#### Course in ANSYS

Example0120



#### **Objective:**

Compute the maximum deflection

#### Tasks:

Create a table and compare results with results obtained from beam theory?

Display the deflection figure?

#### **Topics:**

Topics: Start of analysis, Element type, Real constants, Material, modeling, element size for beam models,

saving/restoring

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a  $E = 210000 \text{N/mm}^2$   $\nu = 0.3$  L = 5000 mm a = 250 mm b = 450 mm c = 10 mm d = 20 mm e = 15 mm f = 350 mmF = 100 N

## Example - title



# Utility Menu > File > Change Title Enter: Cantilever beam /title, Cantilever beam Image Title [/TITLE] Enter new title Image Title OK Cancel Help ANSYS Example0120

## **Example - Keypoints**

Note: An empty #



## Example - Numbering

#### Utility Menu > PlotCtrls > Numbering

View Settings

Numbering .... Symbols ...

Font Controls

Erase Options

Animate

Annotation

Redirect Plots

Write Metafile

Best Quality Image

Hard Copy

Style

Pan Zoom Rotate ... Plot Numbering Controls  $\times$ [/PNUM] Plot Numbering Controls Keypoint numbers 🔽 On KP LINE Line numbers □ off Window Controls AREA Area numbers □ Off VOLU Volume numbers □ Off NODE Node numbers □ Off Elem / Attrib numbering -No numbering Device Options ... TABN Table Names □ Off SVAL Numeric contour values □ Off Save Plot Ctrls ... Restore Plot Ctris .... [/NUM] Numbering shown with Colors & numbers -Reset Plot Ctrls [/REPLOT] Replot upon OK/Apply? Replot Capture Image ... Restore Image .... Help OK Apply Cancel Multi-Plot Controls .... Press OK Multi-Window Layout ...

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#### 5

Switch on Keypoint numbers

## **Example - Lines**

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**Preprocessor > Modeling > Create > Lines > Lines > Straight Line** Create a line between Keypoint 1 and Keypoint 2.

L,1,2

Create Str	aight Li		
• Pick	C Unpick		
🖲 Single	C Box		
C Polygon	C Circle		
C Loop			
Count =	0		
Maximum =	2		
Minimum =	2		
KeyP No. =			
• List of Items			
🔿 Min, Max, Inc			
0К 🗕	Apply		
Reset	Cancel		
Pick All	Help		

HINT: By clicking with the righthand mouse button you shift between the Pick/Unpick function. This is indicated by the direction of the cursor arrow:

Pick: upward arrow

Unpick: downward arrow

Press OK or Cancel to finish selection

## Example – Element Type

#### Preprocessor > Element Type > Add/Edit/Delete



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## **Example - Element Type**

#### **Preprocessor > Element Type > Add/Edit/Delete**

Ele	ment	: Types					×	
	Defin Tyne	ied Elemer 1	nt Types: BEAM44					
		-						
							Г	Press Options
		Add		Options •	De	lete		
		Clo	ise		Help			

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## **Example - Element Type**

#### **Preprocessor > Element Type > Add/Edit/Delete**

BEAM44 element type options	×		
Options for BEAM44, Element Type Ref. No. 1			
Selection	Consistent		
Member force + moment output K6	Exclude output		
Output at extra intermed pts K9	No intermed pts		
Load offset in terms of K10	Length units 🔹	Press Help to learn more about the	
Stiffness release at node I K7	_		
ROTZ		element.	
ROTY			
ROTX			
UZ			
UY			
UX			
Stiffness release at node J K8			
ROTZ			
ROTY			
ROTX			
UZ			
UY			
UX			
OK Cancel	Help		
ANSYS	Exa	ample0120 9	

# **Example - Material Properties**

#### **Preprocessor > Material Props > Material Models**



# **Example - Material Properties**

#### **Preprocessor > Material Props > Material Models**



## **Example - Section**





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## Example – Line Attributes

