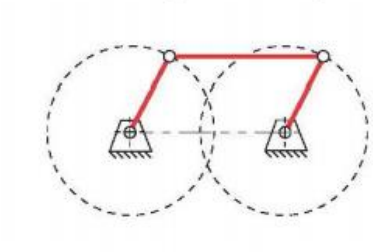
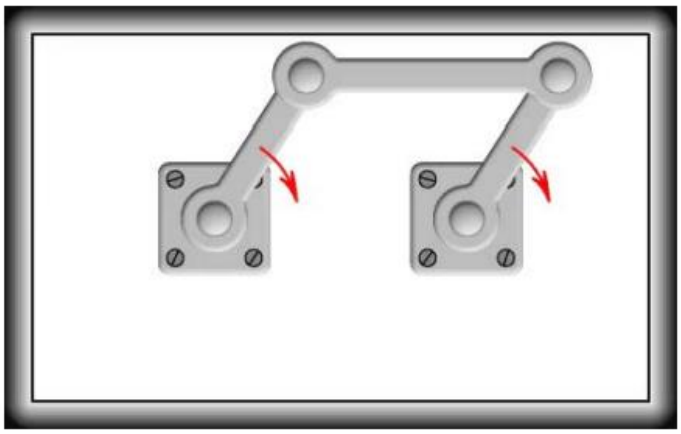
Problems

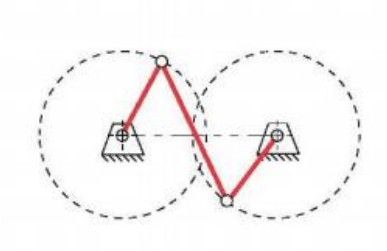
Calculate the degree of freedom
For next problems mechanisms

