	А В	С	D	E	F	G	Н	I	J	K	L N	
1]// A'	ΓΙ Λ Ω D	oiget (#3) Anglusis of	Composit	I aminatos						-	
3	MATLAB Project (#3) - Analysis of Composite Laminates SE-160A Aerospace Structural Analysis, University of California, San Diego (Copyright J.B. Kosmatka, 2020)											
	JL-10			y oj canjor	a, san biego (cop)	, rynt J.	. Rosmutku	, 2020)				
5		version:	Winter, 2020 (v2)	***************************************			********************				-	
7	P	roject Title:	03-05-2020 Test Case - 8 ply qua	si-isotropic ca	rbon/epoxy laminate s	ubjecte	d to Nx and N	xy. Good all-ar	ound laminate			
8												
9	-	Variable	Description	Value	Units		***************************************			eference		
10	-	iInput	Input Units	1	1 = US			F	US 10 ³ lb/in ²	SI MPa		
12	-	iOutput	Output Units	1	1 = US, 2 = SI		***************************************	E, G	10 lb/in 2	GPa		
13								ρ	lb/in ³	kg/m ³		
14	-			*****************			***************************************	P	10711	110,111		
15	Х	Part 1:	Weight Properties									
16 17		Fiber Proper	tios									
18	-	Variable	Description	Value	Units						-	
19			Material Name:	IM7								
20		E _{fL}	Young's Modulus (Longitudinal)	40.03	Msi							
21			Young's Modulus (Transverse)	2.76	Msi			******				
22	-		Shear Modulus (L-T plane)	3.92	Msi							
23			Shear Modulus (T-T plane) Poisson ratio (L-T plane)	0.2	Msi							
25	-		Poisson ratio (T-T plane)	0.2								
26			Weight Density	0.0643	lb/in ³							
27		F_{Ft}	Tension strength	751.3	Ksi							
28	-	F _{FC}	Compression strength	-464.1	Ksi	ļ	***************************************				-	
30	-	Resin Prope	rties									
31		Variable	Description	Value	Units							
32			Material Name:	3501-6								
33			Young's Modulus	0.631	Msi							
34	-		Shear Modulus Poisson ratio	0.232	Msi							
36	-		Weight Density	0.0469	lb/in ³		***************************************					
37			Tension strength	8.08	Ksi							
38			Compression strength	-17.18	Ksi							
39		F _{ms}	Shear Strength	12.61	Ksi							
40	Х	Part 2:	MicroMechanics									
42												
43		Variable	Description	Value	Units							
44 45	-	iAFW AFW	Areal Fiber Weight Units: Areal Fiber Weight:	2 150	$1 = oz/yd^2, 2 = g/m^2$ $oz/yd^2 \text{ or } g/m^2$							
46		RC	Resin Content (by weight)	30	%							
47												
48	V	David Ox	Laurina Bahardan									
49 50	Х	Part 3:	Lamina Behavior					4				
51	-	Variable	Description	Value	Units	İ	***************************************					
52		θ_z	Orientation Angle	20	degrees							
53	-											
54 55	Х	Part 4:	Laminate Behavior*									
56			ninate is a 12-ply maximum where	the lay-up ML	JST be symmetric							
57												
58 59	-	Variable	Description	Value 8	Units			Definition			-	
60	-	n t ply	Number of plies (12 max) ply thickness	0.006	inch		(#) 12	$\theta_{\rm i}$ (degree)			-	
61		N_x	Inplane x-direction load	1000	lb/inch		11					
62		N_y	Inplane y-direction load	0	lb/inch		10					
63		N _{xy}	Inplane shear load	-100	lb/inch		9					
64 65		SF	Safety Factor:	1.5		J	7	0 45			-	
