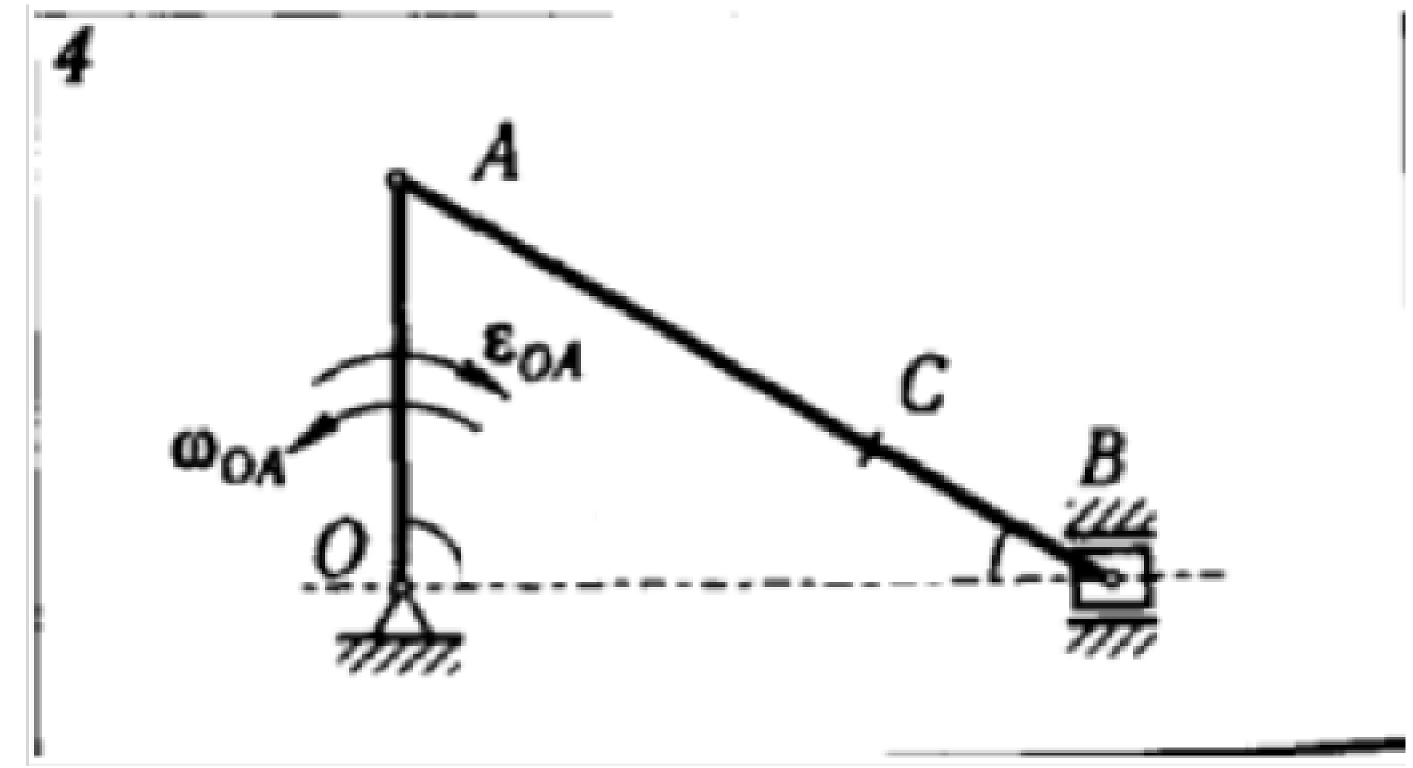
You should find:

1. simulate this mechanism (obtain all positions.) ($x_i(t)$, $y_i(t)$, where i is A, B, C point)

If $\omega_{OA} = const = 1$;
t — 1 cycle;
$OA = 35$, $AB = 70$, $AC = 45$.



Lab 2, task 4

The task is to simulate the mechanism. It means, that we need to find all positions, respect to one variable (t). In our case it is 1 DoF system -> 1 active actuator.

We know $\omega_{OA} = const$ -> we can find $\varphi(t)$ -> all positions $X(\varphi) \to X(t)$, $\begin{bmatrix} x \\ y \end{bmatrix}$

$$① \quad \varphi(t) = \int \omega(t) = \theta_0 + \omega_{OA} t \ ; \ \omega_{OA}(t) = \omega_{OA}$$

There are 3 ways to find kinematics.

ⓐ Geometrical way

Point A can be found as a cirle in parametric form -> $X_A = \begin{bmatrix} OA\cos\varphi \\ OA\sin\varphi \end{bmatrix}$

Points B and C is not so trivial. But point B can be represented as an intersection between line OB and circle AB

$$\begin{cases} (x_b - x_a)^2 + (y_b - y_a)^2 = AB^2 \\ y_b = 0 \end{cases} \to \text{2 vars, 2 eqn.} \Rightarrow \begin{bmatrix} x_b \\ y_b \end{bmatrix}$$

$$x_b^2 - 2x_a x_b + x_a^2 + y_a^2 - AB^2 = 0$$

Positive root!

$$x_b^2 - 2(OA\cos\varphi)x_b + OA^2(\cos^2\varphi + \sin^2\varphi) - AB^2 = 0 \Rightarrow x_b$$

1

Point C can be found $\bar{X}_c = \bar{X}_b + \dfrac{BC\,\overline{BA}}{|\overline{BA}|}$

TIP: for finding vel. and acc. -> take a derivatives or solve analyticaly

(b) Cosine - Sine rule

Let's consider the triangle OAB.
We know 2 length and 1 angle -> we can use cosine rule

$$AB^2 = OA^2 + OB^2 - 2\, OA \cdot OB \cdot \cos\varphi$$

$$OB^2 - 2\, OA \cdot OB \cos\varphi + OA^2 - AB^2 = 0$$

...

(c) Vector form

$$\overline{OB} = \overline{OA} + \overline{AB}$$

on basis

$$x: \quad OB = OA\cos\varphi + AB\cos k \qquad \cos k = \sqrt{1-\sin^2 k}$$

$$y: \quad 0 = OA\sin\varphi + AB\sin k$$

2 vars, 2 eqn