Four-bar linkage examples

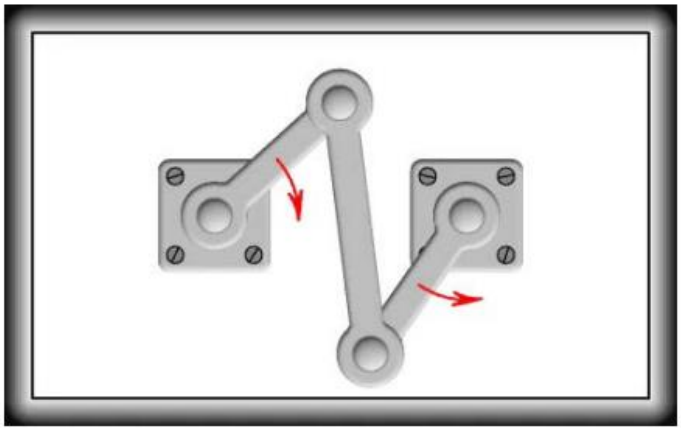


Parallel 4-bar

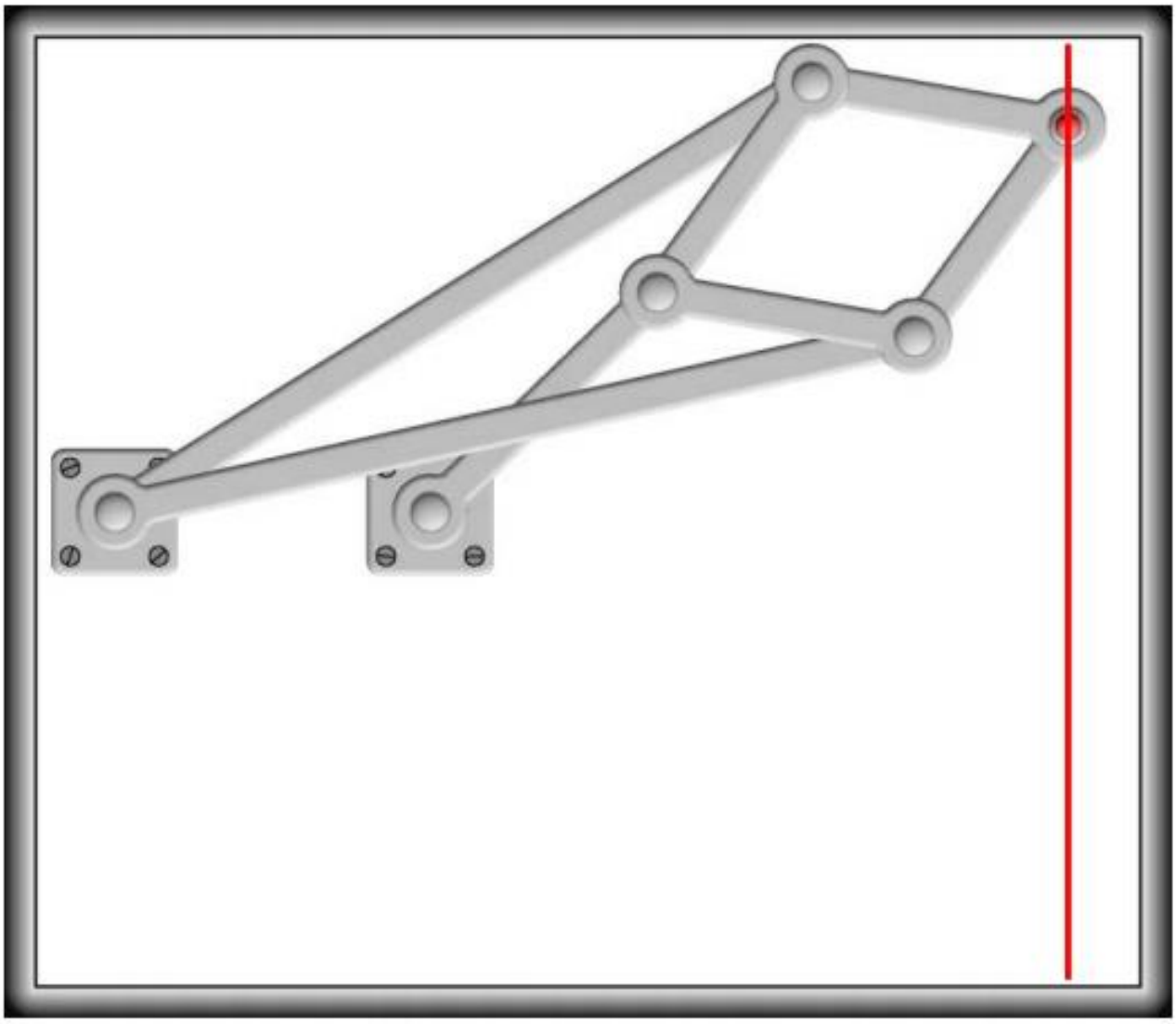


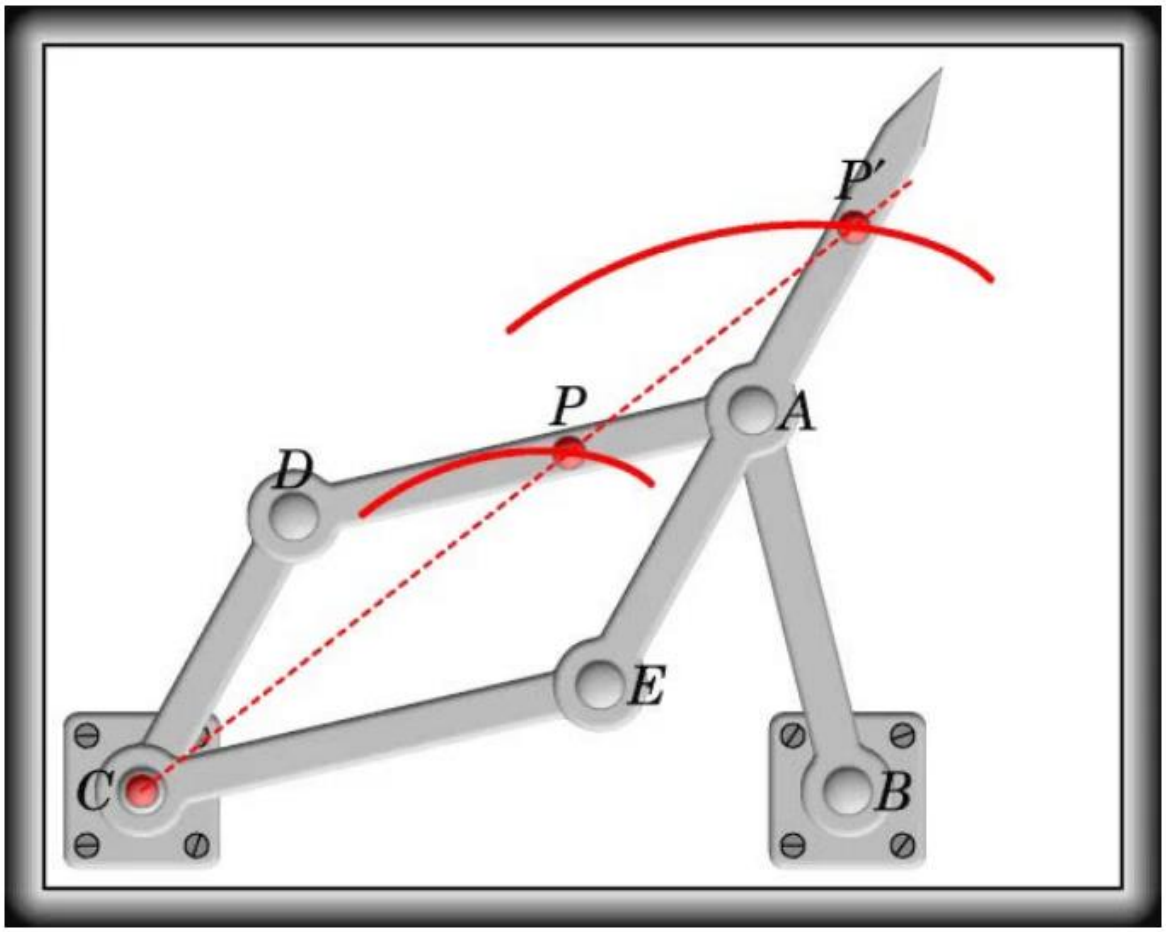


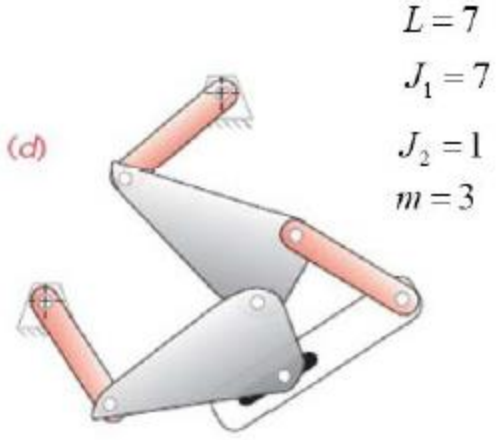
Anti-parallel 4-bar



Straight- line linkages (Peaucellier)







$L = 7$

$J_1 = 7$

$J_2 = 1$

$m = 3$

$L = 7\ ,\ j_1 = 7\ ,\ j_2 = 1$

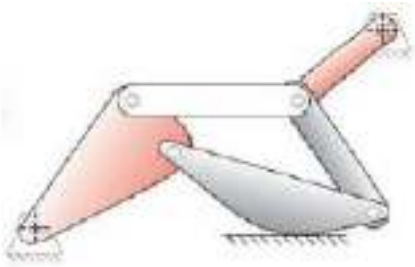
$m = 3(L-1) - 2j_1 - j_2$

$m = 3(7-1) - 2 \times 7 - 1 = 3 \quad DOF$

$L = 4\ , j_1 = 4\ , j_2 = 0$

$m = 3(L-1) - 2j_1 - j_2$

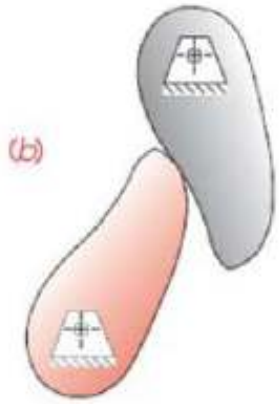
$m = 3(4-1) - 2 \times 4 - 0 = 1 \quad DOF$