66		************		**********************			6	90			-	
67				***************************************			5	-45				
68							4	-45				
69 70	-						2	90 45				
71							1	0	tool surface			
72												
73 74	-										-	
75 ()	END OF FI	LE									

AMATLAB Project (48) - Analysis of Composite Laminates		А В	С	D	E	F	G	Н	I	J	K	L	ΜN
	1												
	2	MAT	TLAB P	roject (#3) - Analysis of Composit	te Laminates								П
1	3					right J.B. Kosmatka,	2020)						+
	-												Ŧ
2			version:	winter, 2020 (VZ) - Input: OS, Output: OS/SI									-
		Stude	ont Name:	John Kosmatka									+
1													+
Section Properties Section Properties Section Properties Section Properties Section Se													Ħ
March Marc		Pro	oject Title:	03-05-2020 Test Case - 8 ply quasi-isotropic carb	on/epoxy laminate su	bjected to Nx and Nx	y. Good all-around lar	ninate.				Į.	Т
23 Work Wo													
Workship Description Value Units		INPUT	ECHO:						i		i	ı	ш
Mapped Separations		-	Variable	Description	Value	Unite				Heite D	· · · · · · · · · · · · · · · · · · ·		_
1		1 1											+
March Secondario Secondar	-	1							E				+
13 Variable Description Value Units	-		ΙΟυιρυι	Output Onits	1	1 = 05, 2 = 51							+
	-												+-
Marian Name					Value	Heite			ρ	lD/ln	Kg/m		_
1		+ +	variable	·		Units							H
The State The		+	-			Mei							+
Co. Shear Modulus (17 plane)		1 1											H
Company Comp		+ +											H
		1 1											H
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Description 1997		1 1											T
Fr Censors transgers						Ksi							Ħ
			F _{Ft}	Tension strength									П
													П
													П
													П
Barrier Barr			Variable			Units							H
Second Column		 	-			Mei							H
10 10 10 10 10 10 10 10		╁											H
	_	1 -				14131							H
		1 1				lb/in^3							H
Frac Compression strength	_	1 1											H
F State Strength 12.61 Ksi		1 1											П
143		1 1											П
Microbitechanics	41						<u> </u>						П
AFW Areal Flace Weight Units: 2		ļ	MicroMech	nanics									
AFM				-		Units							
Accordance Acc													₩.
						g/m^2			D - C - '11'				4
Second			RC	Resin Content (by Weight)	30								+
			Lamina Rol	havior					O (degree)				+
10		i i			Value	Units							+
Signature Sign		1 1											+
	-	1	-	0	-								+
1			Laminate B	Behavior				8	0				T
SS Image Dy thickness Double Inch S Image Imag			Variable		Value	Units							
		\Box											Ц
State N, Inplane y-direction load 0 Ib/in 3 90		↓											H
Section Sec													H
SF Safety Factor: 1.5 1 0		 	_										H
Comparison Com		╁		-		ID/IN				tool confee			H
Column		+ +	ijI.	carety ractor.	1.5		"				///.		H
Color Co													Ħ
State Stat	62	OUTPL	UT:										
Fig.	63	ш											
	64	Х	Part 1:	Weight Properties					l		l	l	Ц
Section Sec	65												H
68 Wf Volume Fraction (Fiber) 0.62989 Image: Composite of the compo		1 1	Variable	Description	Value	Heite							H
69 W W Volume Fraction (Resin) 0.37011		1 -				Ullits							H
