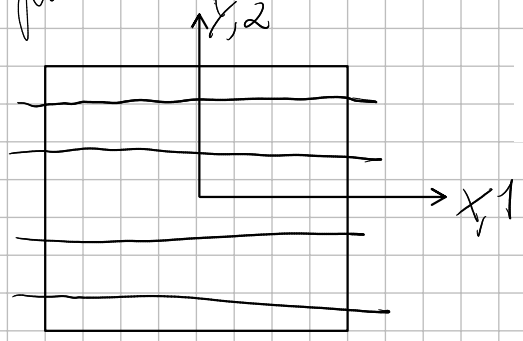
Definizione materiale



$$E_{xx} = V^f E_a^f + V^m E^m$$

$$E_{yy} = \frac{1}{\left(\frac{V^f}{E_t^f} + \frac{V^m}{E^m}\right)} = \frac{E_t^f E^m}{V^f E^m + V^m E_t^f}$$

$$G_{xy} = \frac{1}{\left(\frac{V^f}{G_{ta}^f} + \frac{V^m}{G^m}\right)} = \frac{G_{ta}^f G^m}{V^f G^m + V^m G_{ta}^f}$$

$$v_{yx} = v_{ta}^f V^f + v^m V^m$$

test mat 1

Type	CFRP	BFRP	CFRP	GFRP	KFRP	CFRTP	CFRP	CFRP	CCRP	CCRP
Fiber/cloth	T300	B(4)	AS	E-glass	Kev 49	AS 4	IM6	T300	T300	T300
Matrix	N5208	N5505	H3501	epoxy	epoxy	PEEK	epoxy	Fbrt 934	Fbrt 934	Fbrt 934
Ply eng'g constants and data						APC2		4-mil tp	13-mil c	7-mil c
Ex,GPa	181.0	204.0	138.0	38.6	76.0	134.0	203.0	148.0	74.0	66.0
Ey,GPa	10.30	18.50	8.96	8.27	5.50	8.90	11.20	9.65	74.00	66.00
nu/x	0.28	0.23	0.30	0.26	0.34	0.28	0.32	0.30	0.05	0.04
Es,GPa	7.17	5.59	7.10	4.14	2.30	5.10	8.40	4.55	4.55	4.10
v/f	0.70	0.50	0.66	0.45	0.60	0.66	0.66	0.60	0.60	0.60
rho	1.60	2.00	1.60	1.80	1.46	1.60	1.60	1.50	1.50	1.50
ho,mm	0.125	0.125	0.125	0.125	0.125	0.125	0.125	0.100	0.325	0.175

https://www.e-periodica.ch/cntmng?pid=bse-cr-001:1988:13::1231

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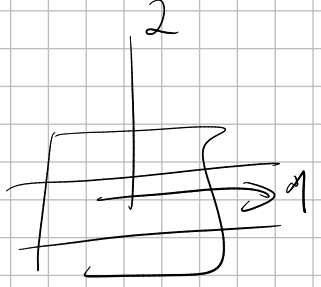
nu/x	0.28	0.23	0.30	0.26	0.34	0.28	0.32	0.30	0.05	0.04
Es,GPa	7.17	5.59	7.10	4.14	2.30	5.10	8.40	4.55	4.55	4.10
v/f	0.70	0.50	0.66	0.45	0.60	0.66	0.66	0.60	0.60	0.60
rho	1.60	2.00	1.60	1.80	1.46	1.60	1.60	1.50	1.50	1.50
ho,mm	0.125	0.125	0.125	0.125	0.125	0.125	0.125	0.100	0.325	0.175
Quasi-isotropic constants										
E,GPa	69.68	78.53	54.84	18.96	29.02	51.81	78.35	56.24	52.67	47.07
nu	0.30	0.32	0.28	0.27	0.32	0.30	0.30	0.32	0.32	0.32
G,GPa	26.88	29.67	21.35	7.47	10.95	19.88	30.23	21.37	19.89	17.8
Max stress, MPa										
X	1500	1260	1447	1062	1400	2130	3500	1314	499	375
X'	1500	2500	1447	610	235	1100	1540	1220	352	279
Y	40	61	51.7	31	12	80	56	43	458	368
Y'	246	202	206	118	53	200	150	168	352	278
S	68	67	93	72	34	160	98	48	46	46
Max strain, eps E-03										
x	8.29	6.18	10.49	27.51	18.42	15.90	17.24	8.88	6.74	5.68
x'	8.29	12.25	10.49	15.80	3.09	8.21	7.59	8.24	4.76	4.23
y	3.88	3.30	5.77	3.75	2.18	8.99	5.00	4.46	6.19	5.58
y'	23.88	10.92	22.99	14.27	9.64	22.47	13.39	17.41	4.76	4.21
s	9.48	11.99	13.10	17.39	14.78	31.37	11.67	10.55	10.11	11.22

Guida

https://appliedcax.com/support-and-training/technical-online-seminars/seminars/composite-laminate-modeling/Composite%20Modeling%20White%20Paper%202014%20Rev-0.pdf

1) Definire MAT ORT. 2D CCRP T300 13 - mil

Con $E_{11}, E_{22}, G_{12}, \nu_{12}$



In Pa

0.01

0.00001

$1e^{-5}$

0.325 mm

$3.25 \cdot 10^{-1}$ mm

$3.25 \cdot 10^{-4}$ m

Definire ply → Global ply

3 strati di tessuto in Layup

Bonus global determina angoli ?! → PROB. SÍ

Property: LAMINATE Options ??

Mesh: Size along SURFACE

$l = 0,015$ m $R = 0,0085$ m

$A = 2\pi R \cdot l = 0,048807 \text{ m}^2 \simeq 0,049 \text{ m}^2 =$

$= 49000 \text{ mm}^2$

Nubo da fare in m (ora è mm)

40 000 / 53.8 ≅ 911 elementi : troppo grandi → 10/100 volte più fine

!! scegliere orientazione lamine

Metodo: mettere ref sys. allineato con x delle lamine