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(// : // :)

ANSYS

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(Kulkarni et al., 1983)

(Baley, 2002)

(Elenga et al., 2009)

(Asasutjarit et al., 2009;

Khanbashi & Al-Kaabi, 2005; Liu et al., 2009)

(d'Almeida et al., 2006)

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(Kaddami et al., 2006)

(Beg et al., 2008)

(Alwar et al., 2009; Zare et al., 2009)

()

(PVA)

(Alix et al., 2009; Ghali et

.(Zare, 2010)

.al.,2009)

. (Jacob et al., 2004)

()
()



.(Zare, 2010)

$$v = -\frac{\epsilon_r}{\epsilon_l}$$

()

(GM1) ε_r ε_t

(GM2) $\varepsilon_t = \frac{L' - L}{L}$ () ()

$\varepsilon_r = \frac{D' - D}{D}$ ()

L' L () ()

D' D

(RMSE)

(Ressing et al., 2007)

$$\int_v \delta \varepsilon^T D \varepsilon dv = \int_v \delta u^T f_b dv + \int_s \delta u^T f_s ds \quad ()$$

$$f_b \quad f_s \quad \delta \varepsilon$$

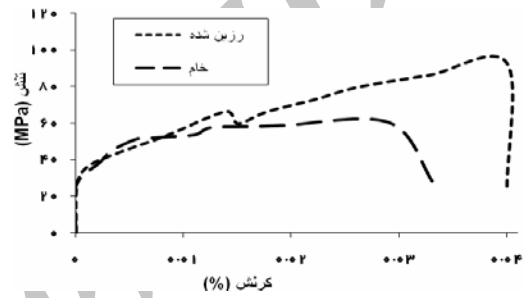
$$D \quad \delta u$$

$$\sum K_{st}^e U = \sum F^e \quad () \quad (discrete) \quad ()$$

$$F^e \quad K_{st}^e$$

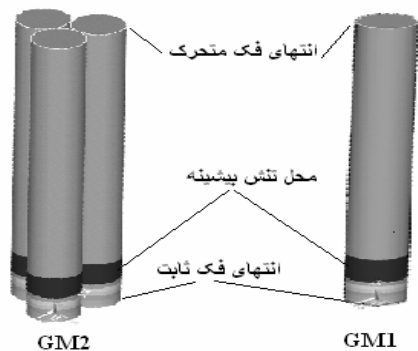
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(mm)	(N)	(MPa)	(%)	(MPa)
/	/	/	/	/
/	/	/	/	/
/	/	/	/	/
/	/	/	/	/
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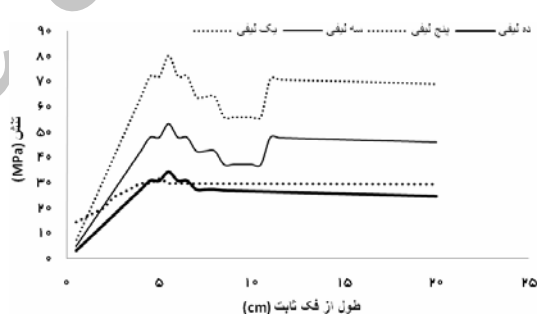
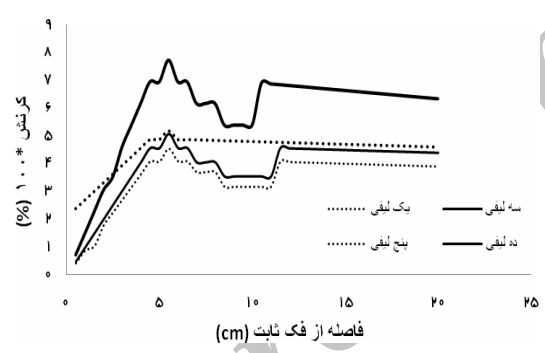
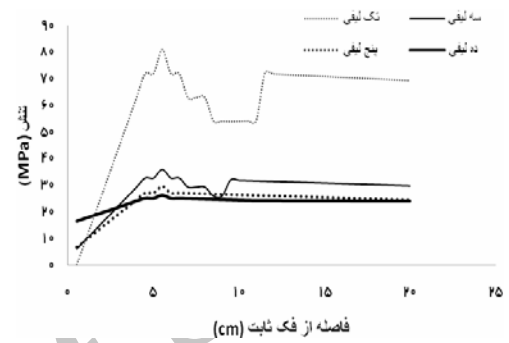
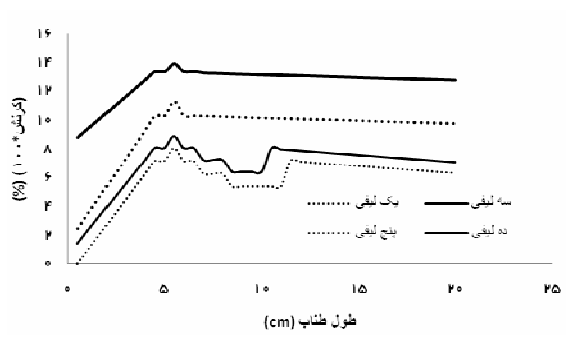
() ()

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(G'Sell et al., 1992)



() ()

()

(RMSE)

GM2

%

(MPa)			(%)		
GM2	GM1		GM2	GM1	
/	/	/	/	/	/
/	/	/	/	/	/
/	/	/	/	/	/
/	/	/	/	/	/
/	/		/	/	RMSE
/	/	/	/	/	/
/	/	/	/	/	/
/	/	/	/	/	/
/	/		/	/	RMSE

$$\frac{1}{r}$$

(GM2)

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