70 Wg Weight Fraction (Fiber) 0.700000 0.700000 0.700000 0.700000 0.700000 0.700000 0.700000 0.700000 0.7000000 0.7000000 0.7000000 0.70000000 0.7000000000 0.70000000000 0.700000000000000 0.70000000000000000000000000000 0.700000000000000000000000000000000000		1 1											H
71 Image: Light of the content of the co	70												П
72 $ρ_c$ Composite density 0.05786 lb/in ³ lb/in ³ $ρ_c$ Composite density 0.05786 lb/in ³ lb/in ³ $ρ_c$ Composite density 0.00527 linch	71												П
74 I Part 2: MicroMechanics Image: Control of the part o	72	<u> </u>											Ц
75 X Part 2: MicroMechanics 76 Image: Second of the content			t _{ply}	Cured ply thickness	0.00527	inch							П
76 Variable Description Value Units 0		-	Don't O	MicroMochanica									Ц
77 Variable Description Value Units 78 E_L Young's Modulus (Longitudinal) 25.4481 Msi 6 6 6 6 6 6 6 7 7 7 7 8 8 8 8 8 8 8 8 8 8 8 9 8 9 8 9 8 9 8 8 8 8 9 8 9 8 9 8 9 8 9 8 9 8 9 8 9 8 9 8 9 9 8 9		^	Part 2:	mici diviectianics									H
78 E_L Young's Modulus (Longitudinal) 25.4481 Msi Section 1.2274 Msi Section		 	Variable	Description	Value	Units							H
79 E_T Young's Modulus (Transverse) 1.2274 Msi <td< td=""><td></td><td>1 1</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>H</td></td<>		1 1											H
80 G_{LT} Shear Modulus (L-T plane) 0.5695 Msi		† †											T
81 G_{TT} Shear Modulus (T-T plane) 0.4873 Msi .	80	1											Ħ
82 V _{LT} Poisson ratio (L-T plane) 0.2592 83 V _{TT} Poisson ratio (T-T plane) 0.2592 84 F _{II} Tension Strength (Longitudinal) 477.6214 Ksi Sign (Sign (81												T
83 V _{TT} Poisson ratio (T-T plane) 0.2592 84 F _{II} Tension Strength (Longitudinal) 477.6214 Ksi Control of the property of the prope	82												П
84 F_{II} Tension Strength (Longitudinal) 477.6214 Ksi	83												
85 F _{2t} Tension Strength (Transverse) 7.0593 Ksi	84							-					
	85		F_{2t}	Tension Strength (Transverse)	7.0593	Ksi							Ш

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A A	В	С	D	1)	E 457.6350	F	G	Н		J	K	L N
86		F _{1c}	Compression Strength (Longitudina		-157.6250	Ksi						
87			Compression Strength (Fiber Fail	lure)	-292.3331	Ksi						
88			Compression Strength (Micro-Bu	uckling)	-569.4834	Ksi						
89			Compression Strength (Delamina		-157.6250	Ksi						
90												
	+	F _{2c}	Compression Strength (Transverse)		-15.0097	Ksi						+
91		F _{s6}	Shear Strength (1-2 plane)		10.6671	Ksi						
92												
93	Х	Part 3:	Lamina Behavior									
94												
95		2-D materia	al reduced stiffness [Q]:		2.55309E+01	3.19185E-01	0.00000E+00					
96					3.19185E-01	1.23134E+00	0.0000E+00	Msi	units			
97					0.0000E+00	0.00000E+00	5.69483E-01	14151	unico			
98					0.00000L+00	0.00000L+00	J.0340JL-01					
99		2-D materia	al reduced compliance [S]:		3.92956E-02	-1.01861E-02	0.0000E+00					
100					-1.01861E-02	8.14763E-01	0.00000E+00	1/Msi	units			
101					0.00000E+00	0.00000E+00	1.75598E+00					
102												
103		Orientation	n Angle (θz):		20	degrees						
104												
105		Transforma	tion matrix [T ₁ ']		8.83022E-01	1.16978E-01	6.42788E-01					
