PROBLEM | FOR A SLIDER CRANK WITH A DRIVE LINK $a = 7$, A COUPLER LINK $b = 25$, AN OFFSET = 10, AND AN ANGLE $\theta_2 = 330°$ USING THE ALGORITHM YOU DEVELOPED DETERMINE ALL (OPEN AND CLOSED) POSITIONS OF THE MECHANISM.

GIVEN:

1. THE SLIDER CRANK SHOWN IN THE FIGURE BELOW
2. DIMENSIONS: $a = 7$, $b = 25$, $c = 10$, $\theta_2 = 330°$
3. $\omega_2 = 100$ 1/s

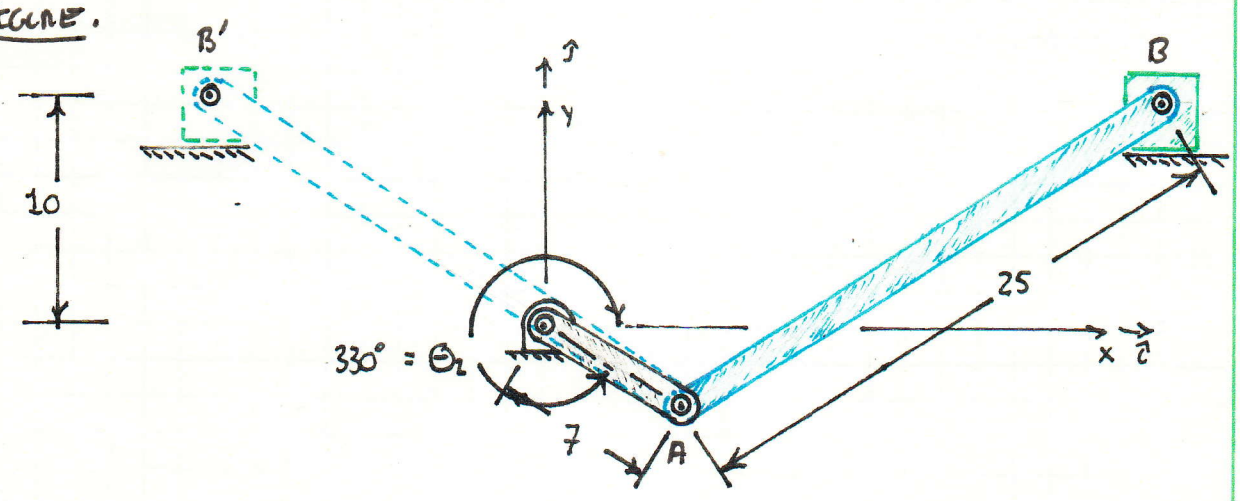
ASSUMPTIONS:

1. ALL MOTION OF THE MECHANISM IS IN A SINGLE PLANE OR PARALLEL PLANES
2. ALL LINKS ARE FRICTIONLESS AT THE JOINTS
3. ALL LINKS ARE RIGID