$L = 6, j_1 = 7\ , j_2 = 1$

$m = 3(L-1) - 2j_1 - j_2$

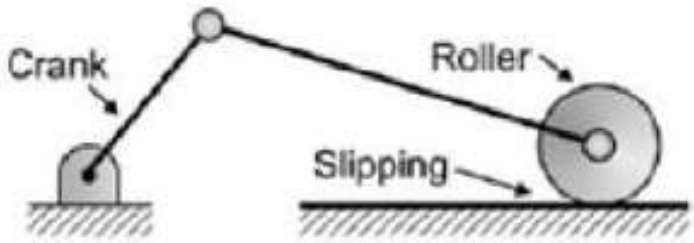
$m = 3(6-1) - 2 \times 7 - 1 = 0 \quad DOF$



$L = 3\ , j_1 = 2\ , j_2 = 1$

$m = 3(L-1) - 2j_1 - j_2$

$m = 3(3-1) - 2 \times 2 - 1 = 1 \quad DOF$

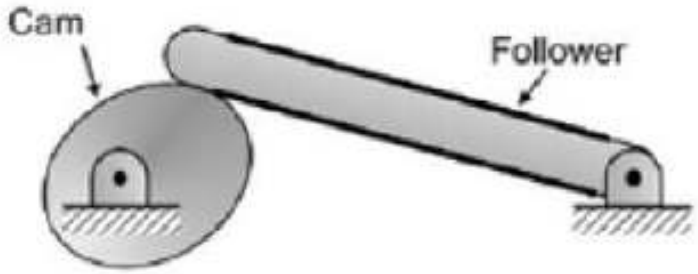


$L = 4\ , j_1 = 3\ , j_2 = 1$ since there is slipping

$m = 3(L-1) - 2j_1 - j_2$

$m = 3(4-1) - 2 \times 3 - 1 = 2 \quad DOF$

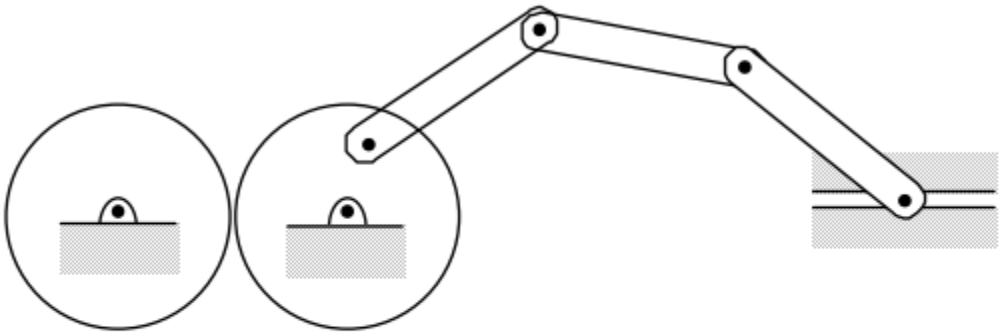
Find the mobility for the following mechanisms?