106		Transforme	ition matrix [1]		1.16978E-01	8.83022E-01	-6.42788E-01					
107					-3.21394E-01	3.21394E-01	7.66044E-01					
108												
109		Transforma	ition matrix [T2']		8.83022E-01	1.16978E-01	-6.42788E-01		<u></u>	<u> </u>		
110					1.16978E-01	8.83022E-01	6.42788E-01					
111					3.21394E-01	-3.21394E-01	7.66044E-01					
112												
113	\vdash	2-D materi	al reduced stiffness [Q-bar]:		2.02252E+01	2.78232E+00	6.84031E+00					
	+	∪ materia	arreduced suffiless [Q-Dar]:					Mci	unite			+
114	+				2.78232E+00	1.61071E+00		Msi	units			+
115	\vdash				6.84031E+00	9.69405E-01	3.03262E+00					
116												
117	<u> </u>	2-D materia	al reduced compliance [S-bar]:		2.21067E-01	-1.01245E-01	-4.66269E-01				<u> </u>	
118					-1.01245E-01	8.15109E-01		1/Msi	units			
119					-4.66269E-01	-3.21919E-02	1.39174E+00	-				
120												
121	\vdash											+
122		Variable	Description		Value	Units						+
	+		-		1							+
123		E _x	Young's Modulus (x -direction)		4.5235	Msi						
124		E _y	Young's Modulus (y-direction)		1.2268	Msi						
125		G _{xy}	Shear Modulus (x-y plane)		0.7185	Msi	-				· ·	
126		ν_{xy}	Poisson Ratio (x-y plane)		0.4580							
127	-		Extension-Shear coupling (x-direction	on, x-v nlane)	-2.1092							+
_	+	$\eta_{x,xy}$										+
128		$\eta_{y,xy}$	Extension-Shear coupling (y-direction	oii, x-y plane)	-0.0395							
129												
130		F* _{1T}	Allowable Fiber Direction Tension S	Strength	318.4143	Ksi						
131		F* 1C	Allowable Fiber Direction Compress	sion Strength	-105.0833	Ksi						
132		F* _{2T}	Allowable Matrix Direction Tension	Strength	4.7062	Ksi						
133		F* 2C	Allowable Matrix Direction Compre		-10.0065	Ksi						
134				.331011 3tl Cligt	7.1114	Ksi						
		F*s	Allowable Shear Strength		7.1114	NSI						
135												
136												
137	Х	Part 4:	Laminate Behavior									
138												
139		In-Plane St	iffness Relationship	()	4	[A]		10 1				
140				N_{x}	4.99218E+05	1.58396E+05	0.00000E+00	ε_{xxo}	units			
141				N _v =	1.58396E+05		1.45519E-11		lb/in	1		
142	+				0.00000E+00		1.70411E+05	77-		1		+
143	\vdash			N _{xy}	3.000002+00	1.433150-11		γхуо				+
	\vdash			* *								
144	\vdash		Diama Oritica - Diama - Diama		1							
145	1	inverse In-	Plane Stiffness Relationship		1	1				1		
146	1					F A + 7						
147						[A*]		ا ا				
148				£ _{xxo}	2.22737E-06	-7.06720E-07	6.03491E-23	N_{x}		2.22737E-03		
				ε_{xxo} ε_{yyo} =	2.22737E-06 -7.06720E-07		6.03491E-23 -1.90202E-22	N _x N _y	.=.	2.22737E-03 -7.06720E-04	inch/inch	
149				ε _{yyo} =		-7.06720E-07			.=.		inch/inch	
			,		-7.06720E-07	-7.06720E-07 2.22737E-06	-1.90202E-22	N_{y}	.=.	-7.06720E-04	inch/inch	
149 150				ε _{yyo} =	-7.06720E-07	-7.06720E-07 2.22737E-06	-1.90202E-22	N_{y}	. . .	-7.06720E-04	inch/inch	
149 150 151		Equivalent		ε _{yyo} = γ _{xyo}	-7.06720E-07 6.03491E-23	-7.06720E-07 2.22737E-06	-1.90202E-22	N_{y}	.=.	-7.06720E-04	inch/inch	
149 150 151 152		•	Laminate Stiffness Properties (In	ε _{yyo} = γ _{xyo}	-7.06720E-07 6.03491E-23	-7.06720E-07 2.22737E-06 -1.90202E-22	-1.90202E-22	N_{y}	.=.	-7.06720E-04	inch/inch	
