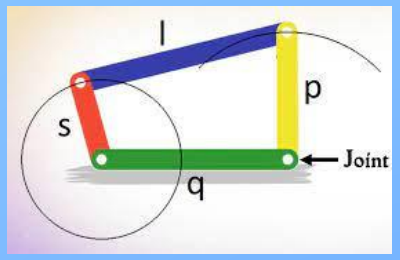
Mechanism Sessional (ME29002)

Enhancing Windshield Wiper coverage



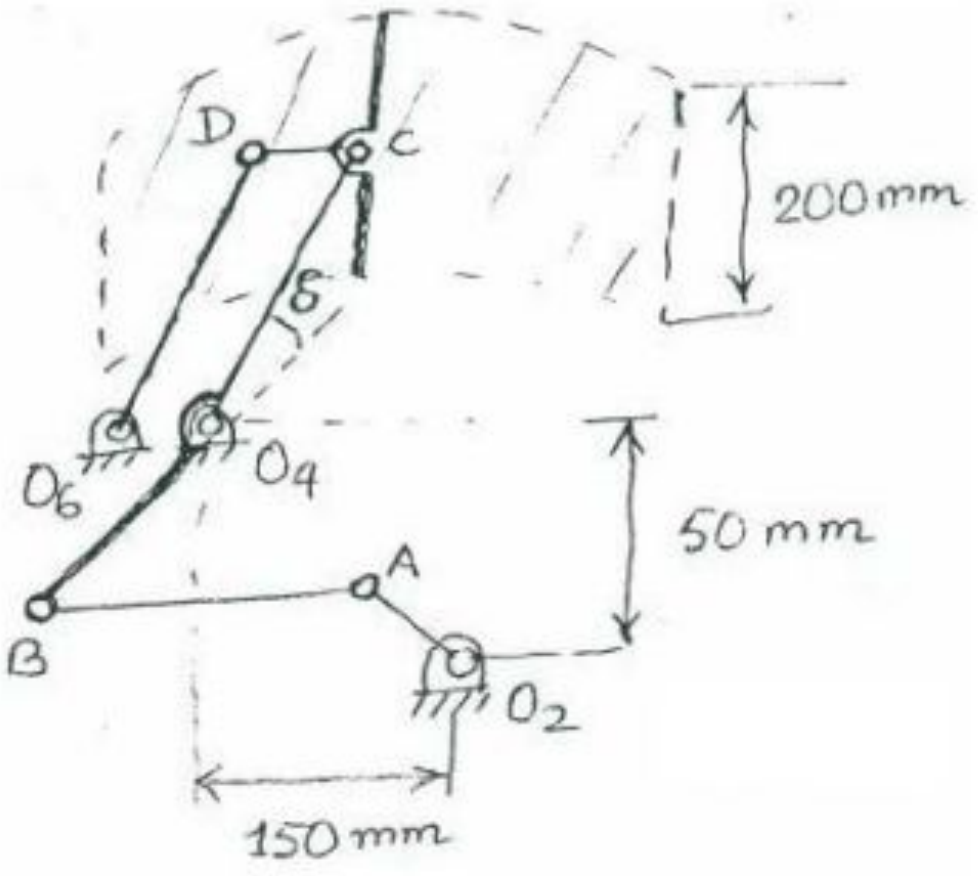
Group members:

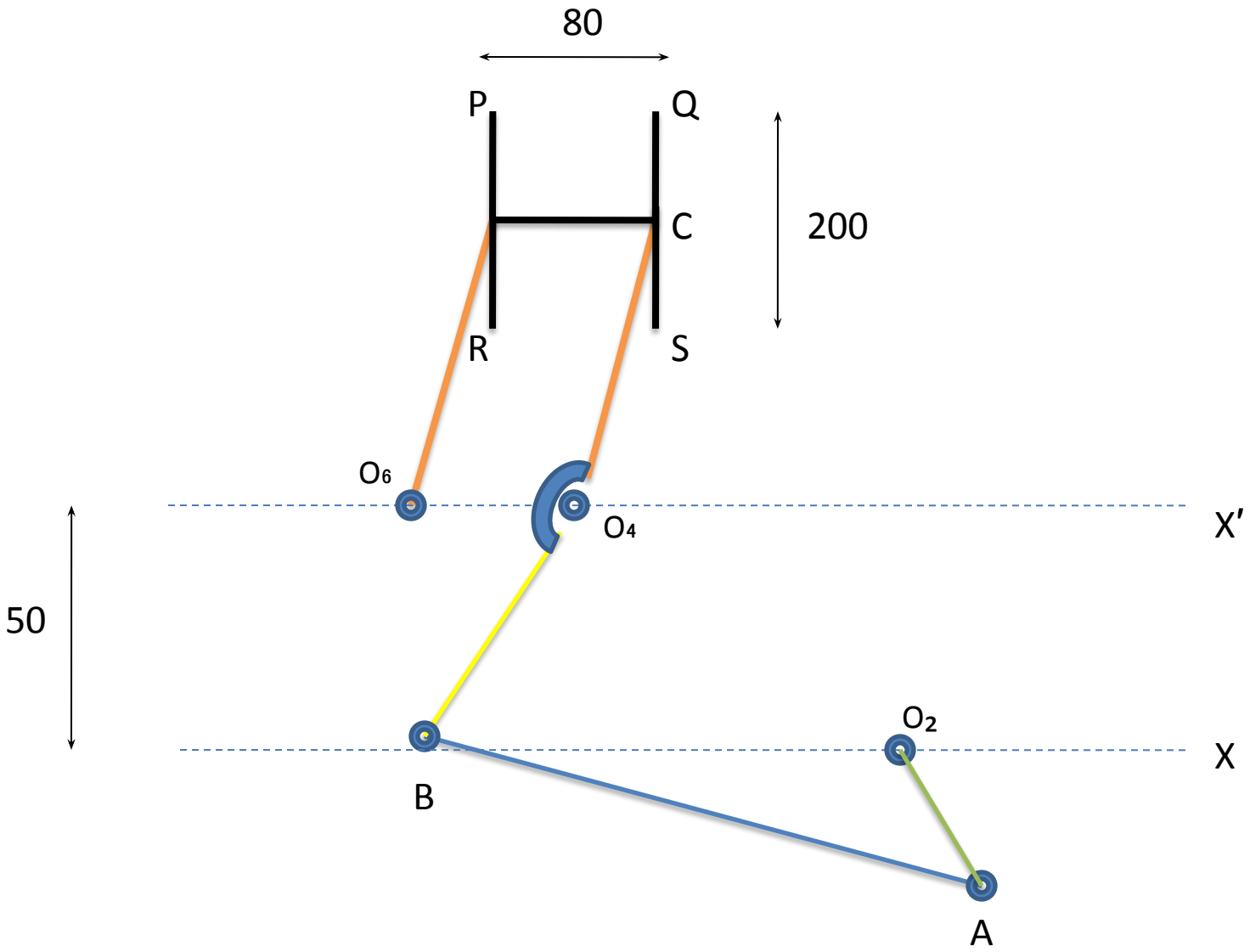
- Kadagala Raja - 20ME10050
- Tondapu Satya Varun - 20ME10088
- Lambu Kushi Reddy - 20ME30032