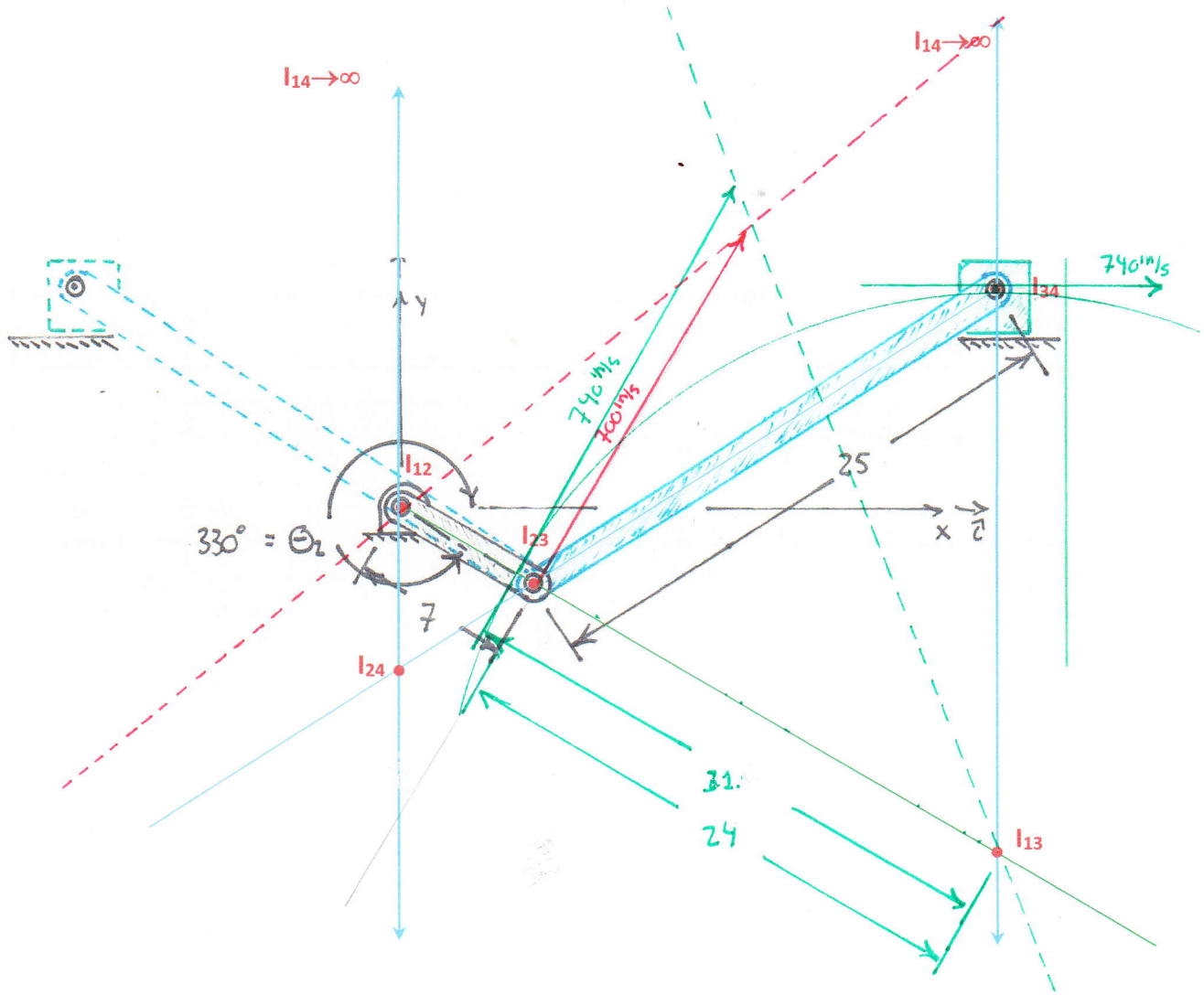
FIND:

1. THE POSITION OF B IN BOTH THE OPEN AND CLOSED CONFIGURATIONS
2. THE ANGLE θ_3 IN BOTH THE OPEN AND CLOSED CONFIGURATIONS.
3. FIND ALL INSTANT CENTERS ASSOCIATED WITH THE MECHANISM
4. USING THE INSTANT CENTERS DETERMINE THE LINEAR VELOCITIES OF AT A & B IN THE OPEN AND CLOSED CONFIGURATIONS
5. USING THE INSTANT CENTERS DETERMINE THE ANGULAR VELOCITY OF LINK 3 IN THE OPEN AND CLOSED CONFIGURATIONS.

FIGURE.