149 150 151 152 153		Variable	Laminate Stiffness Properties (In Description	ε _{yyo} = γ _{xyo}	-7.06720E-07 6.03491E-23 //sis)	-7.06720E-07 2.22737E-06 -1.90202E-22 Units	-1.90202E-22	N_{y}	.=.	-7.06720E-04	inch/inch	
149 150 151 152 153 154		Variable t lam	Laminate Stiffness Properties (In Description Laminate Thickness	ε _{yyo} = γ _{xyo}	-7.06720E-07 6.03491E-23 //sis) Value	-7.06720E-07 2.22737E-06 -1.90202E-22 Units Inch	-1.90202E-22	N_{y}	.2.	-7.06720E-04	inch/inch	
149 150 151 152 153		Variable	Laminate Stiffness Properties (In Description	ε _{yyo} = γ _{xyo}	-7.06720E-07 6.03491E-23 //sis)	-7.06720E-07 2.22737E-06 -1.90202E-22 Units	-1.90202E-22	N_{y}	.5.	-7.06720E-04	inch/inch	
149 150 151 152 153 154		Variable t lam	Laminate Stiffness Properties (In Description Laminate Thickness	ε _{yyo} = γ _{xyo}	-7.06720E-07 6.03491E-23 //sis) Value	-7.06720E-07 2.22737E-06 -1.90202E-22 Units Inch	-1.90202E-22	N_{y}	,=,	-7.06720E-04	inch/inch	
149 150 151 152 153 154 155 156		Variable t_{lam} E_x E_y	Laminate Stiffness Properties (In Description Laminate Thickness Young's Modulus (x-direction) Young's Modulus (y-direction)	ε _{yyo} = γ _{xyo}	-7.06720E-07 6.03491E-23 //sis) Value 0.048 9.3533 9.3533	-7.06720E-07 2.22737E-06 -1.90202E-22 Units inch Msi Msi	-1.90202E-22	N_{y}	,ē,	-7.06720E-04	inch/inch	
149 150 151 152 153 154 155 156		Variable t _{lam} E _x E _y G _{xy}	Laminate Stiffness Properties (In Description Laminate Thickness Young's Modulus (x-direction) Young's Modulus (y-direction) Shear Modulus (x-y plane)	$\varepsilon_{yyo} = \gamma_{xyo}$	-7.06720E-07 6.03491E-23 /sis) Value 0.048 9.3533 9.3533 3.5502	-7.06720E-07 2.22737E-06 -1.90202E-22 Units inch Msi	-1.90202E-22	N_{y}	,=,	-7.06720E-04	inch/inch	
149 150 151 152 153 154 155 156		Variable t_{lam} E_x E_y	Laminate Stiffness Properties (In Description Laminate Thickness Young's Modulus (x-direction) Young's Modulus (y-direction)	$\varepsilon_{yyo} = \gamma_{xyo}$	-7.06720E-07 6.03491E-23 //sis) Value 0.048 9.3533 9.3533	-7.06720E-07 2.22737E-06 -1.90202E-22 Units inch Msi Msi	-1.90202E-22	N_{y}	.=.	-7.06720E-04	nch/inch	
149 150 151 152 153 154 155 156		Variable t lam E x E y G xy V xy	Laminate Stiffness Properties (In Description Laminate Thickness Young's Modulus (x-direction) Young's Modulus (y-direction) Shear Modulus (x-y plane)	$\varepsilon_{yyo} = \gamma_{xyo}$	-7.06720E-07 6.03491E-23 /sis) Value 0.048 9.3533 9.3533 3.5502	-7.06720E-07 2.22737E-06 -1.90202E-22 Units inch Msi Msi	-1.90202E-22	N_{y}	.=.	-7.06720E-04	inch/inch	
149 150 151 152 153 154 155 156 157 158 159			Laminate Stiffness Properties (In Description Laminate Thickness Young's Modulus (x-direction) Young's Modulus (y-direction) Shear Modulus (x-y plane) Poisson Ratio (applied x, measured Extension-Shear Coupling (x, xy)	$\varepsilon_{yyo} = \gamma_{xyo}$	-7.06720E-07 6.03491E-23 /sis) Value 0.048 9.3533 9.3533 0.3173 0.0000	-7.06720E-07 2.22737E-06 -1.90202E-22 Units inch Msi Msi	-1.90202E-22	N_{y}	,=,	-7.06720E-04	inch/inch	
