$$
\begin{aligned}
J_5 &= s\int_\Omega |z|^2\,\Delta_x\left(\Delta_y\varphi-\Delta_x\varphi\right)dxdydt,\\
J_6 &= 2s^3\int_\Omega |z|^2\,\nabla_y\varphi\cdot\nabla_y\left(|\nabla_y\varphi|^2-|\nabla_x\varphi|^2\right)dxdydt\\
&\quad -2s^3\int_\Omega |z|^2\,\nabla_x\varphi\cdot\nabla_x\left(|\nabla_y\varphi|^2-|\nabla_x\varphi|^2\right)dxdydt
\end{aligned}
$$

and

$$
\begin{aligned}
B_0 \;=\;& -2s\,\mathrm{Im}\int_{\Gamma_y} z\partial_t\overline{z}\left(\nabla_y\varphi\cdot\nu\right)dS_ydxdt\\
&+4s\,\mathrm{Re}\int_{\Gamma_y}(\partial_\nu z)\left(\nabla_x\varphi\cdot\nabla_x\overline{z}-\nabla_y\varphi\cdot\nabla_y\overline{z}\right)dS_ydxdt\\
&+2s\int_{\Gamma_y}(\partial_\nu\varphi)\left(|\nabla_y z|^2-|\nabla_x z|^2\right)dS_ydxdt\\
&-2s^3\int_{\Gamma_y}(\partial_\nu\varphi)\,|z|^2\left(|\nabla_y\varphi|^2-|\nabla_x\varphi|^2\right)dS_ydxdt\\
&-2s\int_{\Gamma_y}(\partial_\nu z)\left(\Delta_y\varphi-\Delta_x\varphi\right)\overline{z}dS_ydxdt+s\int_{\Gamma_y}\partial_\nu\left(\Delta_y\varphi-\Delta_x\varphi\right)|z|^2\,dS_ydxdt\\
&+2s\,\mathrm{Im}\int_{\Gamma_x} z\partial_t\overline{z}\left(\nabla_x\varphi\cdot\nu\right)dS_xdydt\\
&+4s\,\mathrm{Re}\int_{\Gamma_x}(\partial_\nu z)\left(\nabla_y\varphi\cdot\nabla_y\overline{z}-\nabla_x\varphi\cdot\nabla_x\overline{z}\right)dS_xdydt\\
&-2s\int_{\Gamma_x}(\partial_\nu\varphi)\left(|\nabla_y z|^2-|\nabla_x z|^2\right)dS_xdydt\\
&+2s^3\int_{\Gamma_x}(\partial_\nu\varphi)\,|z|^2\left(|\nabla_y\varphi|^2-|\nabla_x\varphi|^2\right)dS_xdydt\\
&+2s\int_{\Gamma_x}(\partial_\nu z)\left(\Delta_y\varphi-\Delta_x\varphi\right)\overline{z}dS_xdydt-s\int_{\Gamma_x}\partial_\nu\left(\Delta_y\varphi-\Delta_x\varphi\right)|z|^2\,dS_xdydt.
\end{aligned}
$$

Next, we shall estimate J_k, $1\le k\le 6$ and B_0 using the following elemantary properties of the weight function:

$$
\begin{array}{cc}
\partial_t\varphi=\left(-2\gamma\beta t\right)\varphi, & \varphi_{x_ix_i}=\gamma\varphi\left(2+\gamma\psi_{x_i}^2\right),\\
\varphi_{x_iy_j}=\gamma^2\varphi\psi_{x_i}\psi_{y_j}, & \varphi_{x_ix_j}=\gamma\varphi\left(\psi_{x_ix_j}+\gamma\psi_{x_i}\psi_{x_j}\right),\\
\varphi_{y_iy_j}=\gamma\varphi\left(\psi_{y_iy_j}+\gamma\psi_{y_i}\psi_{y_j}\right), & \nabla_x\varphi=\gamma\varphi\nabla_x\psi,\\
\nabla_y\varphi=\gamma\varphi\nabla_y\psi, & \partial_t(\nabla_x\varphi)=\left(-2\gamma^2\beta t\right)\varphi\nabla_x\psi,\\
\partial_t(\nabla_y\varphi)=\left(-2\gamma^2\beta t\right)\varphi\nabla_y\psi, & \Delta_x\varphi=\gamma\varphi\left(\Delta_x\psi+\gamma\,|\nabla_x\psi|^2\right),\\
\Delta_y\varphi=\gamma\varphi\left(\Delta_y\psi+\gamma\,|\nabla_y\psi|^2\right), & \Delta_y\varphi-\Delta_x\varphi=\gamma\varphi d_1\left(\psi\right)+\gamma^2\varphi d_2\left(\psi\right),
\end{array}
$$