In (3.17), we used the equality $\operatorname{Re} \overline{z} \nabla_y z = \frac{1}{2} \nabla_y \left(|z|^2 \right)$.

$$
\begin{aligned}
I_5 &= 4s \operatorname{Re} \int_\Omega \Delta_x z \nabla_y \varphi \cdot \nabla_y \overline{z} dx dy dt - 4s \operatorname{Re} \int_\Omega \Delta_x z \nabla_x \varphi \cdot \nabla_x \overline{z} dx dy dt \\
&= -4s \operatorname{Re} \int_\Omega \sum_{j=1}^m \sum_{i=1}^n \varphi_{y_i x_j} \overline{z}_{y_i} z_{x_j} dx dy dt - 2s \int_\Omega \sum_{i=1}^m \Delta_y \varphi \left| \nabla_x z \right|^2 dx dy dt \\
&\quad -2s \int_{\Gamma_y} \left(\partial_\nu \varphi \right) \left| \nabla_x z \right|^2 dS_y dx dt + 4s \operatorname{Re} \int_{\Gamma_x} \left(\partial_\nu z \right) \nabla_y \varphi \cdot \nabla_y \overline{z} dS_x dy dt \\
&\quad +4s \operatorname{Re} \int_\Omega \sum_{i,j=1}^n \varphi_{x_i y_j} \overline{z}_{x_i} z_{x_j} dx dy dt - 2s \int_\Omega \Delta_x \varphi \left| \nabla_x z \right|^2 dx dy dt \\
&\quad -2s \int_{\Gamma_x} \left(\partial_\nu \varphi \right) \left| \nabla_x z \right|^2 dS_x dy dt \\
&\quad +4s \operatorname{Re} \int_{\Gamma_x} \left(\partial_\nu z \right) \nabla_x \varphi \cdot \nabla_x \overline{z} dS_x dy dt. \qquad (3.18)
\end{aligned}
$$

In (3.18), we used the equality $\operatorname{Re} z_{x_j} \overline{z}_{x_j y_i} = \frac{1}{2} \left(\left| z_{x_j} \right|^2 \right)_{y_i}$.

$$
\begin{aligned}
I_6 &= 2s \operatorname{Re} \int_\Omega \Delta_x z \left(\Delta_y \varphi - \Delta_x \varphi \right) \overline{z} dx dy dt \\
&= -2s \int_\Omega \left(\Delta_y \varphi - \Delta_x \varphi \right) \left| \nabla_x z \right|^2 dx dy dt \\
&\quad +s \int_\Omega \Delta_x \left(\Delta_y \varphi - \Delta_x \varphi \right) \right) |z|^2 dx dy dt \\
&\quad -s \int_{\Gamma_x} \partial_\nu \left(\Delta_y \varphi - \Delta_x \varphi \right) |z|^2 dS_x dy dt \\
&\quad +2s \operatorname{Re} \int_{\Gamma_x} \left(\partial_\nu z \right) \left(\Delta_y \varphi - \Delta_x \varphi \right) \overline{z} dS_x dy dt. \qquad (3.19)
\end{aligned}
$$