149 150 151 152 153 154 155 156 157 158 159 160		Variable t_{lam} E_x E_y G_{xy} V_{xy} $\eta_{x,xy}$	Laminate Stiffness Properties (In Description Laminate Thickness Young's Modulus (x-direction) Young's Modulus (y-direction) Shear Modulus (x-y plane) Poisson Ratio (applied x, measurec Extension-Shear Coupling (x, xy) Extension-Shear Coupling (y, xy)	$\varepsilon_{yyo} = \gamma_{xyo}$	-7.06720E-07 6.03491E-23 /sis) Value 0.048 9.3533 9.3533 3.5502 0.3173	-7.06720E-07 2.22737E-06 -1.90202E-22 Units inch Msi Msi	-1.90202E-22	N_{y}	.5.	-7.06720E-04	inch/inch	
149 150 151 152 153 154 155 156 157 158 159 160 161			Laminate Stiffness Properties (In Description Laminate Thickness Young's Modulus (x-direction) Young's Modulus (y-direction) Shear Modulus (x-y plane) Poisson Ratio (applied x, measured Extension-Shear Coupling (x, xy)	$\varepsilon_{yyo} = \gamma_{xyo}$	-7.06720E-07 6.03491E-23 /sis) Value 0.048 9.3533 9.3533 0.3173 0.0000	-7.06720E-07 2.22737E-06 -1.90202E-22 Units inch Msi Msi	-1.90202E-22	N_{y}	.=.	-7.06720E-04	inch/inch	
149 150 151 152 153 154 155 156 157 158 159 160 161 162		Variable t_{lam} E_x E_y G_{xy} V_{xy} $\eta_{x,xy}$	Laminate Stiffness Properties (In Description Laminate Thickness Young's Modulus (x-direction) Young's Modulus (y-direction) Shear Modulus (x-y plane) Poisson Ratio (applied x, measurec Extension-Shear Coupling (x, xy) Extension-Shear Coupling (y, xy)	$\varepsilon_{yyo} = \gamma_{xyo}$	-7.06720E-07 6.03491E-23 /sis) Value 0.048 9.3533 9.3533 0.3173 0.0000	-7.06720E-07 2.22737E-06 -1.90202E-22 Units inch Msi Msi	-1.90202E-22	N_{y}	,=,	-7.06720E-04	inch/inch	
149 150 151 152 153 154 155 156 157 158 159 160 161		Variable t_{lam} E_x E_y G_{xy} V_{xy} $\eta_{x,xy}$	Laminate Stiffness Properties (In Description Laminate Thickness Young's Modulus (x-direction) Young's Modulus (y-direction) Shear Modulus (x-y plane) Poisson Ratio (applied x, measurec Extension-Shear Coupling (x, xy) Extension-Shear Coupling (y, xy)	$\varepsilon_{yyo} = \gamma_{xyo}$	-7.06720E-07 6.03491E-23 /sis) Value 0.048 9.3533 9.3533 0.3173 0.0000	-7.06720E-07 2.22737E-06 -1.90202E-22 Units inch Msi Msi	-1.90202E-22	N_{y}	.=.	-7.06720E-04	inch/inch	
149 150 151 152 153 154 155 156 157 158 159 160 161 162		Variable t_{lam} E_x E_y G_{xy} V_{xy} $\eta_{x,xy}$	Laminate Stiffness Properties (In Description Laminate Thickness Young's Modulus (x-direction) Young's Modulus (y-direction) Shear Modulus (x-y plane) Poisson Ratio (applied x, measured Extension-Shear Coupling (x, xy) Extension-Shear Coupling (y, xy) In-plane Isotropic Check (1.00)	$\varepsilon_{yyo} = \gamma_{xyo}$	-7.06720E-07 6.03491E-23 /sis) Value 0.048 9.3533 9.3533 0.3173 0.0000	-7.06720E-07 2.22737E-06 -1.90202E-22 Units inch Msi Msi	-1.90202E-22	N _y N _{xy}	.=.	-7.06720E-04	inch/inch	Ksi