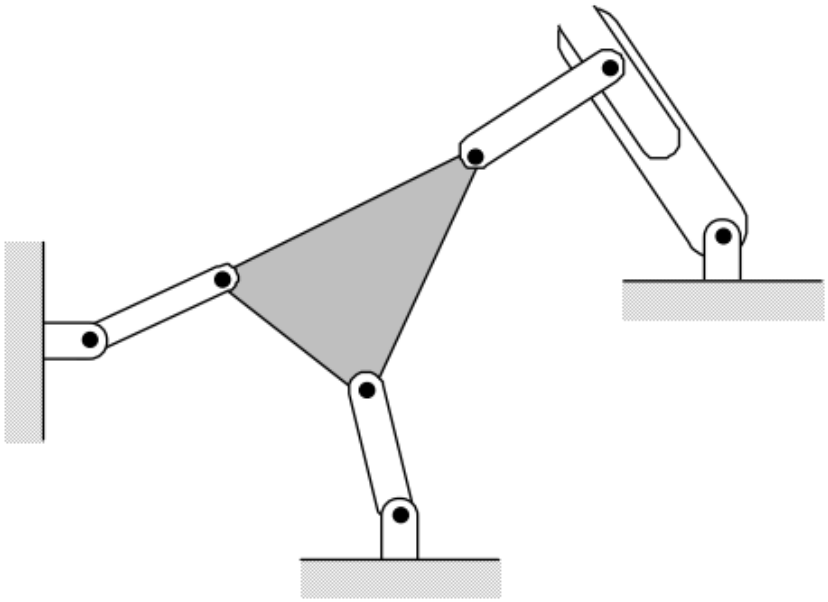
$$L = 3\ ,\ j_1 = 2\ ,\ j_2 = 1$$

$$m = 3(L-1) - 2j_1 - j_2$$

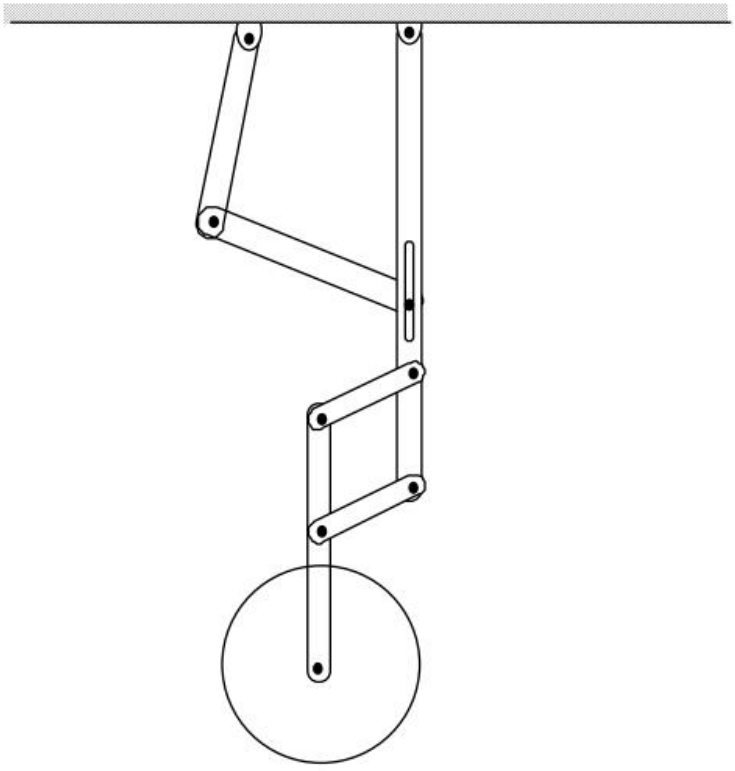
$$m = 3(3-1) - 2 \times 2 - 1 = 1 \quad DOF$$



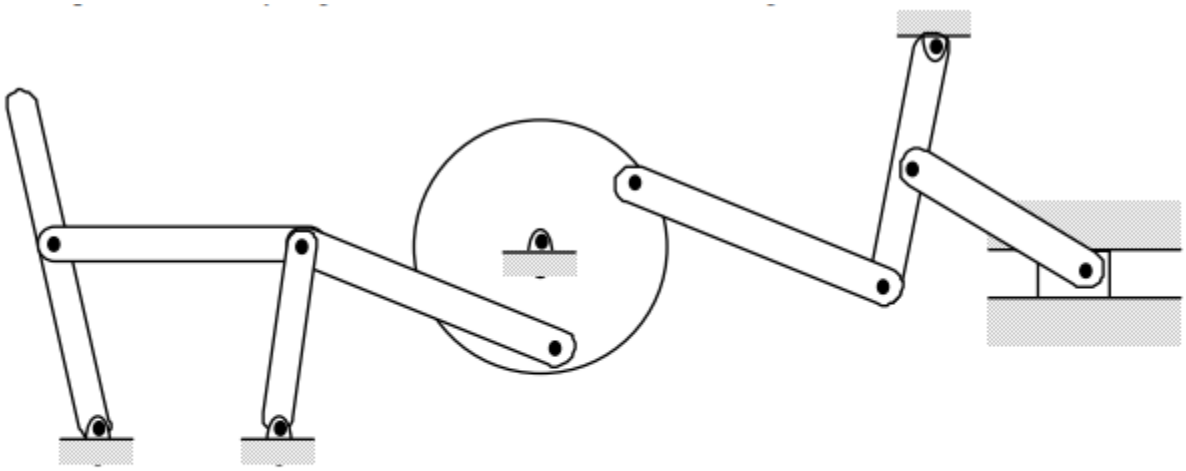
n=6
J1=5
J2=2
DOF=3



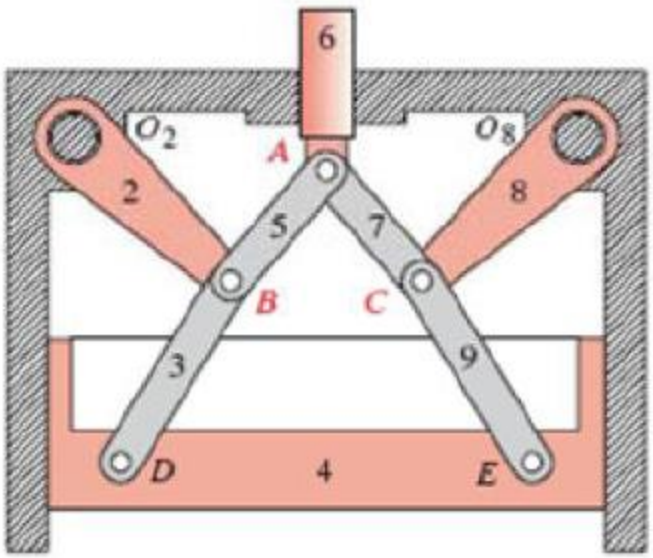
n=6
J1=6
J2=1
DOF = 2



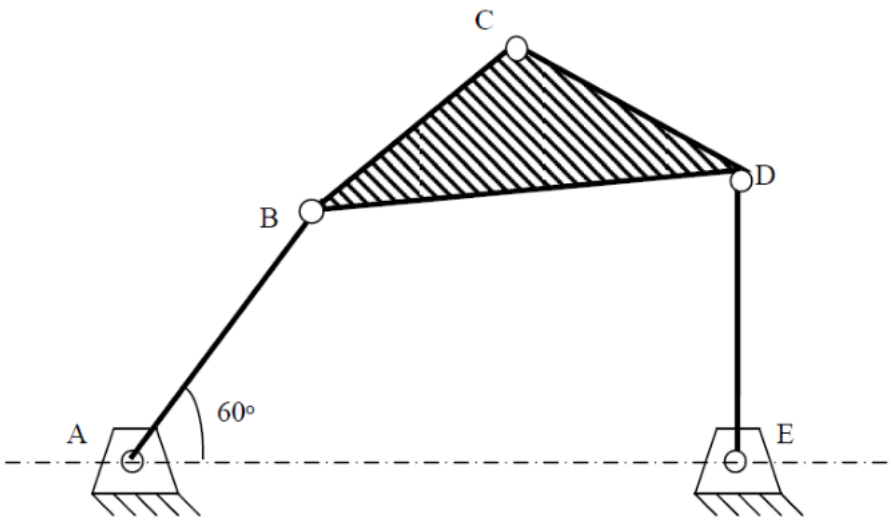
n=8
J1=8
J2=2 Note: you might consider the wheel as just 1 dof
DOF= 3