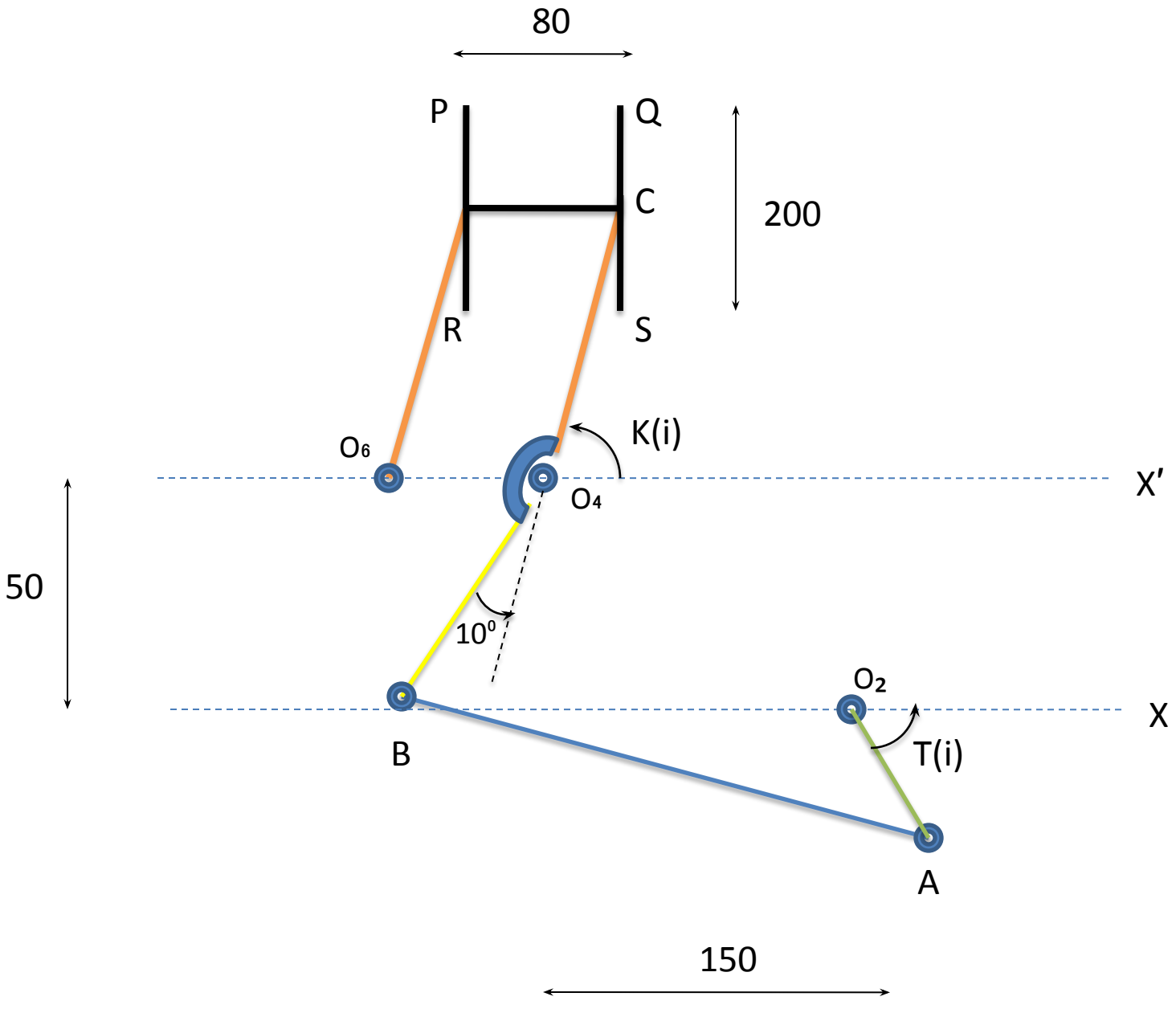
Problem Statement

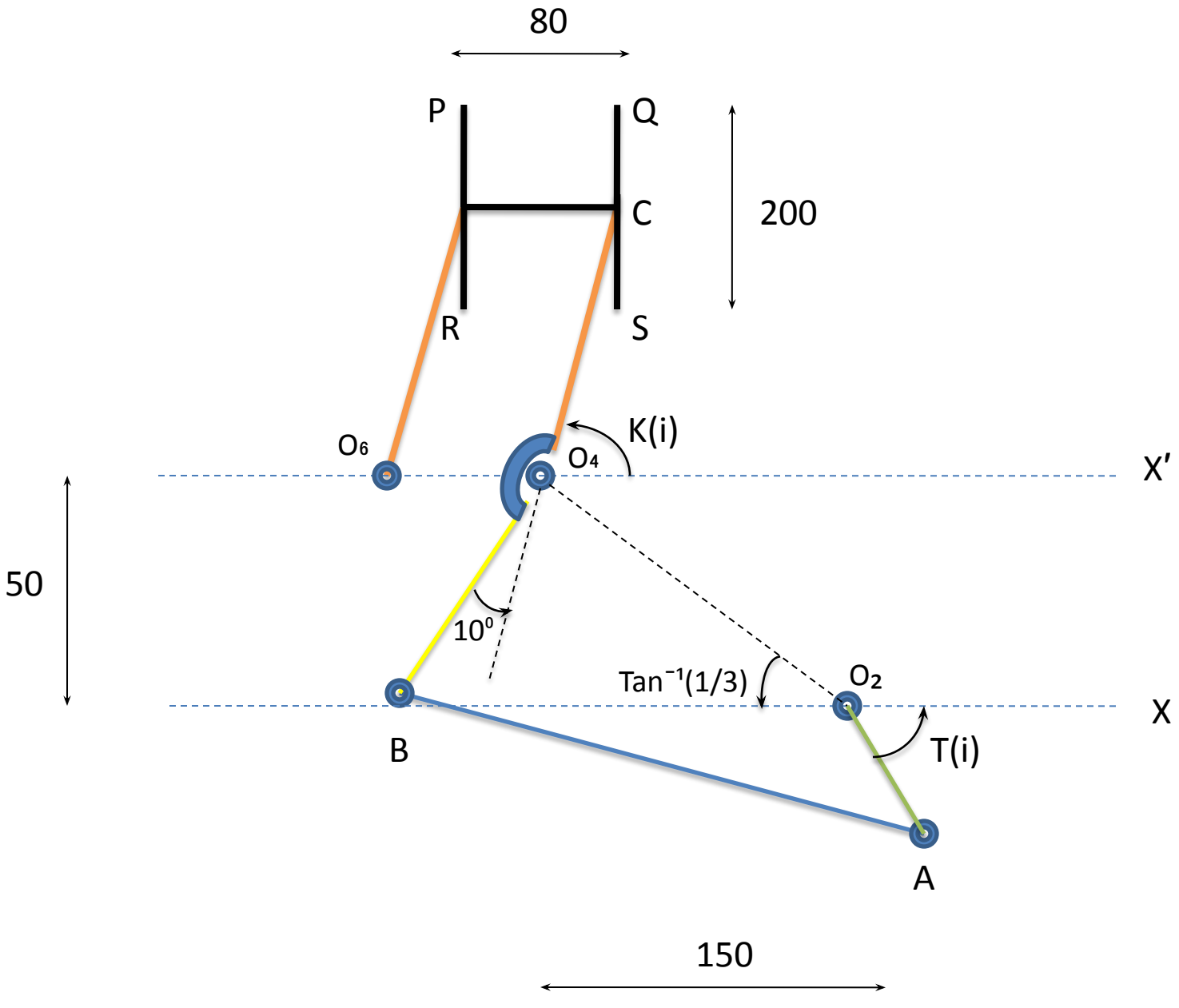
1. Synthesize and make a simulator for the wind screen wiper mechanism shown with no quick-return effect. In the simulation, mark the area wiped. Add any new idea you might have (e.g., adjustment provision to change/increase the wiped region, determination