149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164		$Variable$ t_{lam} E_x E_y G_{xy} V_{xy} $\eta_{x,xy}$ $\eta_{y,xy}$ $Iso-Check$ $Ply stresses$	Laminate Stiffness Properties (In Description Laminate Thickness Young's Modulus (x-direction) Young's Modulus (y-direction) Shear Modulus (x-y plane) Poisson Ratio (applied x, measurec Extension-Shear Coupling (x, xy) Extension-Shear Coupling (y, xy) In-plane Isotropic Check (1.00)	$\varepsilon_{yyo} = \gamma_{xyo}$	-7.06720E-07 6.03491E-23 Value 0.048 9.3533 9.3533 0.3173 0.00000 1.1	-7.06720E-07 2.22737E-06 -1.90202E-22 Units inch Msi Msi Msi inch	-1.90202E-22 5.86818E-06	N _y N _{xy} N _{xy}	Ksi	-7.06720E-04 -5.86818E-04	s (1,2 frame)	
149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165		$\begin{tabular}{ll} Variable \\ I_{lam} \\ E_x \\ E_y \\ G_{xy} \\ V_{XY} \\ \eta_{x,xy} \\ \eta_{y,xy} \\ Iso-Check \\ \hline Ply stresses \\ Ply (\#) \\ \end{tabular}$	Laminate Stiffness Properties (In Description Laminate Thickness Young's Modulus (x-direction) Young's Modulus (y-direction) Shear Modulus (x-y plane) Poisson Ratio (applied x, measured Extension-Shear Coupling (x, xy) Extension-Shear Coupling (y, xy) In-plane Isotropic Check (1.00)	$\varepsilon_{yyo} = \gamma_{xyo}$	-7.06720E-07 6.03491E-23 /sis) Value 0.048 9.3533 9.3533 0.3173 0.0000 1	-7.06720E-07 2.22737E-06 -1.90202E-22 Units inch Msi Msi Msi	-1.90202E-22 5.86818E-06	N _y N _{xy}		-7.06720E-04		Ksi T ₁₂
149 150 151 152 153 154 155 156 157 158 160 161 162 163 164 165 166 166 166 166 166		$\begin{tabular}{ll} Variable \\ t_{lim} \\ E_x \\ E_y \\ G_{xy} \\ V_{xy} \\ $\eta_{x,xy}$ \\ $\eta_{y,xy}$ \\ $Iso-Check$ \\ \\ \hline Ply stresses \\ $Ply (\#)$ \\ 12 \\ \\ \end{tabular}$	Laminate Stiffness Properties (In Description Laminate Thickness Young's Modulus (x-direction) Young's Modulus (y-direction) Shear Modulus (x-y plane) Poisson Ratio (applied x, measurec Extension-Shear Coupling (x, xy) Extension-Shear Coupling (y, xy) In-plane Isotropic Check (1.00)	$\varepsilon_{yyo} = \gamma_{xyo}$	-7.06720E-07 6.03491E-23 Value 0.048 9.3533 9.3533 0.3173 0.00000 1.1	-7.06720E-07 2.22737E-06 -1.90202E-22 Units inch Msi Msi Msi inch	-1.90202E-22 5.86818E-06	N _y N _{xy} N _{xy}	Ksi	-7.06720E-04 -5.86818E-04	s (1,2 frame)	
149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167		$\begin{tabular}{ll} \begin{tabular}{ll} V_{lim} & E_x & E_y & E_y & G_{xy} & V_{xy} & $\eta_{x,xy}$ & $\eta_{y,xy}$ & $Iso\text{-}Check$ & Ply stresses & Ply (#) & 12 & 11 & 11 & 11 & 11 & 12 & 11 & 12 & 11 & 12 & 11 & 12 & 11 & 12 & 11 & 12 & 11 & 12 & 11 & 12 & 11 & 12 & 11 & 12 & 12 & 12 & 11 & 12 &$	Laminate Stiffness Properties (In Description Laminate Thickness Young's Modulus (x-direction) Young's Modulus (y-direction) Shear Modulus (x-y plane) Poisson Ratio (applied x, measurec Extension-Shear Coupling (x, xy) Extension-Shear Coupling (y, xy) In-plane Isotropic Check (1.00)	$\varepsilon_{yyo} = \gamma_{xyo}$	-7.06720E-07 6.03491E-23 Value 0.048 9.3533 9.3533 0.3173 0.00000 1.1	-7.06720E-07 2.22737E-06 -1.90202E-22 Units inch Msi Msi Msi inch	-1.90202E-22 5.86818E-06	N _y N _{xy} N _{xy}	Ksi	-7.06720E-04 -5.86818E-04	s (1,2 frame)	
