



دانشگاه صنعتی شاهرود
سایت دانشگاهی: shahrood.ac.ir



انجمن مهندسی
ساخت و تولید ایران



مؤسسه تخصصی
مهندسی ساخت و تولید



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(Soleimanimehr@modares.ac.ir)

[] []

(horn)

[]

[] ()



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[]

[] :
[] .

$$\frac{\partial^2 u}{\partial x^2} + \frac{1}{A} \frac{\partial A(x)}{\partial x} \frac{\partial u}{\partial x} + \frac{\omega^2}{C^2} u = 0 \quad ()$$

C ω x A u

[] ANSYS

[]

SOLID92 TETRA

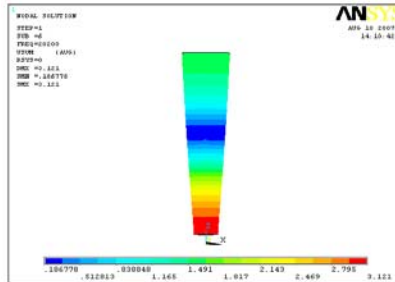
() mm mm mm

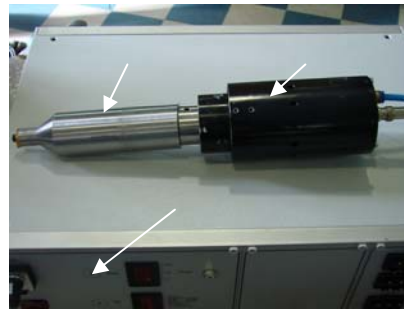
[]

mm mm mm : mm mm

$20 \pm 0.5kHz$

()

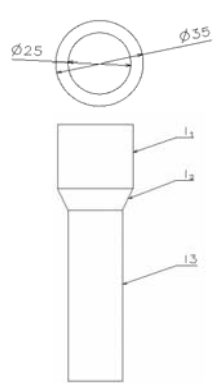




[]

[]

l_3 l_2 l_1 () mm () mm

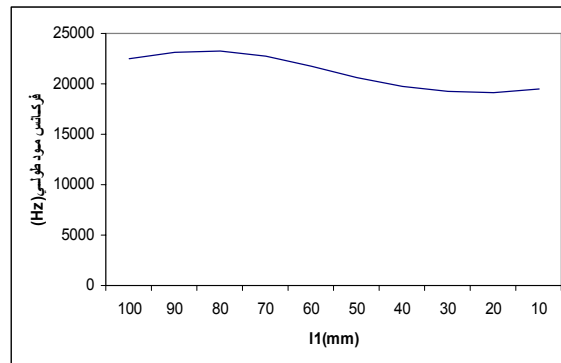


l_3 l_2 l_1 () l_3 l_2 l_1 mm

	kg/m^3	(Gpa)	
/			
/			

$l_1(mm)$	$l_2(mm)$	$l_3(mm)$	(Hz)
			/
			/
			/
			/
			/
			/
			/
			/
			/
			/
			/

$$(\omega_n) \quad (M) \quad l_1 = \frac{l_1}{(\rho)}$$

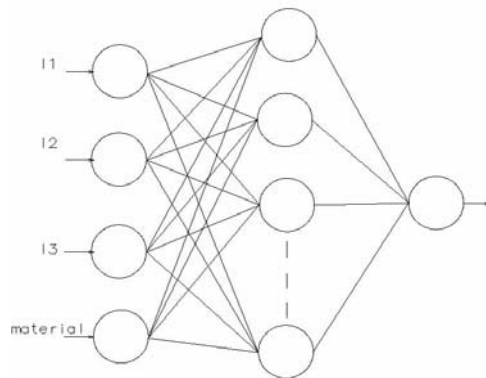


l_1

$$\omega_n = \sqrt{\rho/M} \quad ()$$

[]

$l_3 \quad l_2 \quad l_1$



(B.P)

$$1 \leq j \leq N \quad B_j = (B_{1j}, \dots, B_{lj}) \quad X_j = (X_{1j}, \dots, X_{nj})$$

$$O_j = (O_{1j}, \dots, O_{lj})$$

$$X_j$$

$$B_j$$

$$O_j$$

$$W = (W_{1l}, \dots, W_{nl})$$

$$E$$

$$E = \frac{1}{2} \sum_{i=1}^l \sum_{j=1}^N (B_{ij} - O_{ij})^2 \quad ()$$

$$\Delta W_{nl} = - \frac{\partial E}{\partial W_{nl}} \eta \quad ()$$

$$0 < \eta < 1$$

$$E$$

$$()$$

¹ Back propagation
² Multilayer perceptron
³ Forward propagation
⁴ Error Back propagation



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DeltaBarDelta

()

Epoch "

B.P

[]

B.P

(GA)

B.P

GA

GA .

()

GA .

B.P

GA . [] []

GA :

GA

B.P

B.P

()

B.P

TanhAxon

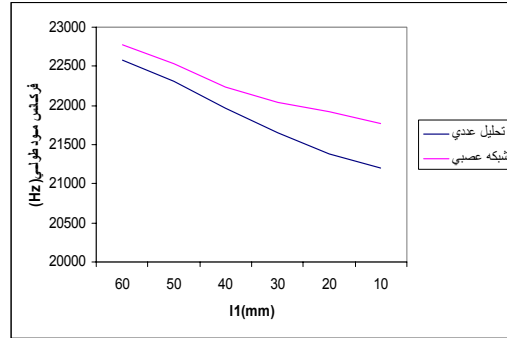
NeuroSolutions

(MultilayerPerceptron)	
	(Hidden Layer)
DeltaBarDelta	
/	(StepSize)
TanhAxon	(Transfer)
	Processing)
	(Element
	Epoch
/	

).

.(

I_1 ()



I_1

/ Hz

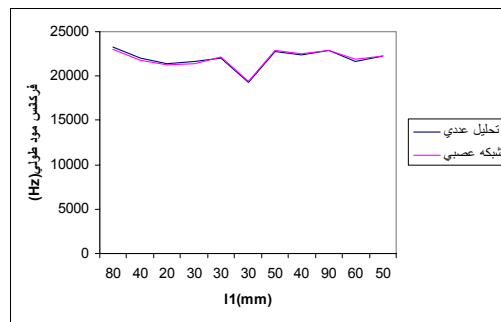
/

I_3 I_2 I_1

20kHz

(/ Hz)

($20 \pm 0.5kHz$)



I_1

I_3 I_2

/ Hz

/

($20 \pm 0.5kHz$)

I_1

I_3 I_2 I_1



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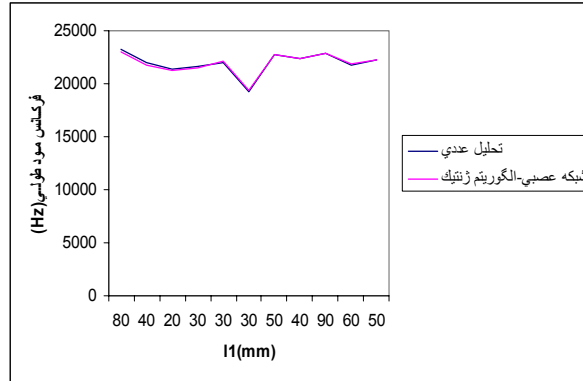
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1



l_1

/ Hz /



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