$= \frac{1}{q!} C_q(\Theta)$. (Here we use $(\sqrt{-1})^{q^2} = (\sqrt{-1})^{q^2-q} \cdot (\sqrt{-1})^q$

$= \left((\sqrt{-1})^{\frac{q^2-q}{2}}\right)^2 (\sqrt{-1})^q = \left((\sqrt{-1})^2\right)^{\frac{q^2-q}{2}} (\sqrt{-1})^q = (-1)^{\frac{q(q-1)}{2}} (\sqrt{-1})^q$.

"Comment on $P^k(A) = \sum_{\# I = K} \det(A_{I,I})$

$\det(I + tA) = 1 + \cdots + t^k P^k(A) + \cdots$

$\det(A_{I,I})$ is the sum of coefficients of t^k in
$\epsilon\ (1 + t a_{j_1 j_1})(1 + t a_{j_2, j_2}) \cdots (1 + t a_{j_{n-k}, j_{n-k}})\ t a_{i_1 \sigma(i_1)} \cdots t a_{i_k \sigma(i_k)}$
where $\{ i_1 \cdots i_k \} = I$
$\{ j_1 \cdots j_{n-k} \} = \{1, \cdots n\} - I$.
Thus every term of $\det(A_{I,I})$ is in $P^k(A)$ and vice versa."

$$\int_Z C_q(\Theta) = q! \sum_\mu (\sqrt{-1})^{q^2} \int_Z \eta_\mu \wedge \overline{\eta}_\mu$$

$$(\sqrt{-1})^{q^2} \int_Z \eta_\mu \wedge \overline{\eta}_\mu = ?$$

$dz_1 \wedge \cdots \wedge dz_q \wedge d\bar{z}_1 \wedge \cdots \wedge d\bar{z}_q = dz_1 \wedge d\bar{z}_1 \wedge \cdots \wedge dz_q \wedge d\bar{z}_q (-1)^{\frac{q(q-1)}{2}}$
$= (-2i\, dx_1 \wedge dy_1) \wedge \cdots \wedge (-2i\, dx_q \wedge dy_q)\ (-1)^{q(q-1)/2}$
$= (-1)^q\, i^q\, dx_1 \wedge dy_1 \wedge \cdots (dx_q \wedge dy_q)\ (-1)^{q(q-1)/2}$
$= (-1)^q \sqrt{-1}^q\ dx_1 \wedge \cdots \wedge dx_q \wedge dy_1 \wedge \cdots \wedge dy_q$.
$= (-1)^q (-1)^{q(q-1)/2} \sqrt{-1}^q$ volume form.

$\Rightarrow (\sqrt{-1})^{q^2} \int_Z \eta_\mu \wedge \overline{\eta}_\mu = (\sqrt{-1})^{q^2} \int |\varphi|^2 (-1)^q (-1)^{q(q-1)/2} (\sqrt{-1})^q$ volume form
$= (\sqrt{-1})^{q^2+q} (-1)^{\frac{q(q+1)}{2}} \int |\varphi|^2 \mathrm{vol} = (-1)^{\frac{q^2+q}{2}} (-1)^{\frac{q^2+q}{2}} \int |\varphi|^2 \mathrm{vol} \geq 0$.