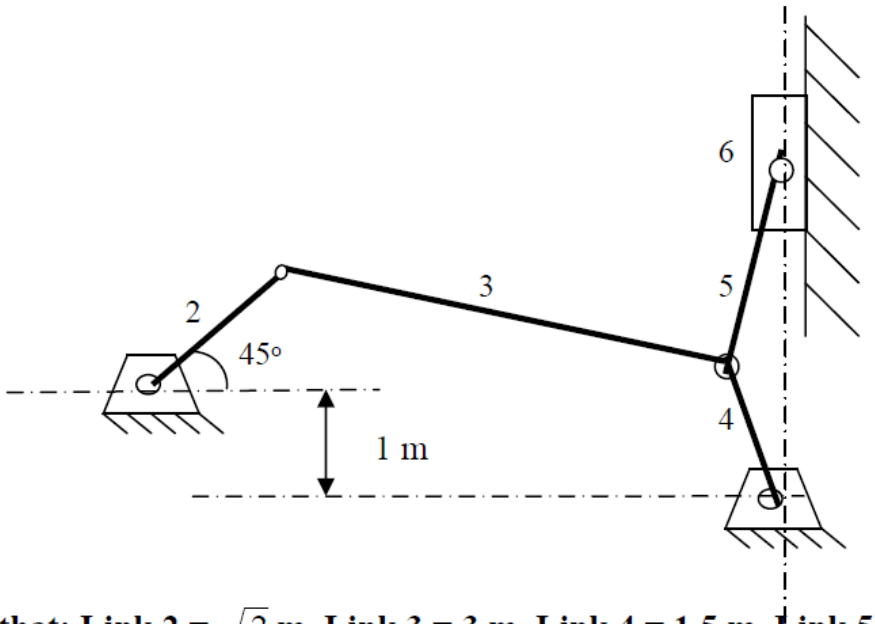
n=10
J1=13
J2=0
DOF=1



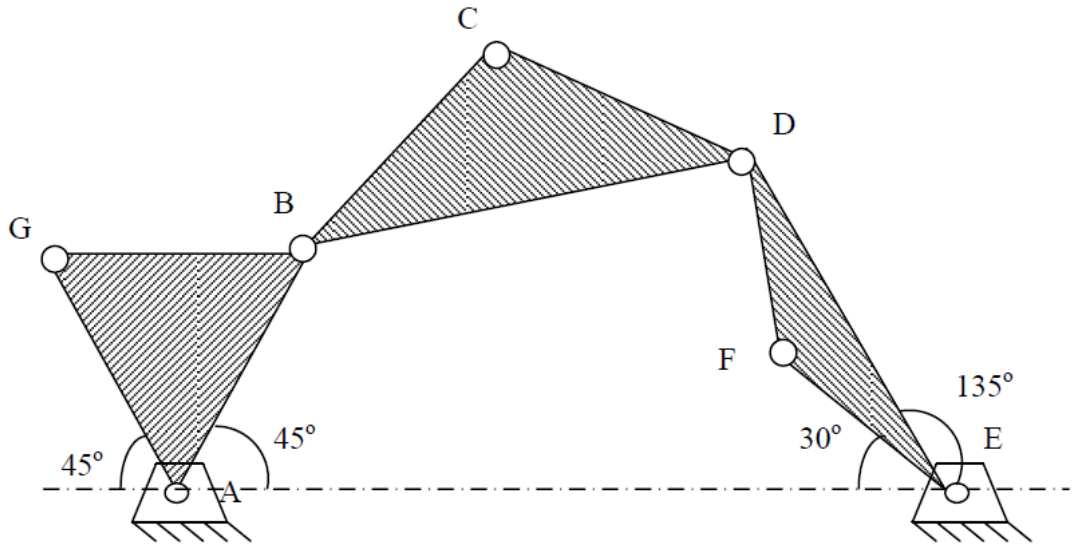
$$L = 9$$
$$J_1 = 12$$
$$J_2 = 0$$
$$m = 0$$



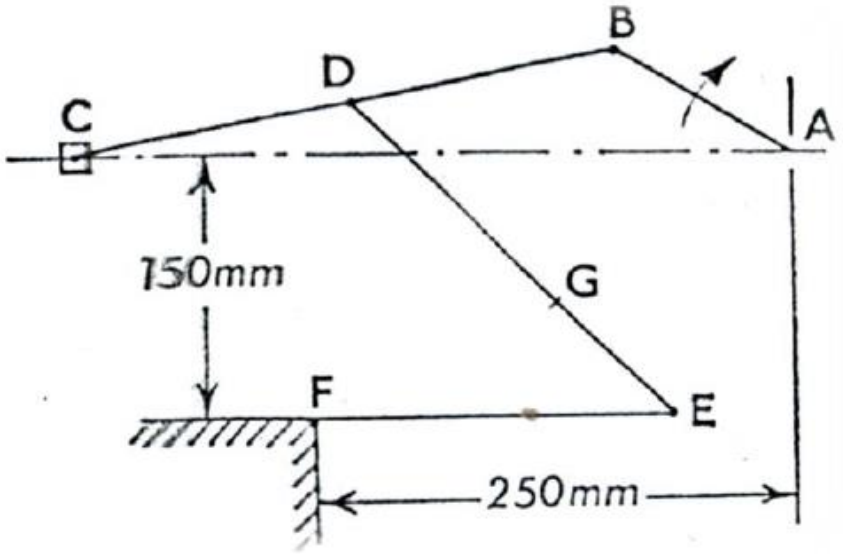
[Given that: AB = DE = 1 m, BC = CD = 0.8 m, AE = 1.5 m]

