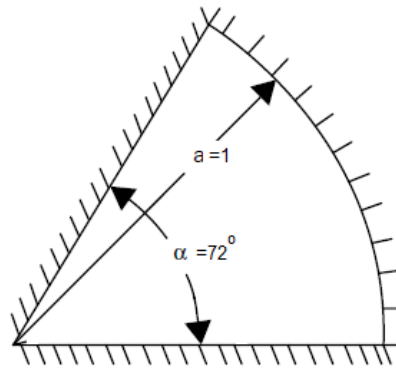


! Free vibration of sectorial circular Membrane

```

/PREP7
SMRT,OFF
ET,1,SHELL181
KEYOPT,1,1,1
SECTYPE,,SHELL
SECDATA,0.001
MP,EX,1,200E9
MP,DENS,1,78.6E2
MP,NUXY,1,.0
MP,ALPX,1,1E-6
CYL4,0,0,0,0,1,72
AMESH,ALL
AREFINE,1,,4
D,ALL,ALL,0

```



! FIX ALL DISPLACEMENTS TO APPLY PRESTRESS

! The prestress is induced by uniform cooling. The temperature difference,  $\Delta T$ , is calculated from  $P = E \alpha t (\Delta T)$ .

```

TREF,0
BFUNIF,TEMP,-0.5
/SOLU
ANTYPE,STATIC
RESCONTROL,LINEAR,ALL,1
OUTPR,,1
/OUT,SCRATCH
SOLVE
FINISH

```

! REFERENCE TEMPERATURE  
! COOL DOWN TO INDUCE PRESTRESS

```

/SOLU
ANTYPE,STATIC,RESTART,,PERTURB
PERTURB,MODAL,,NOKEEP
SOLVE,ELFORM

```

! NEEDED FOR PERTURBATION ANALYSIS

! RESTART STATIC SOLVE FROM LAST LOAD STEP AND SUB STEP  
! PERFORM PERTURBED MODAL SOLVE  
! REFORM ELEMENT MATRICES

```

LSEL,S,,1
NSLL,S,1
D,ALL,UX
D,ALL,UY
D,ALL,UZ
LSEL,S,,2
NSLL,S,2
D,ALL,UX
D,ALL,UY
D,ALL,UZ

```

$\omega$ (Hz)	FE	Analytic
1	3.2716	3.2716
2	4.9856	4.9791
3	5.1657	5.1631
4	6.6275	6.9956
5	7.0090	7.0050

```

LSEL,S,,3
NSLL,S,3
D,ALL,UX
D,ALL,UY
D,ALL,UZ

```

$$\text{Analytic: } \omega = \frac{\lambda}{a} \sqrt{\frac{P}{\rho t}} \text{ rad/s}$$

```

MODOPT,LANB,20,1,10000 ! USE BLOCK LANCZOS ITER, EXTRACT 20 MODES
MXPAND,20

```

```

SOLVE
FINISH
/POST1
file,,rstp

```