Pro/Mechanism Design

Mechanism design is used to define a mechanism, make it move, and analyze its motion.

- 1. Starting Mechanism design:
 - a) Start Pro/E and open tutorial2b.asm
 - b) Click **Applications > Mechanism.** Mechanism Design begins.
- 2. Creating a Servo Motor:
 - a) Click **Mechanism > Servo Motors**. The **Servo Motors** dialog box opens as shown in figure 1.





b) Click New. The Servo Motor Definition dialog box opens as shown in figure 2.

🔚 Servo Motor Definition 🛛 🛛 🔀
Name ServoMotor1
Type Profile Driven Entity
Motion Axis Geometry
Flip
OK Apply Cancel

Figure 2

- c) On the Type tab, for the Driven Entity, select Motion Axis, and choose the pin joint connecting part1.prt to part2.prt (connection_2_axis_1) as shown in figure 3a.
- d) On the **Profile** tab, change the **Specification** to **Velocity** as shown in figure 3b.
- e) The Magnitude should be Constant. Enter the value 72 for A as shown in figure 3b.

	🧱 Servo Motor Definition	
	Name ServoMotor1	
Servo Motor Definition	Type Profile Specification	'sec
	Initial Position ✓ Current ♂ 1.88284 deg	
Oriven Entity Ometry Geometry	Magnitude Constant	· · · · · · · · · · · · · · · · · · ·
Connection_2.axis_1	Graph	Position Velocity
OK Apply Cancel		y Cance



Figure 3b

Select the **Position** check box and click . The plot shows that the servo motor f) will go through two full rotations in 10 seconds as shown in figure 4.



Figure 4

- 3. Creating and Running a Kinematic Analysis
 - a) Select Analysis > Mechanism Analysis or click . The Analysis Definition dialog box opens as shown in figure 5a.

AnalysisDefinition1		
Type -	Applysis Definition	
	Analysis berinition	
Preferences Motors Ext Loads	Name	
Graphical Display	AnalysisDefinition1	
Start Time 0	- Type -	
Ength and Rate	Kinometic	~
Frame Count 101		
Frame Rate 10	Preferences Motors Extloads	
Minimum Interval 0.1	Motor From To	
_ Locked Entities		
	Servomotori Start End	
12		
Current		
Snapshot. 🛛 🗸 రా		
		Inner
OK Run Cancel		ancel

Figure 5a

Figure 5b

- b) Under **Type**, select **Kinematic**. Accept the default name, AnalysisDefinition1.
- c) On the **Preferences** tab, accept the default values.
- d) On the **Motors** tab, be sure ServoMotor1 is listed. If it is not, click as shown in figure 5b.
- e) Click **Run**. The progress of the analysis is shown at the bottom of the model window, and the model moves through the specified motion.

To view the analysis results in later sessions of Mechanism design, you must save them as a playback file.

- 4. Saving and Reviewing Results
 - a) Replay results. Select Analysis > Playback or click [●]. The Playbacks dialog box opens as shown in figure 6a, click [●]. The Animate dialog box opens as shown in figure 6b.

	🛄 Animate 🛛 🔀
	Frame
💹 Playbacks 🛛 🔀	0 0 100
 Close Collision Detection Settings 	Close
Figure 6a	Figure 6b

b) Click **b** to play or click Capture to save animation file as shown in figure 7.

🧱 Capti	ure	
— Name		
Tutorial2	ldmpg Br	owse
- Type -		
MPEG		~
	- .	
- Image	Size	
Width	640	Pixels
Height	646	Pixels
🗹 Lock	Aspect Ratio	
- Quality		
Photo	orender Frames	
- Frame	Rate	
25 fps		~
(OK Cancel	



c) On the **Playbacks** dialog box, click to save your results as a .pbk file. In the **Save** dialog box, accept the default name or change to another name. The default directory is the current working directory. You can also browse to find another directory to save your file. You can open the .pbk file in future sessions by clicking and selecting the playback file. Click **Close** to quit.

d) Select Analysis > Measures or click . The Measure Results dialog box opens as shown in figure 8.

Measure Results	
Graph Type Measure vs. Time	📕 Measure Definition 🛛 🔀
Measures	Name
Name Value Status	measure1
	Туре
×	Position 🔽 units
Graph measures separately	Point or Motion Axis
Result Set	Evaluation Method
	Each Time Step 🔽
Close	OK Apply Cancel

Figure 8

Figure 9

- e) Click . The **Measure Definition** dialog box opens as shown in figure 9. Accept measure1 as the name.
- f) Under **Type**, select **Position**.
- g) Select a vertex on the part2 as shown in figure 10.



Figure 10

h) Select **Y-component** in the **Component** area, and accept the WCS for the **Coordinate System**. Under **Evaluation Method**, accept **Each Time Step** as shown in Figure 11.

🛄 Measure Definition 🛛 🔀
Name
measure1
— Туре ————
Position 💙 in
Point or Motion Axis
PART2:edge_end
Coordinate System
▶ wcs
Component
Magnitude 💌
Evaluation Method
Each Time Step 💌
OK Apply Cancel

Figure 11

- i) Click OK.
- j) On the Measure Results dialog box as shown in figure 12, select measure1 under Measures, and AnalysisDefinition1 under Result Set. (If you changed the result set name, select the appropriate name.) The Graph Type should be Measure vs. Time.





Figure 13

- k) Click to see the plot of the measure. The plot should be a cosine curve as shown in figure 13.
- 1) Click to view animated simulation <u>Tutorial2c.mpg</u>