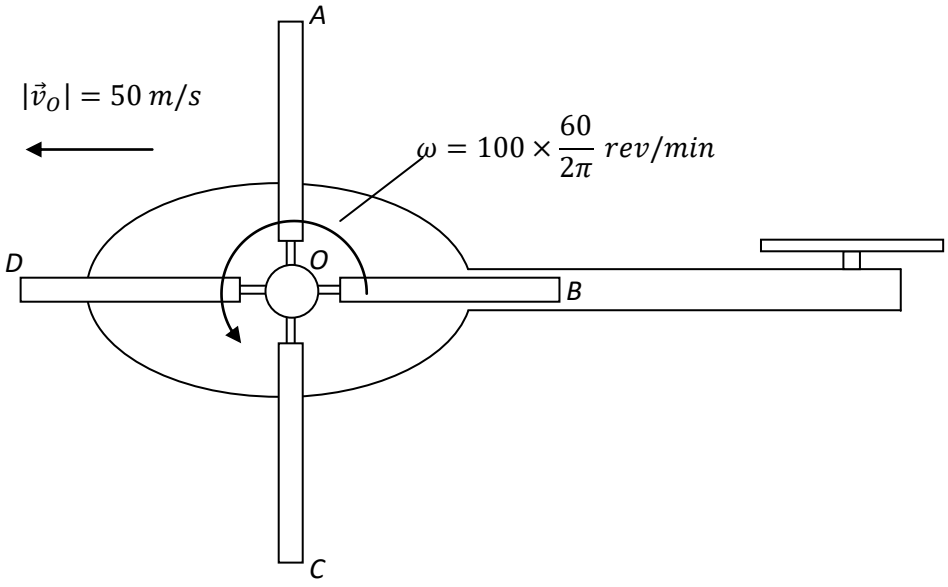
Name-Surname:
Student ID:

ITU Faculty of Aeronautics and Astronautics **23.11.2015**
Department of Aeronautical Engineering
2015-2016 Fall Term
11230 DNK201E Dynamics EXTRA QUIZ – 1

Problem: The helicopter is moving forward at a constant speed of 50 m/s whilst the propeller blades are rotating at a constant rate of $100 \times 60/2\pi \ rev/min$. Find the instantaneous center of rotation of the blades *A*, *B*, *C*, and, *D*. Point *O* is at the center of the blades and $|OA| = 2m$.

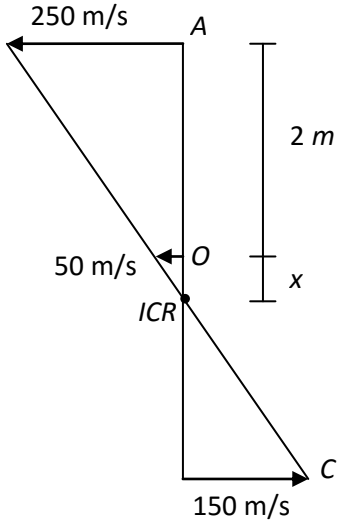


Solution:

$$\omega = 100 \times \frac{60}{2\pi}\ \frac{rev}{min} \times \frac{2\pi}{60}\frac{rad/rev}{s/min} = 100\ rad/s$$

$$\vec{v}_A = \vec{v}_O + \vec{\omega} \times \vec{r} = -50\vec{\imath} + 100\vec{k} \times 2\vec{\jmath} = -250\vec{\imath}\ m/s$$

$$\vec{v}_C = \vec{v}_O + \vec{\omega} \times \vec{r} = -50\vec{\imath} + 100\vec{k} \times (-2\vec{\jmath}) = 150\vec{\imath}\ m/s$$



$$\frac{x}{x+2} = \frac{50}{250} \quad \rightarrow \quad x = 0.5\ m$$