EX. 11-24

A pulley turns initially at 30 rpm clockwise, and then reverses its direction of rotation to 40 rpm counterclockwise in 5 seconds, at a constant deceleration and acceleration rate. Determine

(a) The angular acceleration
(b) The total number of revolutions of the pulley during the 5-second interval
(c) The angular displacement of the pulley at t=5 seconds

In this exercise, we are going to use the "Velocity Motor" to exert the rotation on the pulley.

1. Convert the rotational velocities in RPM to rad/sec values

At t = 0:
Initial velocity v_0 = 30 rpm clockwise = - 30 * ($2\pi/60$) = - π rad/sec

At t = 5:
Velocity v_1= 40 rpm counterclockwise = 40 * ($2\pi/60$) = $4\pi/3$ rad/sec

2. Since the velocity is changing over the time interval, velocity has to be expressed in terms of an equation:

Let velocity at any time ***t*** is expressed as $v = v_0 + k*t$ where ***k*** is a constant and ***t*** is the time.

Since at t=5, v= $4\pi/3$, ***k*** can be found as ***k*** = $7\pi/15$

3. Now, the velocity can be expressed in terms of an equation as

$v = -\pi + 7\pi/15 * t = - 3.14 + 1.47 * t$

4. Once you set the motor at the center of the pulley, select the motor and get the Properties from Windows menu. In this example, instead of acceleration, select the Velocity from Type drop-down menu.

5. Type the following equation in the value field as shown in Figure 1.

$v = - 3.14 + 1.47 * t$

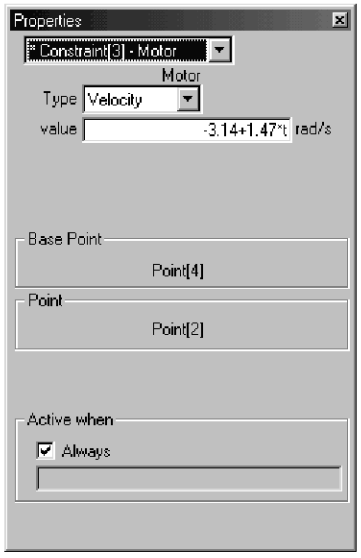

Figure 1

6. Now, the velocity set-up for the motor is completed and you can proceed with the simulation.