Değişken Kalınlıklı İzotrop Plakların ANSYS Paket Programı ile Modellenmesi

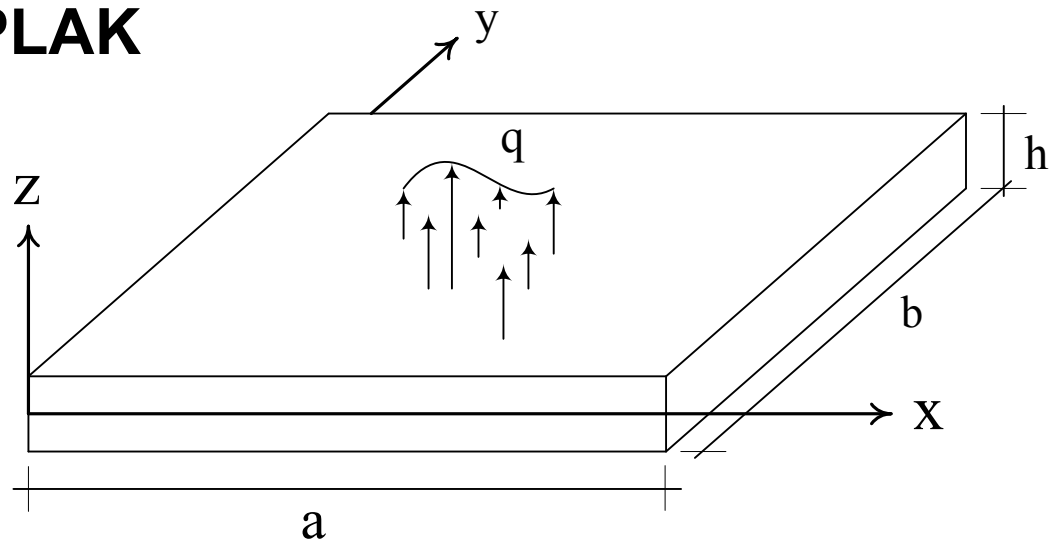
Mustafa Halûk Saraçoğlu mhsaracoglu@ogu.edu.tr

Yunus Özçelikörs yunuso@ogu.edu.tr

Eskişehir Osmangazi Üniversitesi, İnşaat Mühendisliği Bölümü, Eskişehir

AKADEMİK BİLİŞİM 2010 MUĞLA 12 Şubat 2010

İZOTROP PLAK



$$\frac{q}{D} = \frac{\partial^4 w_0}{\partial x^4} + 2\frac{\partial^4 w_0}{\partial x^2 \partial y^2} + \frac{\partial^4 w_0}{\partial y^4}$$

$$D = \frac{Eh^3}{12\left(1-\upsilon^2\right)}$$

DEĞİŞKEN KALINLIK

$$h = h_0\left[1 + \lambda\ f_n(y)\right]$$

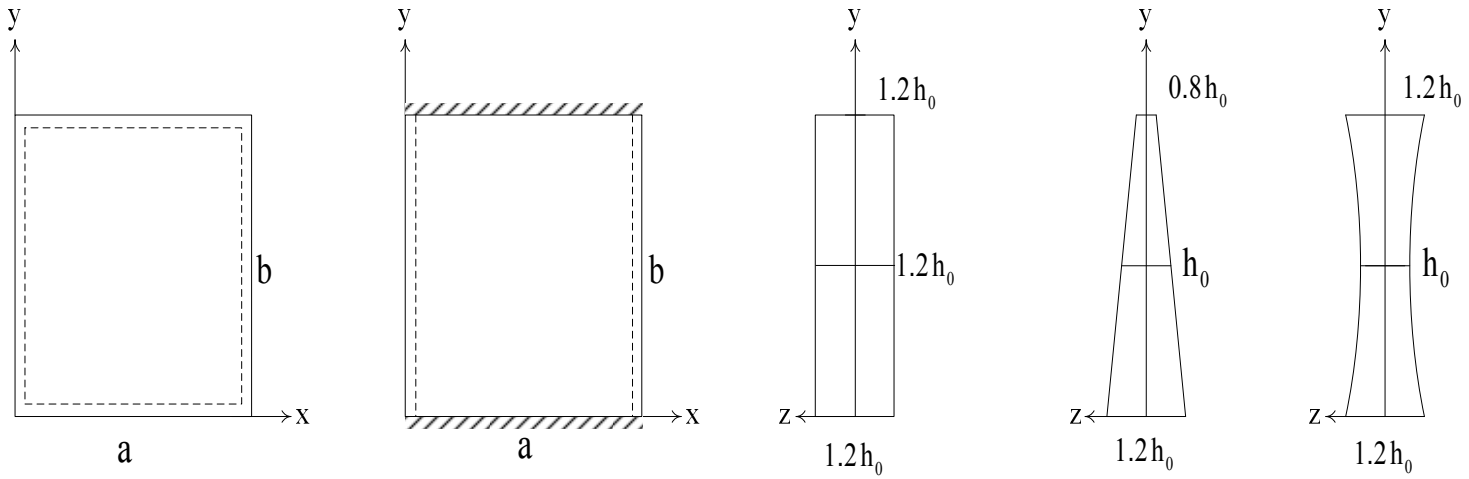
$$f_n(y) = \left(2\bar{y} - 1\right)^n \qquad n = 1,2,3,\cdots$$