of wiping speed and acceleration (or their variation) for a given motor speed (constant), torque requirement on motor (neglecting dynamics) etc.).

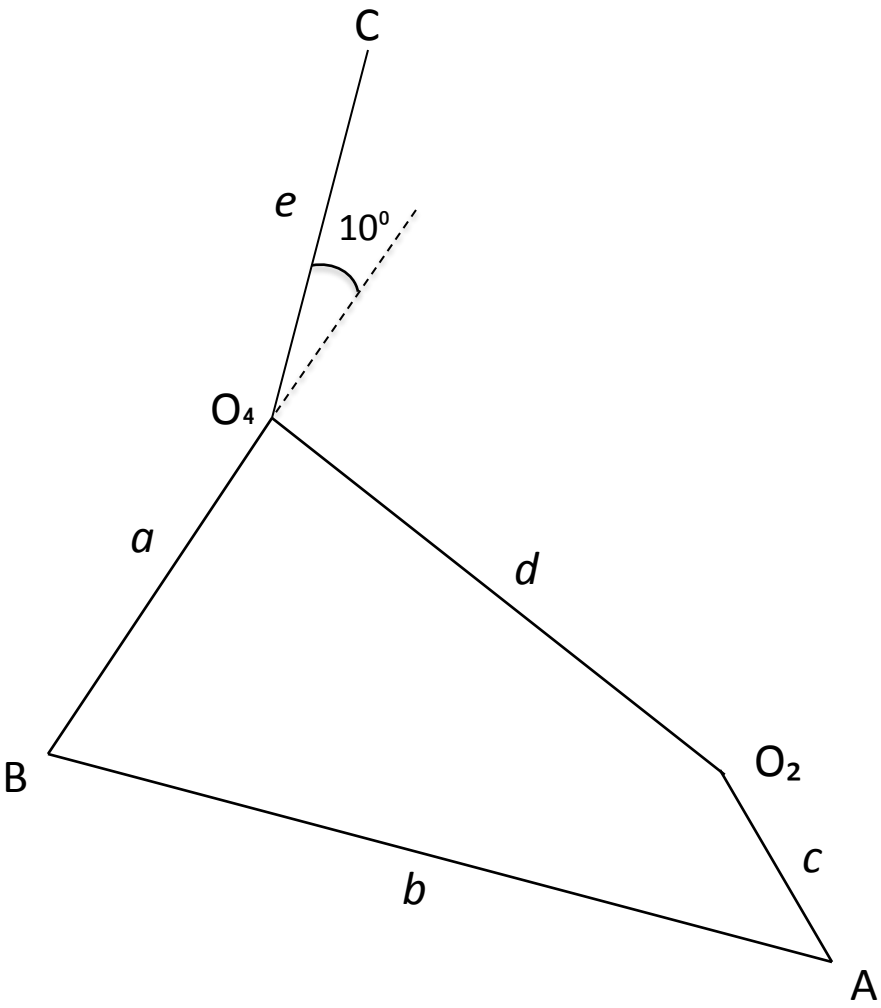
6. For the wiper mechanism shown, determine graphically and hatch the area wiped. Take O_2A=30 mm, AB=200 mm, O_4B=80 mm, δ=10 deg, DO_6=300 mm, and CO_4=300 mm.