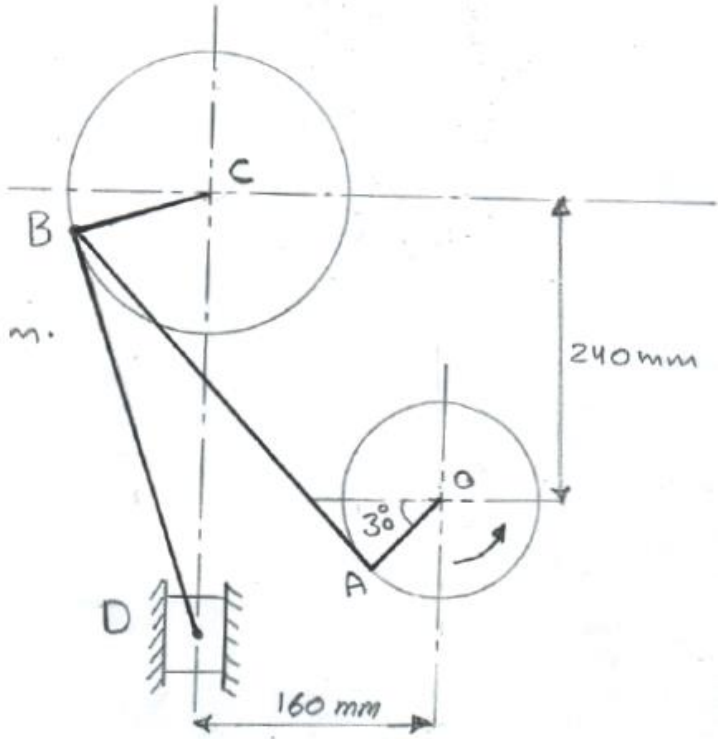


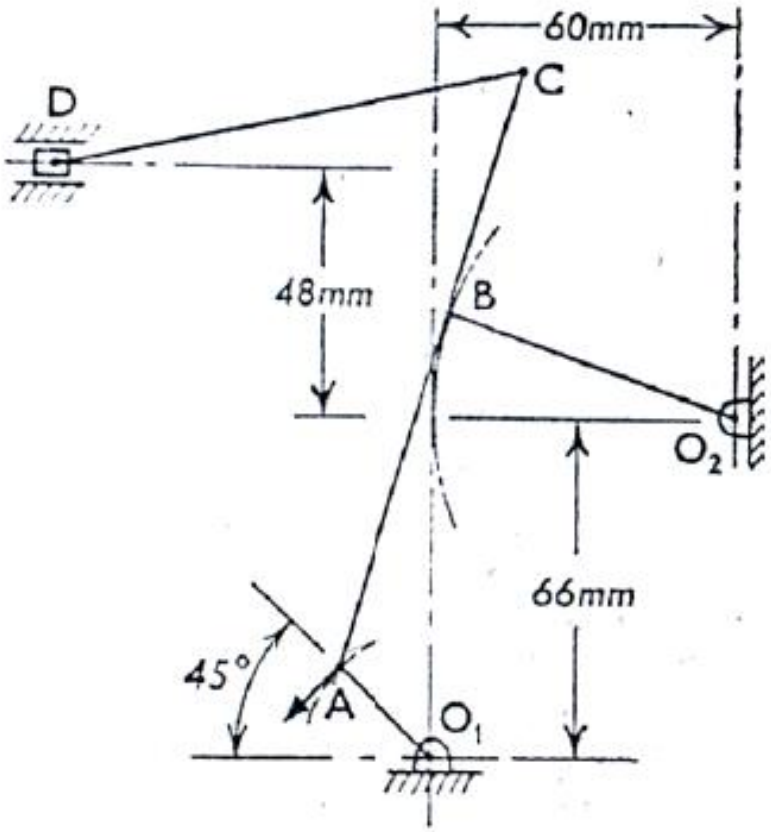
[Given that: Link 2 = $\sqrt{2}$ m, Link 3 = 3 m, Link 4 = 1.5 m, Link 5 = 2 m]