$$\bar{y} = y/b$$

$$\lambda = 0.2$$

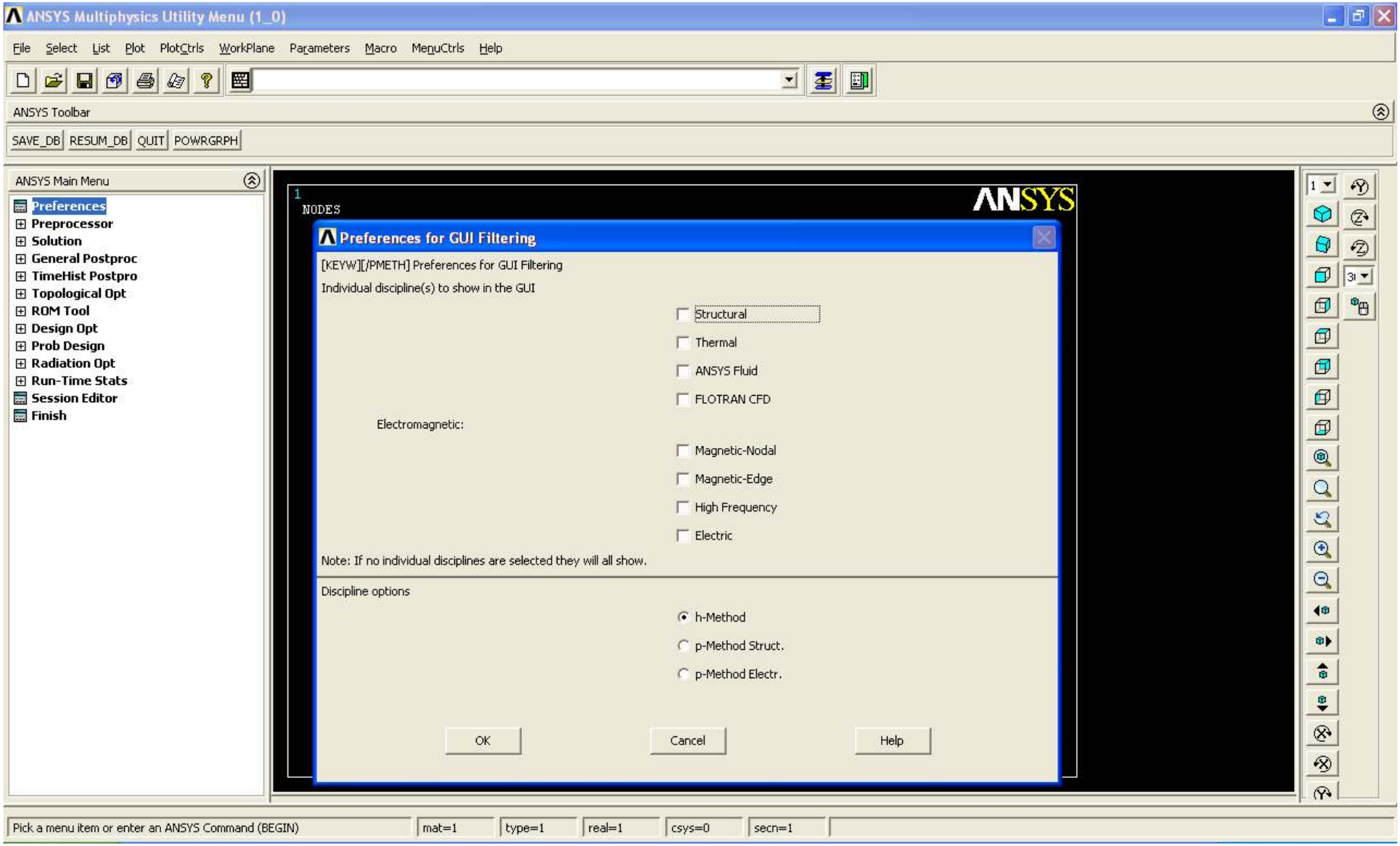
$$\mathrm{h_0} = \mathrm{a} / 20$$

DEĞİŞKEN KALINLIKLI İZOTROP PLAK

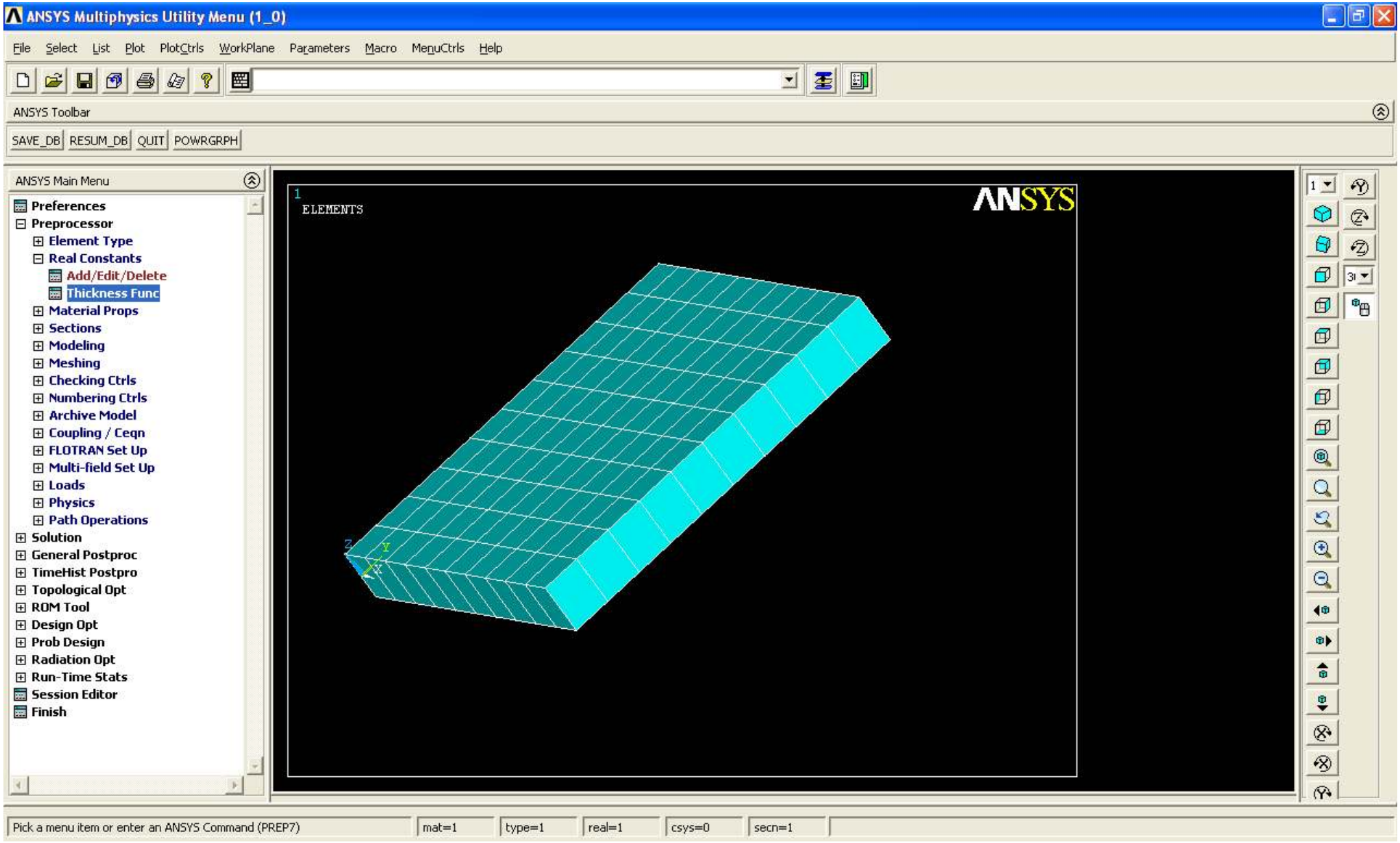


n=0 n=1 n=2

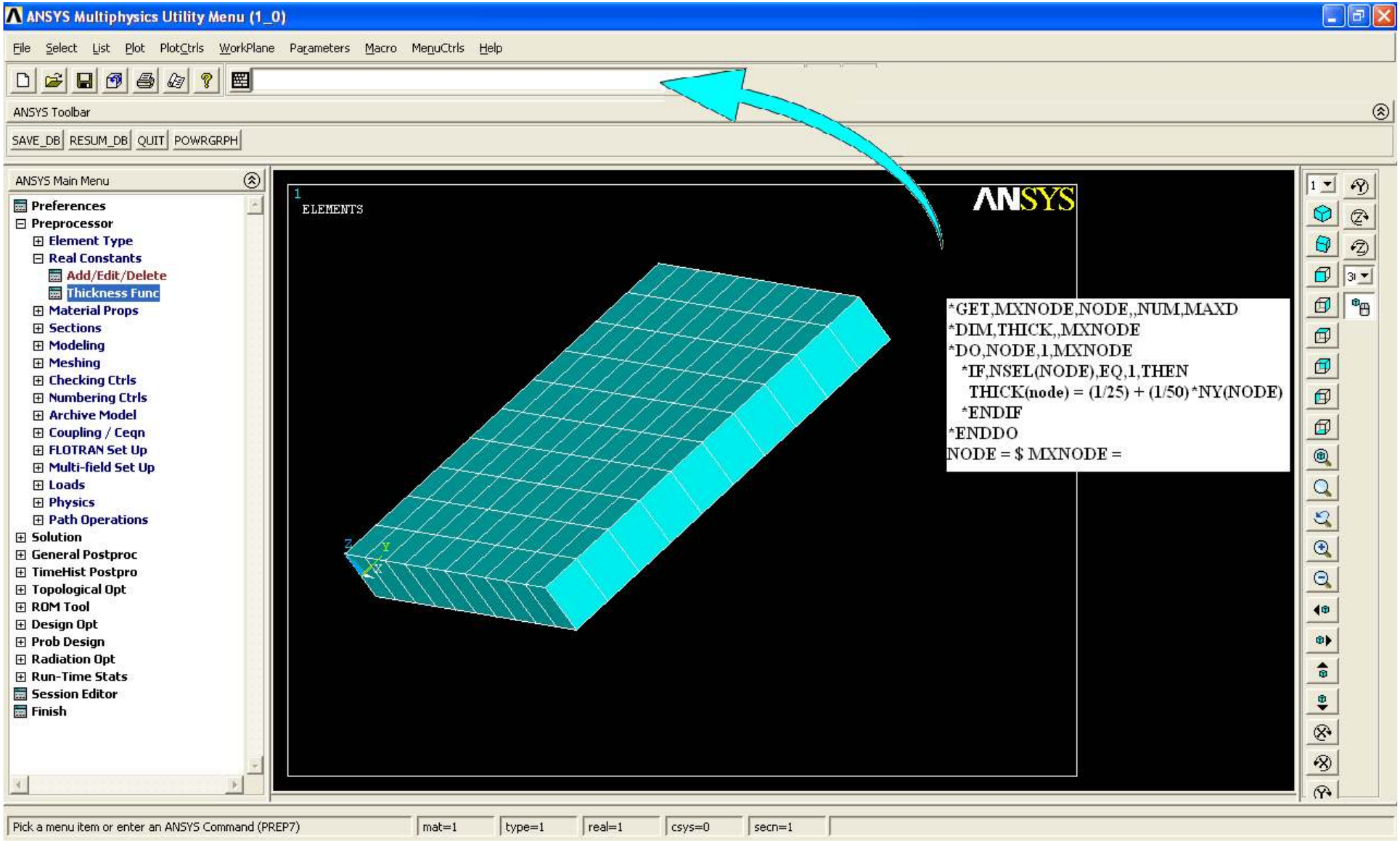
ANalysis **SYS**tem



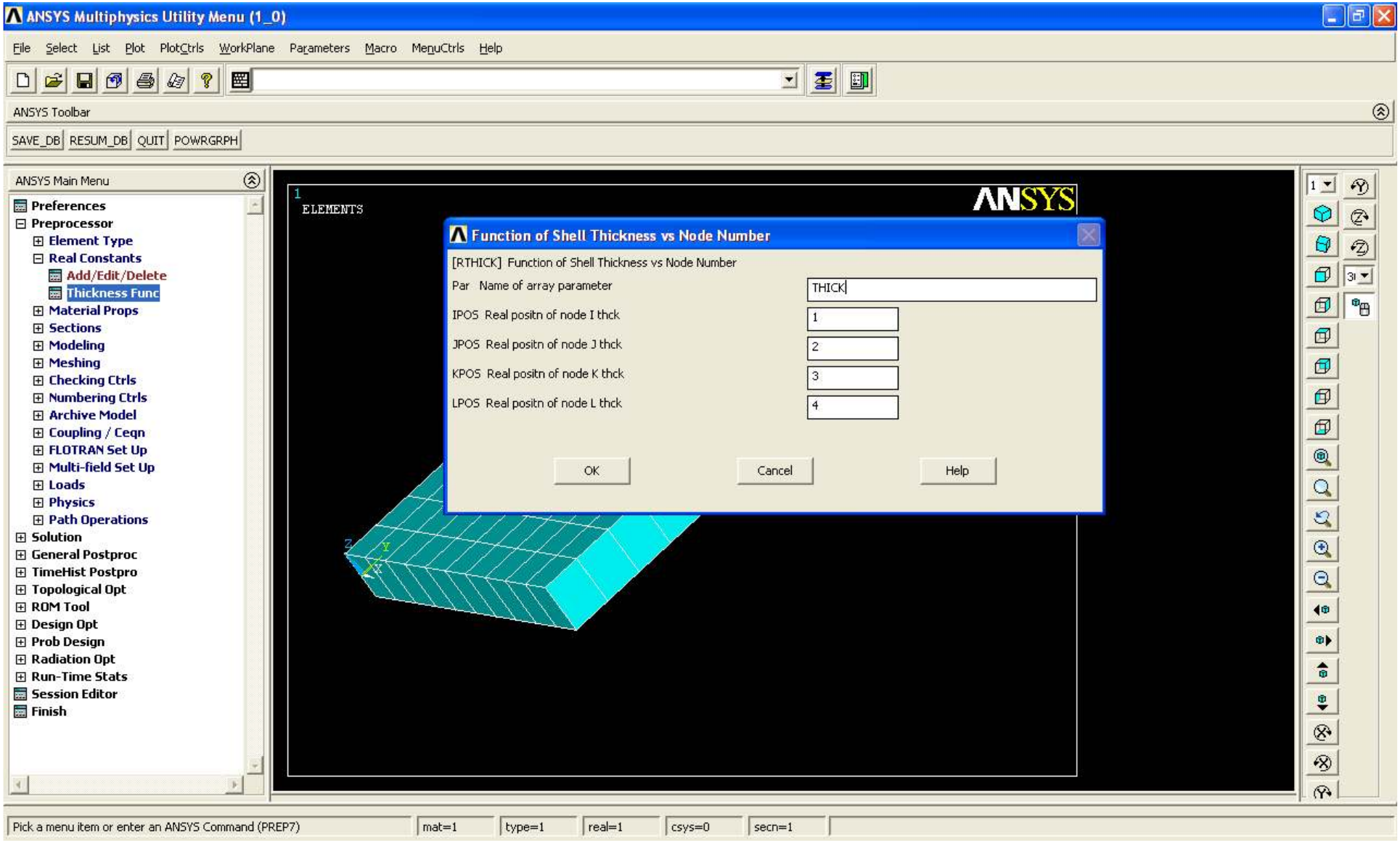
SABİT KALINLIKLI İZOTROP PLAK



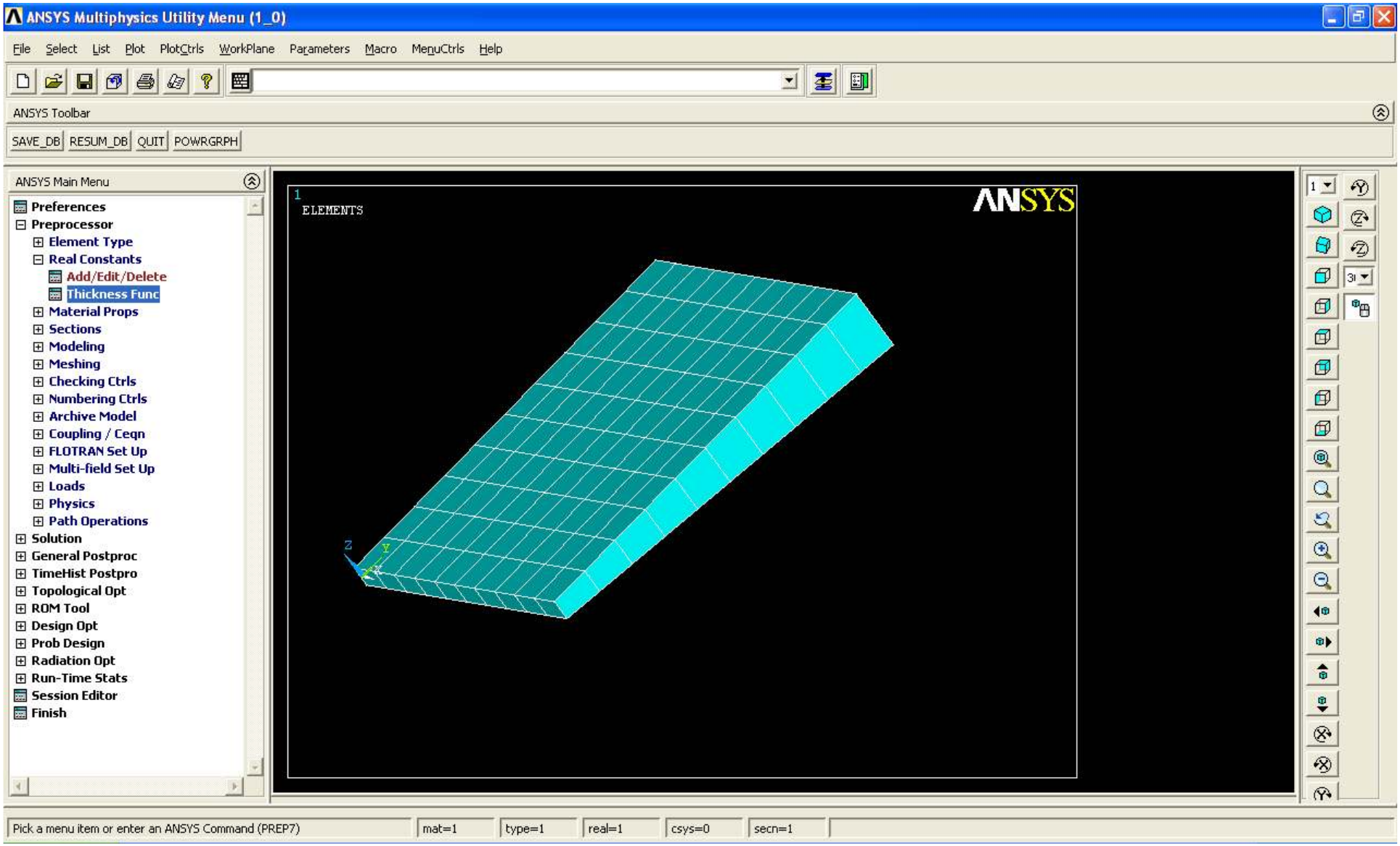
KALINLIK DEĞİŞİMİ



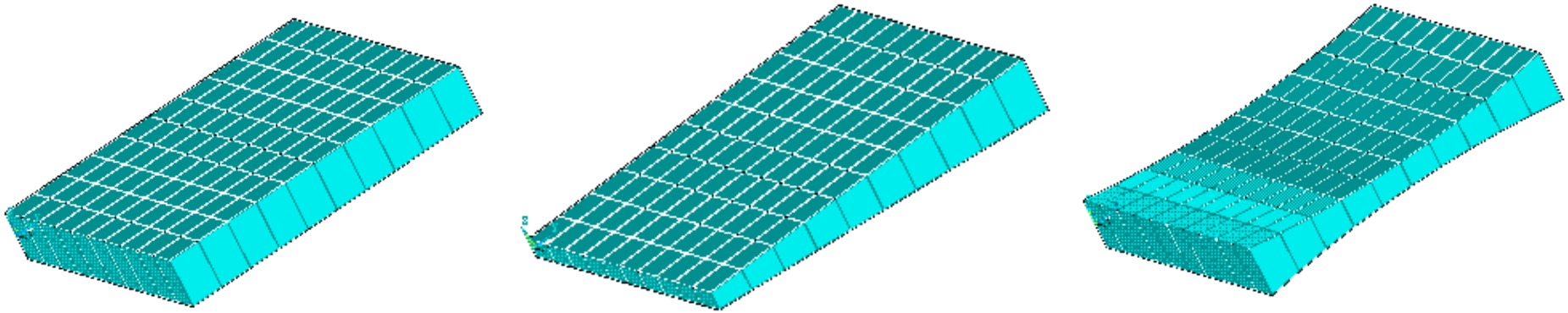