#### **Preprocessor > Meshing > Mesh Attributes > Picked Lines**



## **Example - Meshing**

Preprocessor > Meshing > Size Cntrls > ManualSize > Lines > Picked Lines

	Element Size on P
•	• Pick C Unpick
	© Single O Box O Polygon O Circle O Loop
Select/Pick Lines to specify mesh size for	Count = 0 Maximum = 1 Minimum = 1 Line No. = © List of Items © Min, Max, Inc
	OK Apply Reset Cancel Pick All Help

∧ Element Sizes on Picked Lines	×
[LESIZE] Element sizes on picked lines	
SIZE Element edge length	
NDIV No. of element divisions	•
(NDIV is used only if SIZE is blank or zero)	
KYNDIV SIZE,NDIV can be changed 🔽 Yes	
SPACE Spacing ratio	
ANGSIZ Division arc (degrees)	
( use ANGSIZ only if number of divisions (NDIV) and element edge length (SIZE) are blank or zero)	
Clear attached areas and volumes	
OK Apply Cancel	Help
ss OK when finish with selection	Enter 5 –
Example0120	14

## **Example - Meshing**

#### Preprocessor > Meshing > Mesh > Lines

Mesh Lines			
• Pick • C Unpick			
• Single C Box			
C Polygon C Circle C Loop			
Count = 0			
Maximum = 1			
Minimum = 1			
Line No. =			
● List of Items ○ Min, Max, Inc			
10 <u></u>			
OK Apply			
Reset Cancel			
Pick All Help			

Select individual lines to be meshed by Picking

**NB**: It is often necessary to "Clear" the model for example if Element Type is to be changed

Select all lines defined to be meshed

## Example - PlotCtrls Menu

Pan Zoom Rotate … View Settings	
Numbering Symbols	
Style 🕨	Hidden Line Options
Font Controls	Size and Shape ●- Edge Options
Erase Options 🔹 🕨	Contours 🕨 🕨
Animate Annotation	Graphs   Colors
Device Options Redirect Plots Hard Copy	Light Source Translucency Texturing
Save Plot Ctrls Restore Plot Ctrls Reset Plot Ctrls	Background  Multilegend Options Floating Point Format
Capture Image Restore Image	Displacement Scaling Vector Arrow Scaling
Write Metafile	Shell Normals
Multi-Plot Controls Multi-Window Layout	Solid Model Facets Symmetry Expansion 🔸
Best Quality Image	

∧Size and Shape	×
[/SHRINK] Shrink entities by	0 percent 🔽
[/ESHAPE] Display of element	□ Off ●
shapes based on real	
constant descriptions	
SCALE Real constant multiplier	0
[/EFACET] Facets/element edge	1 facet/edge
[/RATIO] Distortion of Geometry	
WN Window number	Window 1
RATOX X distortion ratio	1
RATOY Y distortion ratio	1
[/CFORMAT] Component/Parameter Format	
NFIRST, NLAST Widths	32 0
[/REPLOT] Replot upon OK/Apply?	Replot
OK Apply	Cancel Help
	Change to On
Example0120	<b>5</b> 16

# Example – Display of Element



#### Example – Analysis Type Write Database Log File > Write DB log file Write Database Log to Directories: OK. Enter "example0120.lgw" c:\...\administrator \*.lgw Cancel 🗁 c:\ 🗁 DOCUMENTS AN Help 👝 ADMINISTRATOL Cookies Dokumenter Foretrukne Solution > Analysis Type > New Analysis List Files of Type: Drives: Database Log (\*.lgw) **C**: Network... • Ψ. New Analysis $\times$ Write non-essential cmds as comments • [ANTYPE] Type of analysis Static C Modal C Harmonic O Transient C Spectrum C Eigen Buckling Press OK Substructuring OK ( Cance Help

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### Example – Define Loads

#### Solution > Define Loads > Apply > Structural > Displacement > On Keypoints



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## Example – Define Loads

#### Solution > Define Loads > Apply > Structural > Force/Moment > On Keypoints



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## **Example - Save**



#### **Example - Solve**

#### Solution > Solve > Current LS



## **Example - PostProcessing**

#### **General Postproc > Plot Results > Deformed Shape**



## **Example - PostProcessing**



Read Maximum displacement: DMX

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