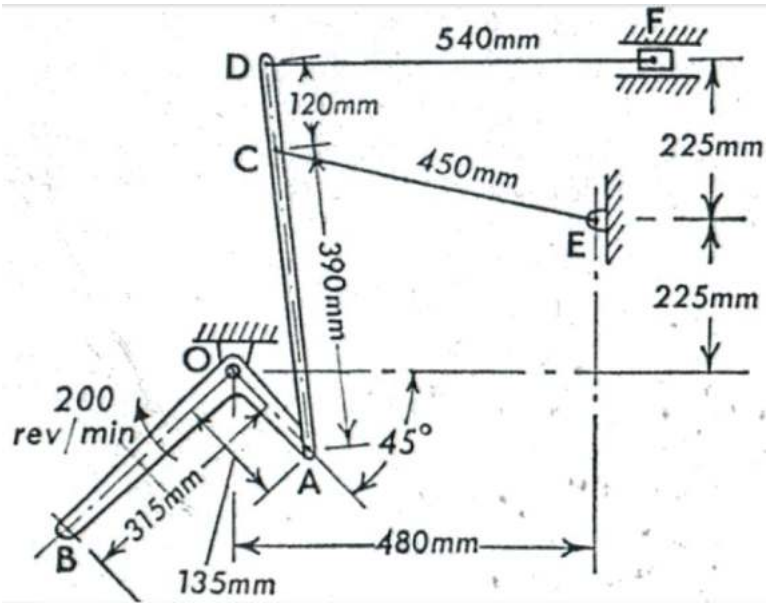


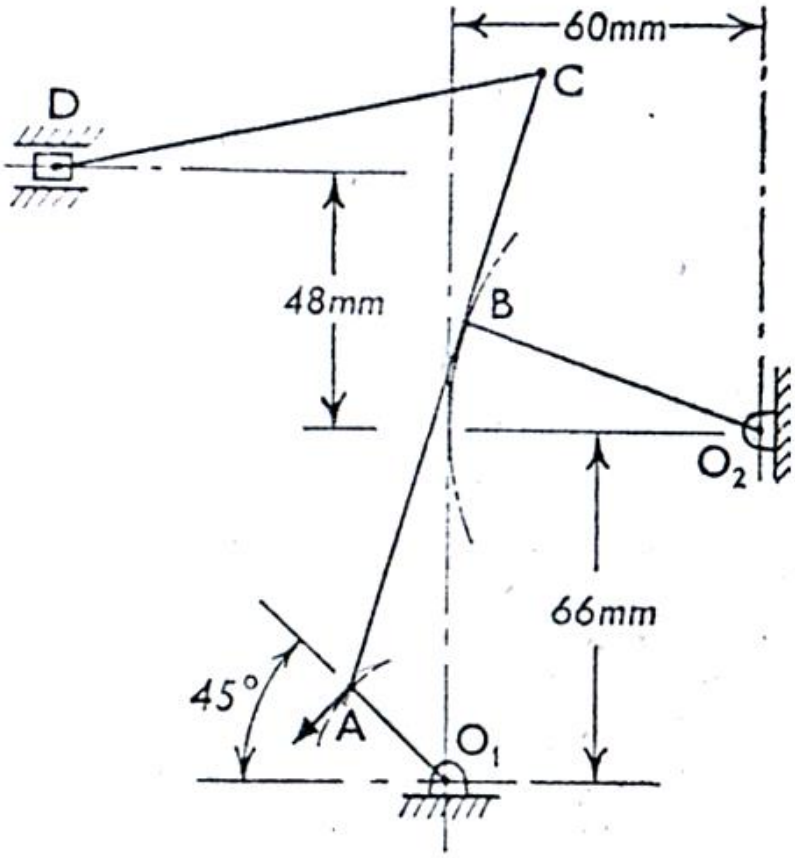
[Given that: AB = AG = $2\sqrt{2}$ m, BC = CD = 2 m, AE = $3\sqrt{2}$ m, EF = 2 m]