KALINLIK DEĞİŞİMİ



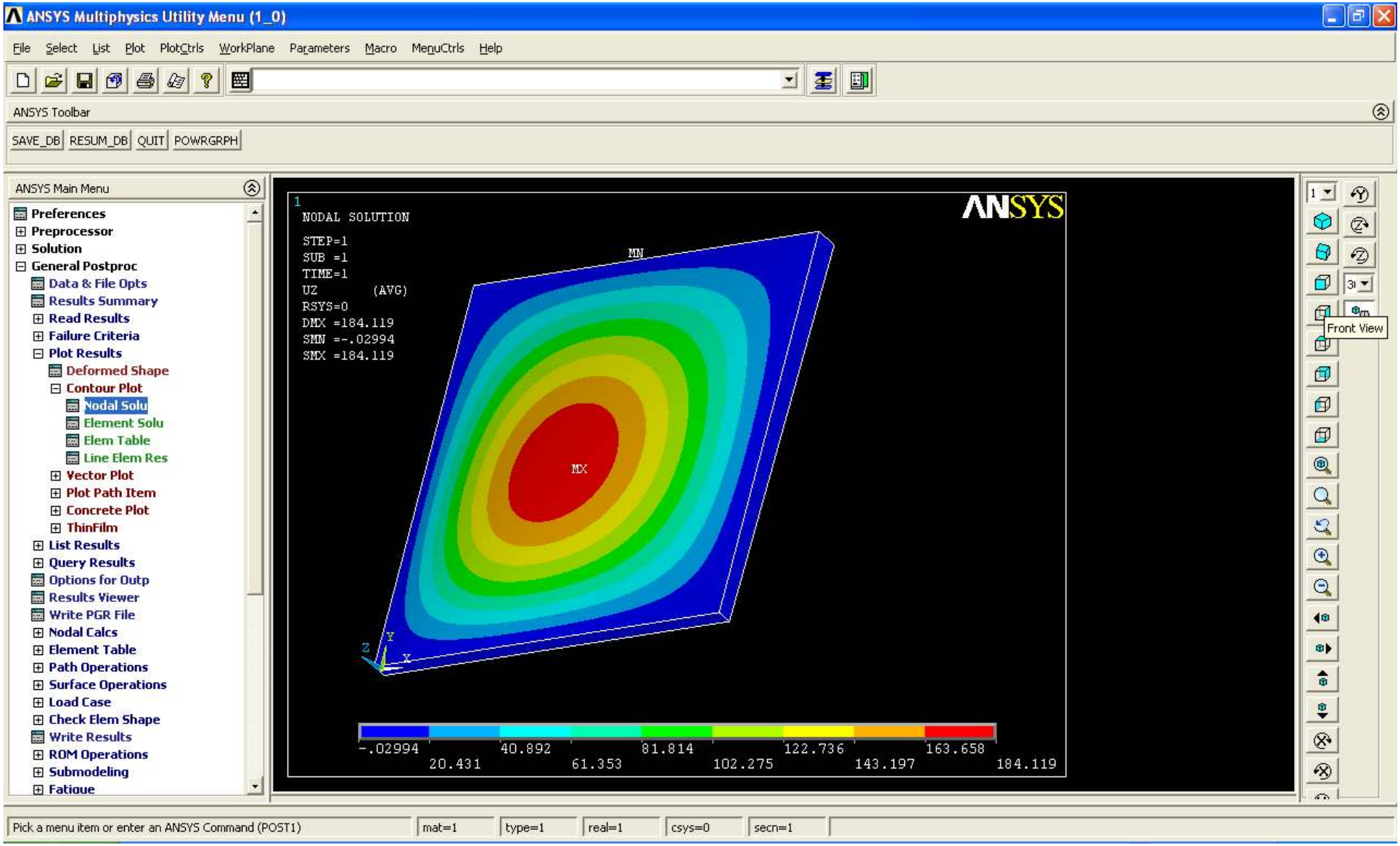
DEĞİŞKEN KALINLIKLI PLAK



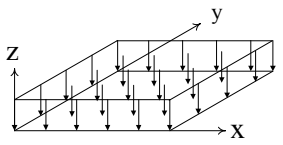
DEĞİŞKEN KALINLIKLI PLAK



SONUÇ

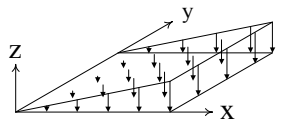

ANSYS Multiphysics Utility Menu (1_0)
File Select List Plot PlotCtrls WorkPlane Parameters Macro MenuCtrls Help
ANSYS Toolbar
SAVE_DB RESUM_DB QUIT POWRGRPH
ANSYS Main Menu
Preferences
Preprocessor
Solution
General Postproc
