9:*

|  |  |
| --- | --- |
|  |  |
| -590.4122416522366, | 252.79324 |
| -589.090868553847, | 211.5467794 |
| -552.8519512176995, | 165.393848 |
| -499.5132174468812, | 173.6617196 |
| -500.0022295384112, | 214.9104097 |
| -400.9408652095394, | 116.4257527 |
| -405.8309861248393, | 128.9126541 |
| -394.9478659601507, | 136.4418053 |
| -394.9634727290293, | 234.5667635 |
| -301.7962647799817, | 127.9413185 |
| -300.1783630728985, | 122.3206522 |
| -197.97483594313195, | 101.3444117 |
| -202.90137265248188, | 109.4562156 |
| -196.2164733161411, | 112.5991216 |
| -102.34175851126292, | 90.97557169 |
| -101.43656591630315, | 99.72799631 |
| -96.4163885936814, | 102.8664432 |
| -46.68802069011656, | 77.3746442 |
| -47.45795462146157, | 84.87258188 |
| -4.237609340279732, | 77.48835066 |
| -4.274025134329804, | 73.11325312 |

***WWFE II Test case 10:***

|  |  |
| --- | --- |
|  |  |
| -601.5432038550831, | 116.3462551 |
| -601.3383537858242, | 145.0935482 |
| -606.9102756696644, | 163.1671772 |
| -500.3062996273678, | 123.2584818 |
| -495.91665528610713, | 139.2719043 |
| -480.1958756852721, | 145.4213083 |
| -403.3214975515539, | 133.4590397 |
| -399.0723218292135, | 129.7600328 |
| -397.71445851298347, | 120.3135182 |
| -303.54195524513705, | 135.8548101 |
| -303.66486528669236, | 118.6064342 |
| -202.35187389039527, | 136.1962269 |
| -202.41625534073376, | 127.1613633 |
| -202.44259320678134, | 123.4652828 |
| -202.504048227559, | 114.8410949 |
| -201.1081413270382, | 110.7333632 |
| -99.82148779678869, | 124.6270753 |
| -102.7713287941159, | 110.6660554 |
| -101.36371617535156, | 108.2010262 |
| -3.0795793745246556, | 100.7415573 |
| -3.1293286770587656, | 93.7600718 |

WWFE II Test ***case*** 11:

|  |  |
| --- | --- |
|  |  |
| -1.7772511848343129, | 69.71403486 |
| -1.7772511848343129, | -103.5927381 |
| 2.369668246445144, | -151.3944223 |
| -109.59715639810429, | -211.3465569 |
| -97.15639810426546, | -289.0145579 |
| -151.06635071090068, | -313.0109892 |
| -200.82938388625644, | -432.6178698 |
| -246.44549763033183, | -480.5045222 |
| -399.88151658767765, | -636.1449935 |
| -499.4075829383887, | -803.6456071 |
| -851.8957345971567, | -1204.645871 |
| -860.189573459716, | -1276.37318 |
| -860.189573459716, | -1318.20585 |

***WWFE II Test case 12:***

|  |  |
| --- | --- |
|  | = |
| -2234.2398022249695, | -300.1414153 |
| -2085.908529048208, | -249.999871 |
| -1838.6897404202723, | -199.8335531 |
| -1665.6365883807173, | -147.1805962 |
| -1585.2904820766382, | -100.8139124 |
| -1399.8763906056865, | -50.66307795 |
| -1140.296662546354, | 0.758946198 |
| 1097.0333745364642, | 1.319446416 |
| 1399.8763906056856, | 1.39531523 |
| 1467.861557478368, | 2.664956608 |
| 1677.9975278121137, | 1.464990671 |
| 1474.0420271940666, | -150.1518667 |
| 1572.9295426452409, | -143.8640451 |
| 1647.095179233621, | -299.1690558 |
| 2024.1038318912233, | -299.0746069 |
| 2203.337453646477, | -295.2718762 |
| 2283.6835599505566, | -299.0095765 |
| 1208.2818294190356, | -410.7612429 |
| 1486.4029666254637, | -449.5224652 |
| 1591.4709517923357, | -439.4752665 |
| 1461.6810877626694, | -499.6330427 |
| 1220.6427688504327, | -498.4408185 |

***WWFE II Test case 13***:

|  |  |
| --- | --- |
|  | = |
| -2056.478405315616, | -300 |
| -1963.4551495016624, | -250.5494505 |
| -1757.4750830564797, | -201.0989011 |
| -1584.717607973423, | -149.4505495 |
| -1564.7840531561474, | -96.7032967 |
| -1538.2059800664463, | -47.25274725 |
| -1485.0498338870443, | 0 |
| 1996.6777408637872, | 1.098901099 |
| 1863.7873754152824, | -50.54945055 |
| 1857.142857142856, | -98.9010989 |
| 1691.0299003322252, | -149.4505495 |
| 1471.7607973421918, | -200 |
| 1504.9833887043187, | -300 |

***WWFE II Test case 14:***

|  |  |
| --- | --- |
| = |  |
| 0.7594936708861724, | 68.20083682 |
| -0.12658227848100978, | -148.3263598 |
| -47.08860759493666, | -240.5857741 |
| -69.24050632911394, | -255.6485356 |
| -95.82278481012656, | -295.1882845 |
| -73.67088607594928, | -302.7196653 |
| -111.77215189873414, | -319.665272 |
| -135.69620253164555, | -342.2594142 |
| -121.51898734177212, | -323.4309623 |

***WWFE II Test case 15:***

|  |  |
| --- | --- |
|  | () |
| -1393.3701657458564, | 0 |
| -781.2209669882631, | 0 |
| -547.3241527170776, | 133.3333333 |
| -549.6055633435035, | 128.159204 |
| -273.56037492097516, | 113.8308458 |
| -273.5988565459993, | 111.0447761 |
| -136.84065858552526, | 92.33830846 |
| -64.13237679008284, | 76.41791045 |
| -28.88320826805193, | 68.45771144 |
| -33.34157939583838, | 65.67164179 |
| 1.9570655012232692, | 61.29353234 |
| -247.17297490448323, | 104.278607 |

***WWFE II Test case 16:***

|  |  |
| --- | --- |
|  | () |
| -1396.9125346662129, | -0.039114993 |
| -785.0639718607035, | 0.084740992 |
| -557.1053191984117, | 147.9041658 |
| -138.19304888884517, | 103.8594112 |
| -80.36748021608696, | 121.684882 |
| -31.4615006156082, | 77.16036902 |
| 0.09485018566169856, | 67.45015776 |
| -96.95830753000314, | 93.74630084 |