**Geometric Kinematics for Four Bar**

C



3

B

D

A

2

B



r2

r1

e

r1 = AD = 90 cm 2 = 65°

r2 = AB = 30 cm  = 10 rad/s CW

r3 = BC = 60 cm = 2 rad/s2 CCW

r4 = CD = 45 cm  = 0.5 rad/s3 CW

2





4

1

1

D

A

# POSITION ANALYSIS

D

B











C



r4

r3







e

























**VELOCITY ANALYSIS**

































**ACCELERATION ANALYSIS**

































**JERK ANALYSIS**

































**SNAP ANALYSIS**







































**SAMPLE VALUES FOR FOUR BAR**

2 = 65°  = -10 rad/s = +2 rad/s2 = -0.5 rad/s3

e = 81.9626 cm  = -298.5547 cps  = +364.3867 cps2  = +32987 cm/s3

= 19.3737°  = -0.3588 rad/s = -38.9682 rad/s2 = -363.3719 rad/s3

 = 101.6763°  = -9.2546 rad/s  = +62.7055 rad/s2  = -253.3073 rad/s3

 = 45.7986°  = +5.7122 rad/s = -30.8000 rad/s2  = +125.9668 rad/s3

4 = 114.8278° = -5.3533 rad/s = +69.7682 rad/s2 = +237.4051 rad/s3

3 = 13.1515°  = +3.9013 rad/s = +7.0627 rad/s2 = +490.7125 rad/s3

**MATLAB code available in Notes\_03\_02**

**Freudenstein’s Equations for Four Bar**

horizontal and vertical components



rearrange



square both equations



add equations and simplify to remove 



rearrange



use same process to remove 

































**VELOCITY ANALYSIS**













**ACCELERATION ANALYSIS**













**Geometric Kinematics for Slider Crank**

1

1

2

3

4

A

B

# C





R = AB

L = BC

s

# POSITION ANALYSIS







# VELOCITY ANALYSIS











# ACCELERATION ANALYSIS











# JERK ANALYSIS











# SNAP ANALYSIS











**APPROXIMATE EXPLICIT SOLUTION**





binomial series 









 for 

 for 

 for 

**HIGHER ORDER APPROXIMATION** (for )











**Geometric Kinematics for Inverted Slider Crank**

B





r

r

r

A

C



# POSITION ANALYSIS













# VELOCITY ANALYSIS

















# ACCELERATION ANALYSIS















#

# JERK ANALYSIS

















# SNAP ANALYSIS





