Data & File Opts
Results Summary
Read Results
Failure Criteria
Plot Results
Deformed Shape
Contour Plot
Nodal Solu
Element Solu
Elem Table
Line Elem Res
Vector Plot
Plot Path Item
Concrete Plot
ThinFilm
List Results
Query Results
Options for Outp
Results Viewer
Write PGR File
Nodal Calcs
Element Table
Path Operations
Surface Operations
Load Case
Check Elem Shape
Write Results
ROM Operations
Submodeling
Fatigue
1
NODAL SOLUTION
STEP=1
SUB =1
TIME=1
UZ (AVG)
RSYS=0
DMX =184.119
SMN =-.02994
SMX =184.119
ANSYS
MN
MX
Front View
-.02994
20.431
40.892
61.353
81.814
102.275
122.736
143.197
163.658
184.119
Pick a menu item or enter an ANSYS Command (POST1)
mat=1
type=1
real=1
csys=0
secn=1

SONUÇ

b/a	Kalınlık Değişimi / Yükleme durumu									
	Sabit (n = 0)			Doğrusal ($n=1$)			İkinci dereceden ($n=2$)			
	$\bar{w}$	$\overline{M}_x$	$\overline{M}_y$	$\bar{w}$	$\overline{M}_x$	$\overline{M}_y$	$\bar{w}$	$\overline{M}_x$	$\overline{M}_y$	
1.0	0.4062	0.4789	0.4789	0.4100	0.4772	0.4628	0.3494	0.4217	0.4510	Zenkour
	0.4057	0.4781	0.4781	0.4096	0.4768	0.4623	0.3490	0.4214	0.4506	Bu çalışma
	-0.1231	**-0.1754**	**-0.1754**	**-0.0976**	**-0.0901**	**-0.1188**	**-0.1145**	**-0.0783**	**-0.0887**	% Fark
1.5	0.7724	0.8116	0.4984	0.7795	0.8115	0.4774	0.6766	0.7231	0.4858	Zenkour
	0.7722	0.8115	0.4984	0.7795	0.8114	0.4771	0.6765	0.7231	0.4857	Bu çalışma
	-0.0259	**-0.0154**	**-0.0100**	**0.0000**	**-0.0092**	**-0.0628**	**-0.0148**	**-0.0069**	**-0.0206**	% Fark
2.0	1.0129	1.0168	0.4635	1.0229	1.0194	0.4427	0.9097	0.9259	0.4667	Zenkour
	1.0121	1.0164	0.4633	1.0222	1.0190	0.4422	0.9090	0.9255	0.4664	Bu çalışma
	-0.0790	**-0.0393**	**-0.0539**	**-0.0684**	**-0.0392**	**-0.1129**	**-0.0769**	**-0.0432**	**-0.0686**	% Fark