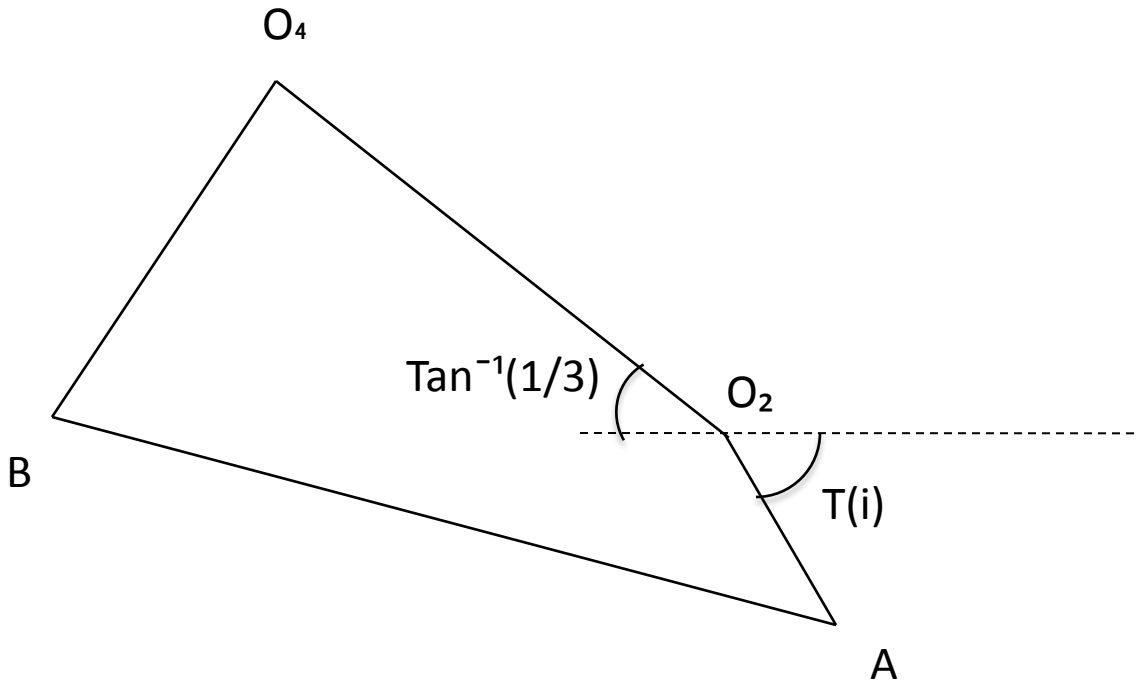



80
P
Q
C
200
R
S
O6
O4
X′
50
O2
X
B
A
150


80
P
Q
C
200
R
S
O6
K(i)
O4
X′
50
10⁰
O2
X
T(i)
B
A
150

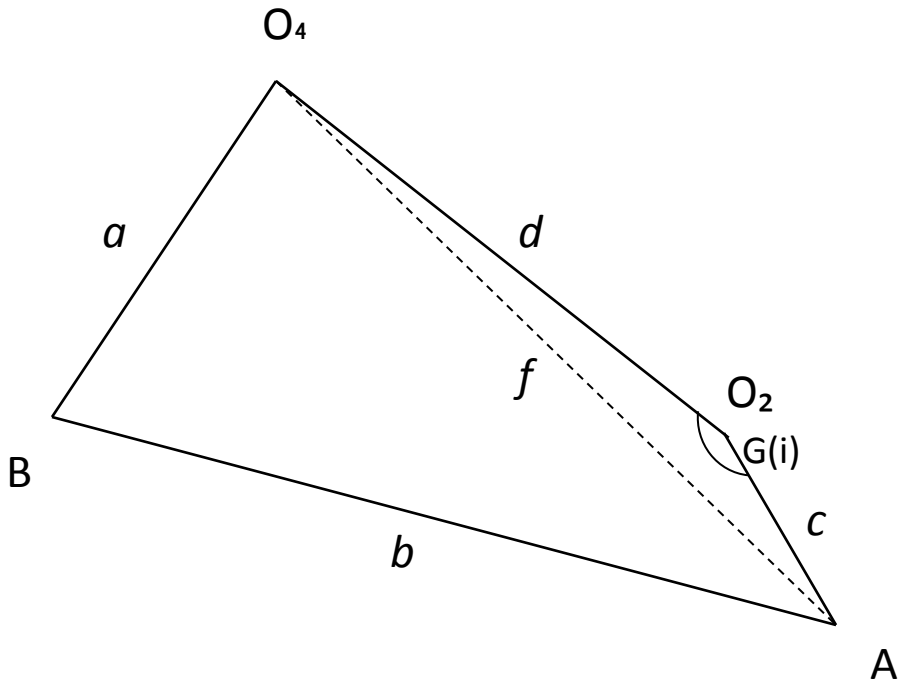

80
P
Q
C
200
R
S
O6
O4
K(i)
X′