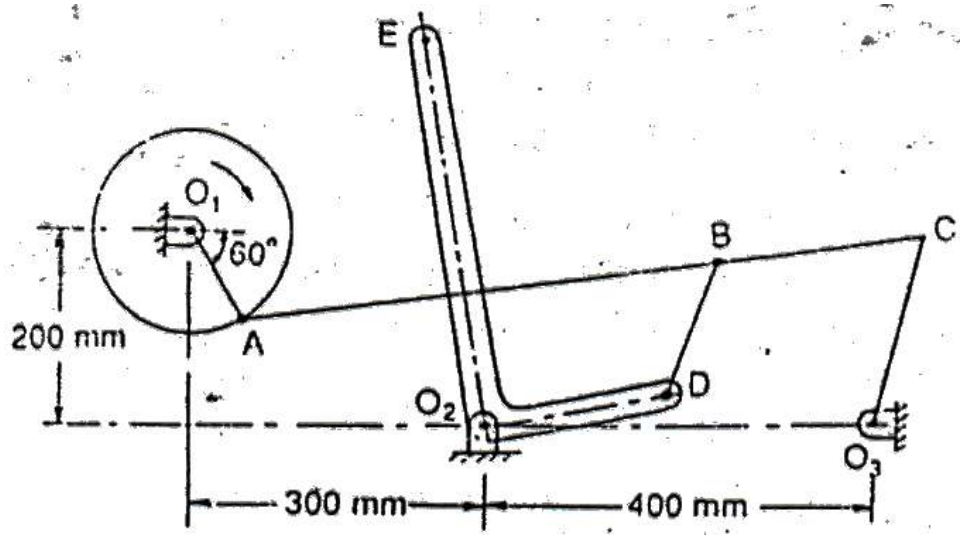


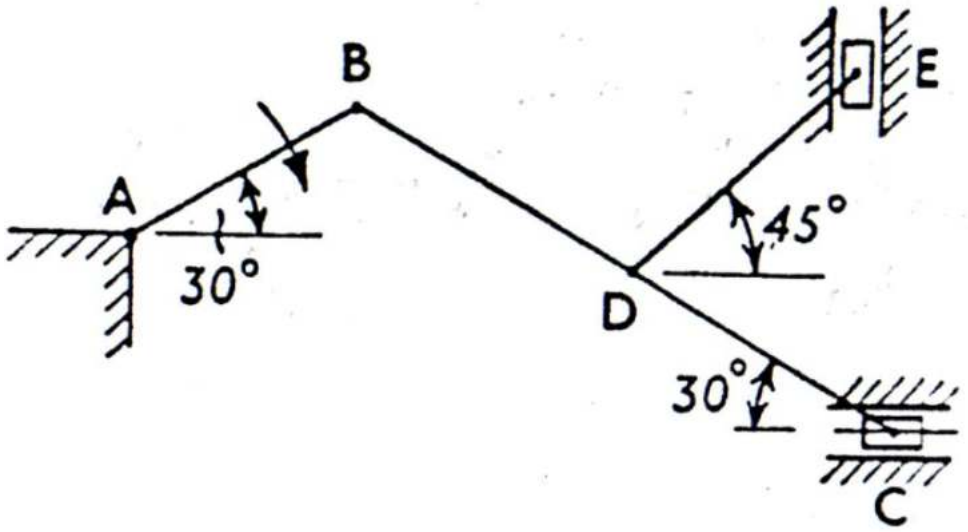

C
B
240mm
O
30°
A
D
160 mm

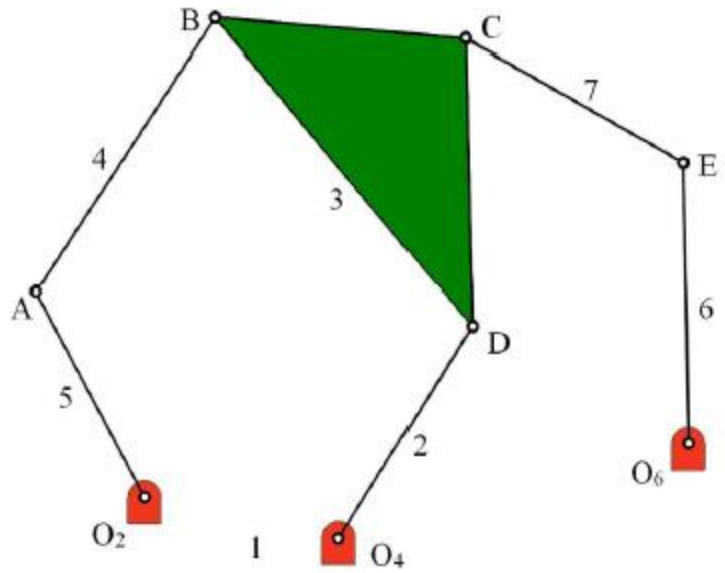

60mm
C
D
48mm
B
O2
66mm
45°
A
O1

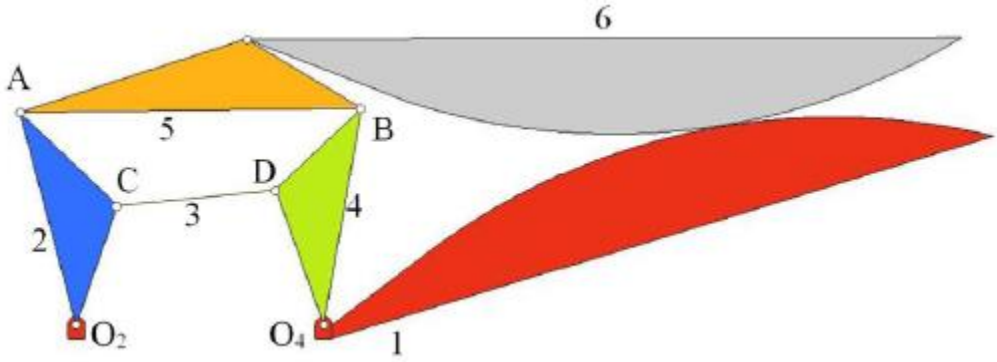

540mm
F
D
120mm
C
450mm
225mm
E
225mm
390mm
O
200
rev/min
45°
A
315mm
B
480mm
135mm

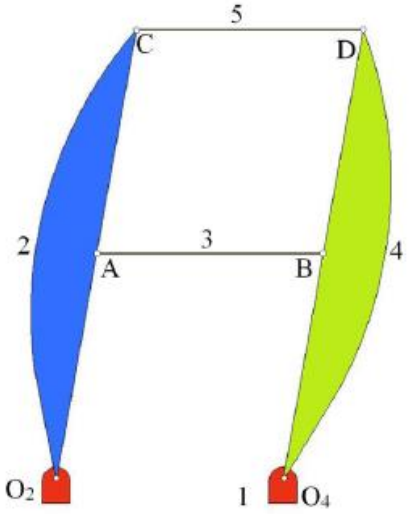

60mm
C
D
48mm
B
O2
66mm
45°
A
O1

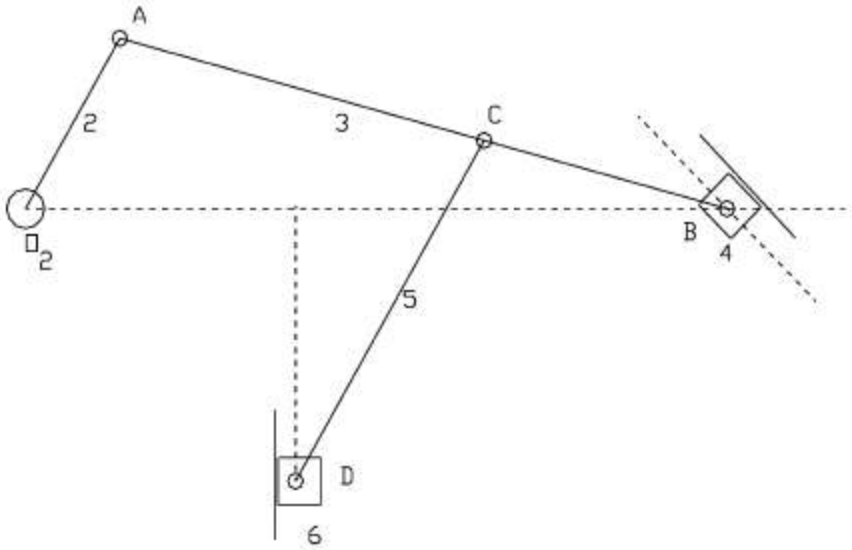

E
O1
60°
B
C
200 mm
A
O2
D
O3
300 mm
400 mm

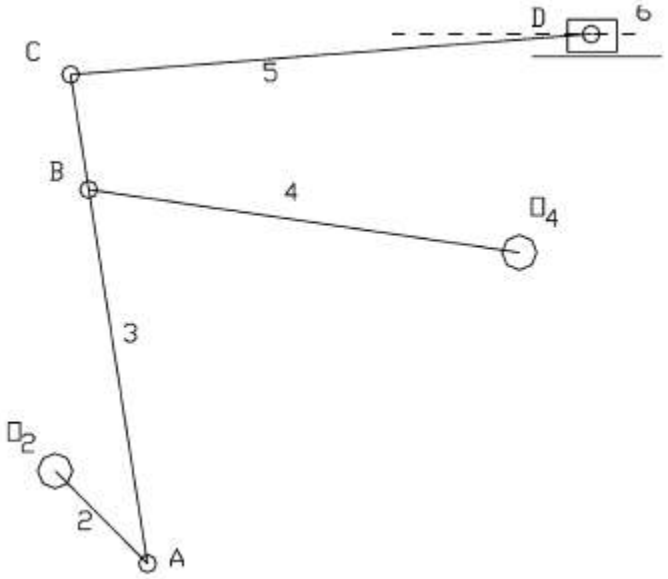

B
E
A
45°
30°
D
30°
C


B
C
7
4
E
3
A
6
D
5
2
O6
O2
1
O4


6
A
5
B
C
D
4
3
2
O2
O4
1


5
C
D
2
3
4
A
B
O2
1
O4


A
2
3
C
B
4
5
D
6


D
6
C
5
B
4
3
2
A