149 150 151 152 153 154 155 156 157 158 160 161 162 163 164 165 166 167 168		$\begin{tabular}{ll} Variable \\ t_{lim} & E_x \\ E_y & G_{xy} \\ V_{xy} & $\eta_{y,xy}$ \\ $Iso-Check$ & \\ Ply stresses \\ Ply (\#) \\ 12 & 11 \\ 10 & 10 \\ \end{tabular}$	Laminate Stiffness Properties (In Description Laminate Thickness Young's Modulus (x-direction) Young's Modulus (y-direction) Shear Modulus (x-y plane) Poisson Ratio (applied x, measurec Extension-Shear Coupling (x, xy) Extension-Shear Coupling (y, xy) In-plane Isotropic Check (1.00)	$\varepsilon_{yyo} = \gamma_{xyo}$	-7.06720E-07 6.03491E-23 Value 0.048 9.3533 9.3533 0.3173 0.00000 1.1	-7.06720E-07 2.22737E-06 -1.90202E-22 Units inch Msi Msi Msi inch	-1.90202E-22 5.86818E-06	N _y N _{xy} N _{xy}	Ksi	-7.06720E-04 -5.86818E-04	s (1,2 frame)	
149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169		$\begin{tabular}{ll} Variable & t_{limm} & E_x & E_y & G_{xy} & G_{xy} & $\eta_{y,xy}$ & $\eta_{y,xy}$ & $Iso-Check$ & $Ply stresses$ & $Ply (\#)$ & 12 & 11 & 10 & 9 & 9 & 1 & 10 & 9 & 1 & 1 & 10 & 9 & 1 $	Laminate Stiffness Properties (In Description Laminate Thickness Young's Modulus (x-direction) Young's Modulus (x-y plane) Poisson Ratio (applied x, measured Extension-Shear Coupling (x, xy) Extension-Shear Coupling (y, xy) In-plane Isotropic Check (1.00) Ply Angle (degree)	$\varepsilon_{yyo} = \gamma_{xyo}$	-7.06720E-07 6.03491E-23 Value 0.048 9.3533 9.3533 0.3173 0.0000 0.0000 1 Ply Depth Bottom	-7.06720E-07 2.22737E-06 -1.90202E-22 Units inch Msi Msi inch Top	-1.90202E-22 5.86818E-06	N _y N _{xy} N _{xy}	Ksi t _{xy}	-7.06720E-04 -5.86818E-04 -5.86818E-04 -5.86818E-04 -5.86818E-04 -5.86818E-04	s (1,2 frame) σ ₂₂	T ₁₂
149 150 151 152 153 154 155 156 157 158 160 161 162 163 164 165 166 167 168		$\begin{tabular}{ll} Variable \\ t_{lim} & E_x \\ E_y & G_{xy} \\ V_{xy} & $\eta_{y,xy}$ \\ $Iso-Check$ & \\ Ply stresses \\ Ply (\#) \\ 12 & 11 \\ 10 & 10 \\ \end{tabular}$	Laminate Stiffness Properties (In Description Laminate Thickness Young's Modulus (x-direction) Young's Modulus (y-direction) Shear Modulus (x-y plane) Poisson Ratio (applied x, measurec Extension-Shear Coupling (x, xy) Extension-Shear Coupling (y, xy) In-plane Isotropic Check (1.00)	$\varepsilon_{yyo} = \gamma_{xyo}$	-7.06720E-07 6.03491E-23 Value 0.048 9.3533 9.3533 0.3173 0.00000 1.1	-7.06720E-07 2.22737E-06 -1.90202E-22 Units inch Msi Msi Msi inch	-1.90202E-22 5.86818E-06	N _y N _{xy} N _{xy}	Ksi	-7.06720E-04 -5.86818E-04	s (1,2 frame)	

P	В	С	D	E	F	G	Н	1	J	K	L	ΜN
172		6	90	0.006	0.012	2.517	-17.332	-0.334	-17.332	2.517	0.334	
173		5	-45	-1.73472E-18	0.006	15.652	12.311	-13.070	27.052	0.911	1.671	
174		4	-45	-0.006	-1.73472E-18	15.652	12.311	-13.070	27.052	0.911	1.671	
175		3	90	-0.012	-0.006	2.517	-17.332	-0.334	-17.332	2.517	0.334	
176		2	45	-0.018	-0.012	8.523	5.181	5.405	12.257	1.447	-1.671	
177		1	0	-0.024	-0.018	56.641	-0.159	-0.334	56.641	-0.159	-0.334	
178	2		tool surface									
179												
180												
181	End of	f Output										