50
10⁰
Tan⁻¹(1/3)
O2
X
B
T(i)
A
150


C
e
10⁰
O₄
a
d
B
O₂
c
b
A



From the above figure, in triangle O_4O_2A:

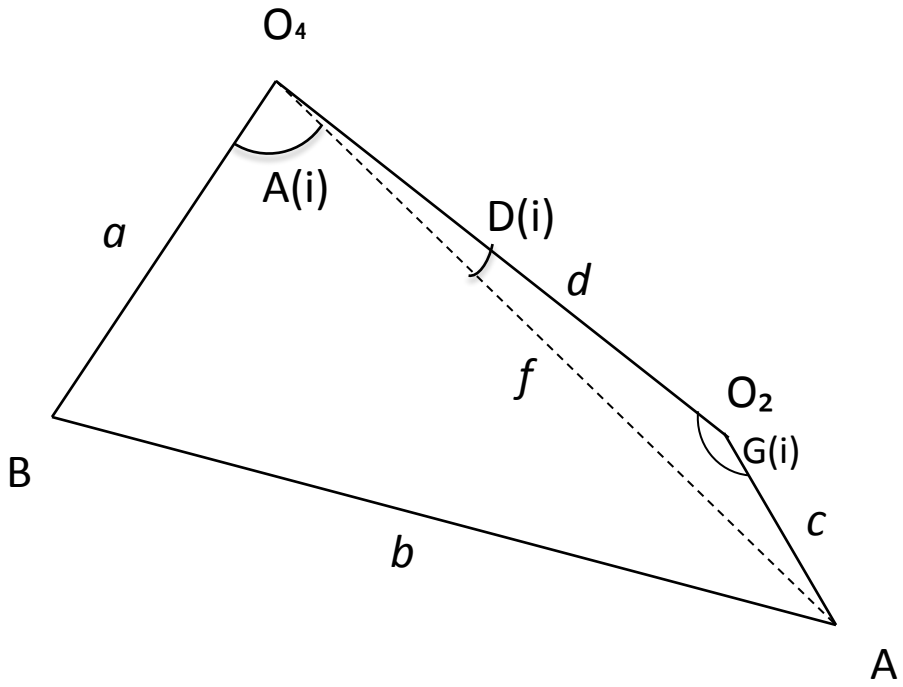
$$\angle O_4O_2A = G(i) = \pi - T(i) + \tan^{-1}\frac{1}{3}$$



