

# TRANSIENT RESPONSE ANALYSIS OF BEAM WITH SINUSOIDAL LOAD



All dimensions are in mm

Figure 1

Material property: E = 200 GPa, v = 0.3; Load P = sin(12.56t), (the load is having a frequency of 2Hz.)

### PROCEDURE

### 1. Create key points

Command : POINT,ADD

Menu : Geometry  $\rightarrow$  Keypoint  $\rightarrow$  Create  $\rightarrow$  By X/Y/Z

Parameters :

POINT,ADD

Coordinate data	0/0/0	
Coordinate Type	0	•
Entity ID		





Similarly create key point at (3000/0/0)

#### 2. Create curve

	113	
	Output ID	
	End Points P1/P2	6
Parameters :	CURVE, LINE	
Menu : G	eometry $\rightarrow$ Curve $\rightarrow$ Create $\rightarrow$ 1	Line
Command : C	URVE,LINE	





### 3. Generate mesh

Command : FEM,BAR

Menu	:	Mesh	$\rightarrow$	FE Mesh -	>	BAR
D						

FEM,BAR				
Curve	1	Þ		
Elem Size	100	ß		
Туре	2-Node 🖃			
Subdivisions	30	ß		
Bias	1	ß		
	114			





### 4. Erase curve

	Curve IDs
Parameters :	CURVE, ERASE
Menu :	Geometry $\rightarrow$ Curve $\rightarrow$ Miscellaneous $\rightarrow$ Erase
Command :	CURVE,ERASE

Type in the curve ID or pick the curve after clicking the arrow in the surface ID box





### 5. Apply boundary condition

Command : BC,ADD

Menu : Loa	$d/BC \rightarrow I$	Displacement BC $\rightarrow$ A	dd	E BC	
Parameters :	Node IDs BC value LCS ID Set ID	BC,ADD 1/3 1/0/2/0/3/0/4/0/5/0/6/0 0		Translation           IF         Ux           IF         Uy           IF         Uz           Rotation           IF         Rx           IF         Ry           IF         Rz	Apply Cancel





### 6. Specify material property

Command : MATERIAL, ISO

Menu : Property  $\rightarrow$  Material  $\rightarrow$  Isotropic  $\rightarrow$  Add



Parameters	:		Material Properties	
		MATERIAL, ISO	Modulus of elasticity	200000
	Element IDs	All	Coefft. of thermal expansion	0 7.85E-09
	Material-Data	200000/0.3/0/7.85E-09/0	 Plastic strain Vs True stress	0
	Material ID			Table
			Load from Library	ОК
			Add to Library	Cancel

# 7. Specify beam section

Command : BEAMSECTION, ADD

Menu : Property  $\rightarrow$  Physical  $\rightarrow$  Beam Properties  $\rightarrow$  Standard section  $\rightarrow$  Add

Parameters ·	BEAMS	ECTION, ADD		Beam Sections	
r arameters .	Element IDs	ALL	L3	Shape	
	Cross-section shape			·	
	Node offsets (yoff/zoff)	0/0		d	
	Set ID	1			Ż
				Dimensions	
					VALUES
				d	200
				Ok	Cancel

### 8. Specify load

i) Define sine function

In order to specify the sinusoidal load a sine function has to be defined

Command : FUNCTION, EXPRESSION

Menu : Property  $\rightarrow$  Function  $\rightarrow$  Expression

Expression					
sin(12.56*T]					
Variables Operators					
X Y Z T * / + - ( ) ,					
Range LCS 0					
Constants					
0 1 2 3 4 5 6 7 8 9 . pi					
Functions					
abs sqrt max min cos acos cos					
acosh sin asin sinh asinh tan ataı					
tanh atanh ceil floor exp log log1					
atan2 pow					
<u>Q</u> K <u>C</u> ancel					



Parameters :	FUNCTION, EXPRESSION	
	Set ID 1	
	Data sin(12.56*T)	

ii) Define load

Command : FORCE, ADD

Menu : Load/BC  $\rightarrow$  Point Load  $\rightarrow$  Add

Parameters :		FORCE, ADD		Tables	
	Node IDs	31	B	1:Expression	
	Data	F1		-	
	Component	Fy 🖃			
	LCS ID	0	<b>₽</b>		
	Set ID	1		Accept Car	ncel

At the end of the above operation your screen should look like this.