TOPS



THE INSTANT CENTERS FOR THE OPEN CONFIGURATION ARE SHOWN

THE VELOCITY AT A IS FOUND

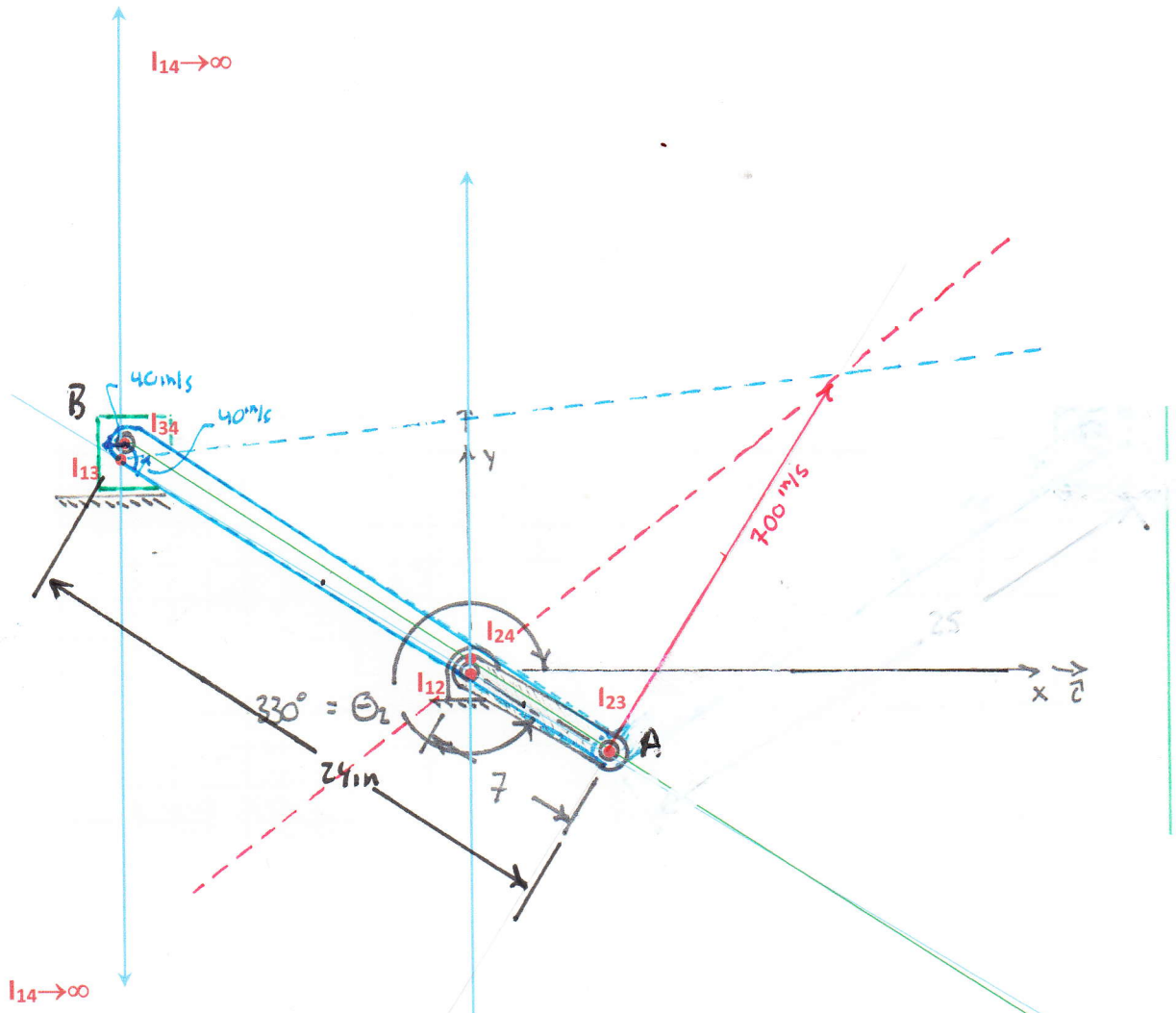
$$v_A = \omega_2 \cdot r_{O_2A} = \omega_2 \cdot r_{I_{12}I_{23}} = (100\ ^1/_s)\cdot(7\text{in}) = \underline{700\ ^{in}/_s}$$

BY DIRECT MEASUREMENT

$$v_B = v_{I_{34}} = \underline{740\ ^{in}/_s}$$

AND THE ANGULAR VELOCITY IS GIVEN BY

$$\omega_3 = v_A / r_{I_{23}I_{13}} = 700\ ^{in}/_s / 24\text{in} = \underline{29\ ^1/_s}\ (CW)$$



THE INSTANT CENTERS FOR THE CLOSED/CROSSED CONFIGURATION ARE SHOWN.

THE VELOCITY AT A IS

$$v_A = r_{I_{12}I_{23}}\omega_2 = r_A\,\omega_2 = (7\text{in})(100\text{'/s}) = \underline{700\text{'/s}}$$

FROM DIRECT MEASUREMENT

$$v_B = v_{I_{34}} = \underline{40\text{in/s}}$$

THE ANGULAR VELOCITY OF LINK 3

$$\omega_3 = v_A / r_{I_{13}I_{23}} = 700\text{in/s}/24\text{in} = \underline{29\text{'/s ccw}}$$

Summary:

BOTH SOLUTIONS MATCH THE ANALYTICAL SOLUTIONS WITH IN THE PRECISION OF THE DRAWING INSTRUMENT.