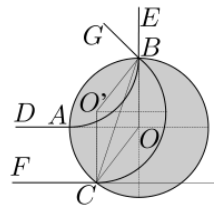
**4. Magnetic field** (6 points)

1) Since the radius of the cyclotron orbit is equal to the radius of the region $R$, the trajectory is given by the curve $DABE$ in the Figure ($AB$ is a circle fragment).




2) Circular part of the trajectory is a quarter of the full circle, so $t = \pi R/2v$.

3) Let $O'$ be the centre of the circular orbit of the electron and $B$ — the intersection point of the trajectory with the region boundary. The polygon $COBO'$ is rhomb, because all the sides are equal to $R$. So, the line $BO$ is vertical (because $O'C$ is vertical and $BO$ is parallel to it). Hence, the inclination angle of the electron is

$$\alpha = \angle CO'B = \angle AOB + \angle AOC = \frac{\pi}{2} - \arcsin\frac{a}{R}.$$