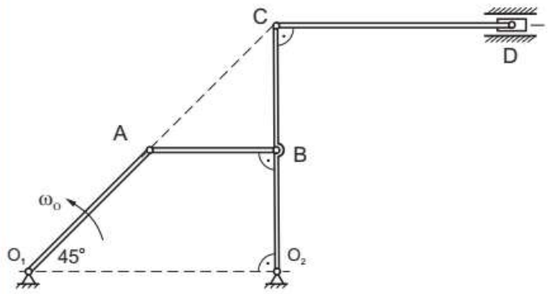
Zadatak 1.37



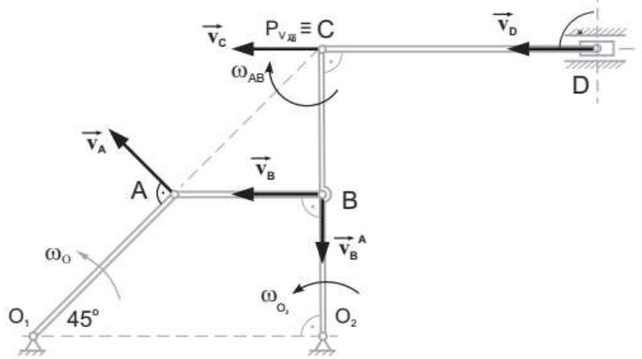
Slika 1.60: uz zad. 1.37.

Za mehanizam prikazan na slici 1.60 izračunati brzinu i ubrzanje klizača D. Poznate su vrednosti:

$$\overline{O_1A} = R\sqrt{2},$$
$$\overline{AB} = \overline{O_2B} = \overline{BC} = R,$$
$$\overline{CD} = 2R.$$

■ **Rešenje 1.37** Brzine:

$$v_A = \overline{O_1A}\cdot\omega_0 = R\omega_0\sqrt{2},$$
$$\mathbf{v}_B = \mathbf{v}_A + \mathbf{v}_B^A, \quad v_B^A = \overline{AB}\omega_{AB},$$
$$v_B = v_A\cos 45^\circ = v_A\frac{\sqrt{2}}{2} \quad \Rightarrow$$
$$v_B = R\omega_0.$$



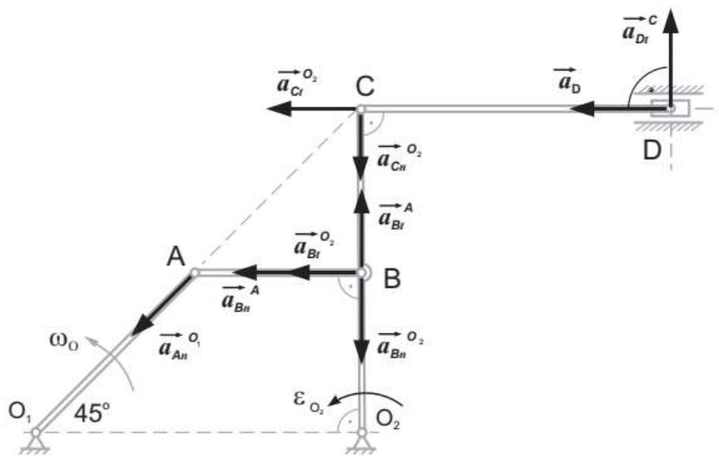
Slika 1.61: uz zad.1.37 - brzine.

Projekcija na O_2C-osu:

$$0 = v_A\sin 45^\circ - v_B^A \quad \Rightarrow \quad v_B^A = R\omega_0, \qquad \omega_{AB} = \frac{v_B^A}{\overline{AB}} \quad \Rightarrow$$
$$\omega_{AB} = \omega_0, v_B = \overline{O_2B}\cdot\omega_{O_2} \quad \Rightarrow$$
$$\omega_{O_2} = \omega_0, \qquad v_C = \overline{O_2C}\cdot\omega_{O_2} \quad \Rightarrow$$
$$v_C = 2R\omega_0, \omega_{CD} = 0, \qquad \boxed{v_D = v_C = 2R\omega_0}.$$

Brzinu možemo da odredimo i koristeći trenutni pol brzina, koji je prikazan na Slici 1.61.

Ubrzanja:



Slika 1.62: uz zad.1.37 - ubrzanja.

$$a_A = a_{An}^{O_1} = R\omega_0\sqrt{2},$$
$$\mathbf{a}_B = \mathbf{a}_{O_2}^{\,0} + \mathbf{a}_{Bt}^{O_2} + \mathbf{a}_{Bn}^{O_2}, \quad a_{Bn}^{O_2} = \overline{BO_2}\cdot\omega_{O_2}^2 = R\omega_0^2,$$
$$\mathbf{a}_A + \mathbf{a}_{Bt}^A + \mathbf{a}_{Bn}^A = \mathbf{a}_{Bt}^{O_2} + \mathbf{a}_{Bn}^{O_2} \quad \Rightarrow$$

projekcije na pravac AB i upravan pravac:

$$\Rightarrow \quad \begin{cases} -a_A\cos 45^\circ - a_{Bn}^A = -a_{Bt}^{O_2}, \\ a_A\sin 45^\circ - a_{Bt}^A = a_{Bn}^{O_2}, \end{cases} \quad \Rightarrow \quad \begin{cases} a_{Bt}^{O_2} = 2R\omega_0, & a_{Bt}^A = 0, \\ \varepsilon_{O_2} = 2\omega_0^2, & \varepsilon_{AB} = 0. \end{cases}$$

$$\mathbf{a}_C = \mathbf{a}_{O_2}^{\,0} + \mathbf{a}_{Ct}^{O_2} + \mathbf{a}_{Cn}^{O_2},$$
$$a_{Ct}^{O_2} = \overline{CO_2}\cdot\varepsilon_{O_2} = 4R\omega_0^2, \quad a_{Cn}^{O_2} = \overline{CO_2}\cdot\omega_{O_2}^2 = 2R\omega_0^2,$$
$$a_C = \sqrt{(a_{Ct}^{O_2})^2 + (a_{Cn}^{O_2})^2} = 2R\omega_0^2\sqrt{5}.$$

$$\mathbf{a}_D = \mathbf{a}_C + \mathbf{a}_{Dt}^C + \mathbf{a}_{Dn}^C,$$
$$a_{Dn}^C = \overline{CD}\cdot\omega_{CD}^2 = 0.$$

Projekcija na pravac CD

$$-a_D = -a_{Ct}^{O_2} \quad \Rightarrow \quad \boxed{a_D = 4R\omega_0^2}.$$