Using cosine rule in triangle O_4O_2A, we obtain:

$$f^2 = c^2 + d^2 - 2c.d.cos(G(i))$$

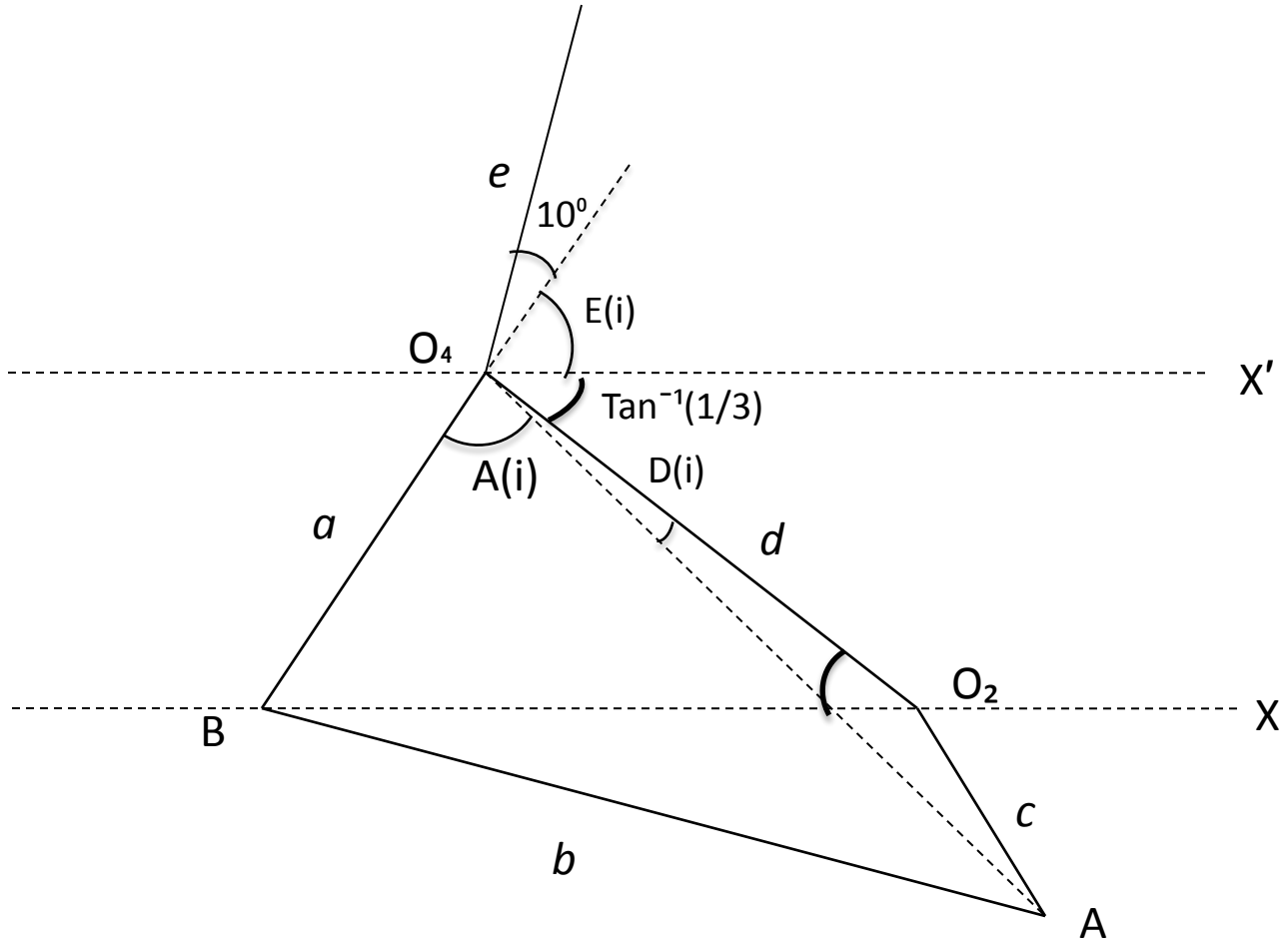
$$f = \sqrt{c^2 + d^2 - 2c.d.cos(G(i))}$$



Similarly, we can obtain the angles $\angle AO_4B$ and $\angle AO_4O_2$ using cosine rule as:

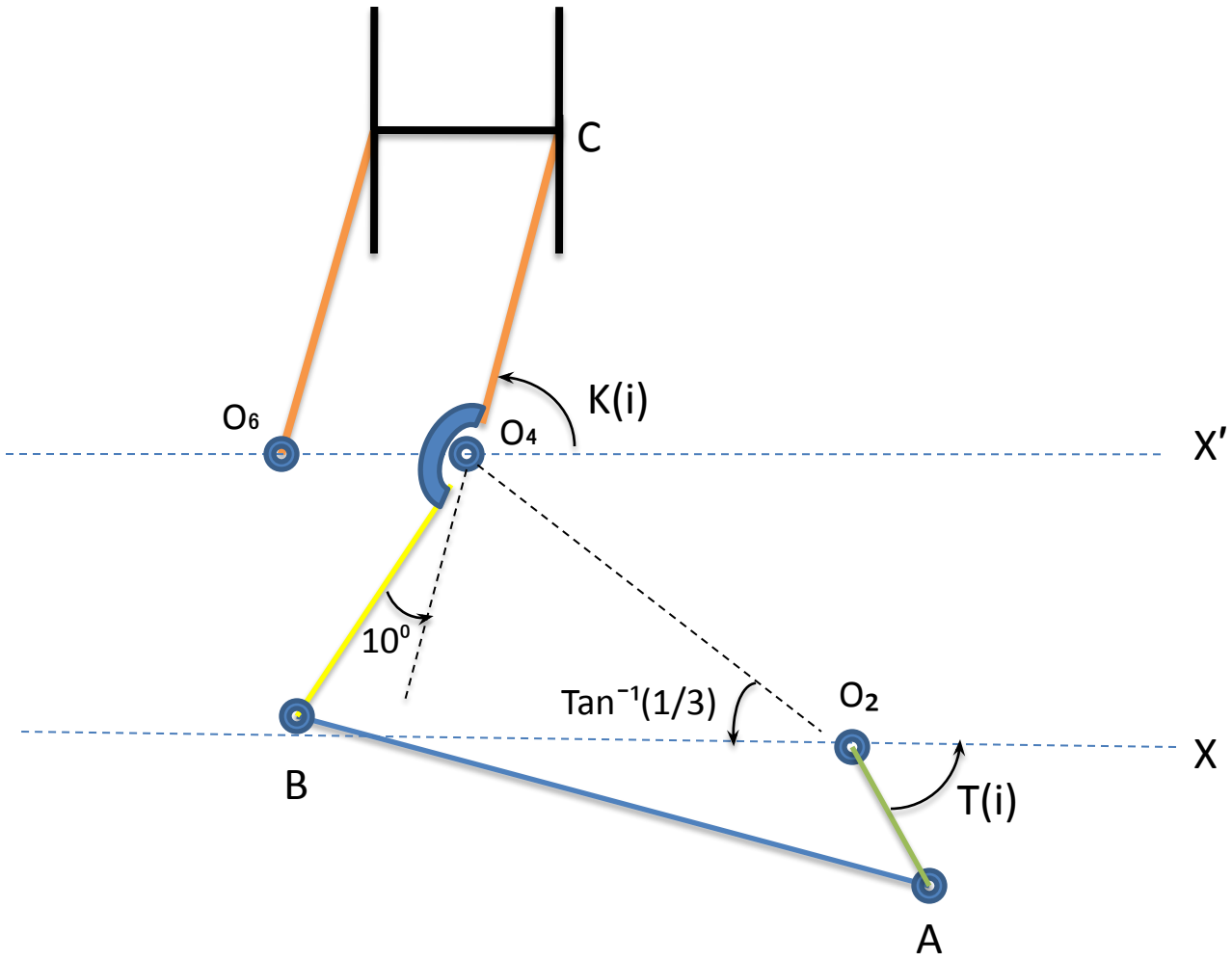
$$\angle AO_4B = A(i) = \cos^{-1}\left(\frac{a^2+f^2-b^2}{2.a.f}\right)$$

$$\angle AO_4O_2 = D(i) = \cos^{-1}\left(\frac{a^2+f^2-b^2}{2.a.f}\right)$$



$A(i) + D(i) + \mathrm{Tan}^{-1}(1/3) + E(i) = \Pi$

$E(i) = \Pi - (A(i) + D(i) + \mathrm{Tan}^{-1}(1/3))$



$$K(i) = E(i) + 10^0$$

Link of video demonstration

https://youtu.be/ISHyyaZS5JI