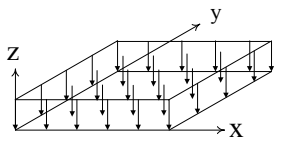
Tablo 1. Dört kenarından basit mesnetli, düzgün yayılı yükle yüklü dikdörtgen plakların orta noktasındaki boyutsuz çökme ve boyutsuz eğilme momentleri.

SONUÇ

b/a	Kalınlık Değişimi / Yükleme durumu									
	Sabit ($n=0$)			Doğrusal ($n=1$)			İkinci dereceden ($n=2$)			
	$\bar{w}$	$\bar{M}_x$	$\bar{M}_y$	$\bar{w}$	$\bar{M}_x$	$\bar{M}_y$	$\bar{w}$	$\bar{M}_x$	$\bar{M}_y$	
1.0	0.2031	0.2394	0.2394	0.2050	0.2386	0.2314	0.1747	0.2108	0.2255	Zenkour
	0.2029	0.2392	0.2392	0.2048	0.2384	0.2311	0.1745	0.2107	0.2253	Bu çalışma
	-0.0985	**-0.0710**	**-0.0710**	**-0.0976**	**-0.0880**	**-0.1167**	**-0.1145**	**-0.0569**	**-0.0887**	% Fark
1.5	0.3862	0.4058	0.2492	0.3898	0.4058	0.2387	0.3383	0.3616	0.2429	Zenkour
	0.3861	0.4058	0.2492	0.3897	0.4057	0.2385	0.3383	0.3615	0.2429	Bu çalışma
	-0.0259	**-0.0123**	**-0.0110**	**-0.0257**	**-0.0185**	**-0.0649**	**0.0000**	**-0.0207**	**-0.0185**	% Fark
2.0	0.5064	0.5084	0.2318	0.5114	0.5097	0.2214	0.4548	0.4630	0.2334	Zenkour
	0.5060	0.5082	0.2316	0.5111	0.5095	0.2211	0.4545	0.4628	0.2332	Bu çalışma
	-0.0790	**-0.0433**	**-0.0733**	**-0.0587**	**-0.0353**	**-0.1355**	**-0.0660**	**-0.0540**	**-0.0900**	% Fark

Tablo 2. Dört kenarından basit mesnetli, üçgen yayılı yükle yüklü dikdörtgen plakların orta noktasındaki boyutsuz çökme ve boyutsuz eğilme momentleri.

SONUÇ

b/a	Kalınlık Değişimi / Yükleme durumu									
	Sabit ($n=0$)			Doğrusal ($n=1$)			İkinci dereceden ($n=2$)			
	$\bar{w}$	$\overline{M}_x$	$\overline{M}_y$	$\bar{w}$	$\overline{M}_x$	$\overline{M}_y$	$\bar{w}$	$\overline{M}_x$	$\overline{M}_y$	
1.0	0.1917	0.2439	0.3324	0.1944	0.2428	0.3215	0.1548	0.2029	0.2995	Zenkour
	0.1915	0.2437	0.3322	0.1943	0.2426	0.3210	0.1547	0.2029	0.2993	Bu çalışma
	-0.1043	**-0.0656**	**-0.0632**	**-0.0514**	**-0.0741**	**-0.1524**	**-0.0646**	**0.0049**	**-0.0801**	% Fark
1.5	0.5326	0.5848	0.4595	0.5393	0.5857	0.4432	0.4538	0.5085	0.4368	Zenkour
	0.5325	0.5848	0.4594	0.5393	0.5857	0.4428	0.4538	0.5086	0.4367	Bu çalışma
	-0.0188	**-0.0085**	**-0.0272**	**0.0000**	**0.0000**	**-0.0846**	**0.0000**	**0.0098**	**-0.0229**	% Fark
2.0	0.8445	0.8687	0.4736	0.8539	0.8717	0.4560	0.7506	0.7838	0.4692	Zenkour
	0.8439	0.8683	0.4733	0.8534	0.8714	0.4555	0.7501	0.7835	0.4689	Bu çalışma
	-0.0710	**-0.0426**	**-0.0549**	**-0.0586**	**-0.0321**	**-0.1140**	**-0.0666**	**-0.0344**	**-0.0703**	% Fark

Tablo 3. Karşılıklı iki kenarı ankastre, diğer kenarları basit mesnetli düzgün yayılı yükle yüklü dikdörtgen plakların orta noktasındaki boyutsuz çökme ve boyutsuz eğilme momentleri.

TEŞEKKÜRLER…