#### 9. Set analysis type

Command : ANTYPE,SET

Menu :	Analysis	$\rightarrow$ Analysis	Туре
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Parameter : ANTYPE,SET
Analysis Type Transient Response ----

#### 10. Specify transient response general data

Command : TRANSGEN, ADD

Menu : Analysis  $\rightarrow$  Transient Response  $\rightarrow$  General  $\rightarrow$  Add

Parameters :	TRANSGEN, ADD		
i urumetens .	No. of eigen values	20	
	No. of time steps	100	l
	Start time for analysis	0	l
	End time for analysis	1	l
	Mass computation	Lumped 🛁	l
	Stress output	Yes 🖃	l
	Node IDs	All	
			I.





### 11. Specify damping

Command	•	TRANSGEN, ADD
Menu	:	Analysis $\rightarrow$ Transient Response $\rightarrow$ Damping $\rightarrow$ Add

Parameters :	EXPLICITDAMP, ADD	Damping Factors	<b>—</b> ———————————————————————————————————
	Damping factors	Frequencv(Hz) Fa	ctor Insert Row 0.02 0.02 Paste Copy From file Cancel OK

### 12. Set analysis option

Command : ANOPTION,SET

Menu : Analysis  $\rightarrow$  Analysis Option

Parameters :	ANOPTION, SET		
	Linear Solver	MultiFrontal 🖃	
	Eigen Solver	Lanczos 🖃	
	Pre-stress File		

# **13. Save the project model**

Menu : File  $\rightarrow$  Save

# 14. Submit the job in to FEAST

Menu: Analysis  $\rightarrow$  Run Solver



**Click Here** 



#### **15. Perform Post Processing**

#### i) Displacement

Command : POST, DISPDEFORM

Menu : Post  $\rightarrow$  deformed Shape

<b>Parameters</b>	•	
1 urumeters	•	





#### ii) Beam stress

Command : POST, BEAMCONTOUR

Menu : Post  $\rightarrow$  Beam Plots  $\rightarrow$  Stress Contour

Parameters :

POST, BEAMCONTOUR			
Component	AXIAL	•	
Decimal Places		2	
No. of contours		9 ♣	
Element List		ALL	
Time Step	0.25	•	
🗏 Highlight Maximum			
🗌 Use Absolute			<b>7</b> 2
Colour:Label			.25





FreWin 2018R1.U2 (PROFESSIONAL VERSION) - E:\t12-1 Eile Edit View Geometry Mesh Load/BC Property Analysis Settings Post Help 🧾 🖪 🛄 🖬 🗠 🗠 🗅 🛃 🍎 📥 図 오 冬 🖸 🥑 🔟 😐 😐 🕒 🔽 💶 🚥 🔡 🎒 🧕 🍝 🥙 Main Edit Show Colour Settings F • Commands 1.80E-16 🗄 🦲 Geometry  $\sim$ PreWin 2018R1.U2 🗄 🧰 Mesh -1.86E-16 🕀 🧰 Load/BC VSSC/ISR0 🗄 🧰 Property 🗄 🚞 Analysis 🗄 🧰 Settings 8 🗄 🦲 Post × Deformed Shape Contour 🗄 🧰 Beam Plots Stress Contour \* Strain Contour 0 > Force diagram ∅
 №
 №
 № POST, BEAMCONTOUR \* -▼ AXIAL Component 2 **Decimal Places** 9 🌲 No. of contours B Element List ALL STRESS (AXIAL) ▼ Time Step 0.25 Minimum = -1.86445e-16 Maximum = 1.80372e-16 . 🗌 Highlight Maximum Ŷ Use Absolute Command: POST, DISPDEFORM Command: POST, BEAMCONTOUR • Þ ⊒ POST, BEAMCONTOUR - Done ! AutoExec Apply Command:

At the end of the above operation your screen should look like this.