On some problems related with some special operator classes

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We will consider the following operators:

$$\mathcal{K}_{\varphi,\theta,\Omega} := [T_{\overline{\varphi}\Omega}, T_\theta]\, \varphi(M_\theta),$$

$$\mathcal{L}_{\varphi,\theta,\Omega} := [T_{\overline{\theta}\Omega}, T_\varphi]\, \varphi(M_\theta),$$

where $\Omega \in (\sum) \cup \{1\}$, $\varphi \in H^\infty(\mathbb{D})$, $\theta \in (\sum)$ (the set of all inner functions), T_f ($f \in L^\infty(\partial\mathbb{D})$) denotes the Toeplitz operator on the Hardy space $H^2(\mathbb{D})$ over the unit disc $\mathbb{D} = \{z \in \mathbb{C} : |z| < 1\}$ and $\varphi(M_\theta)\, h := P_\theta(\varphi h)$, $h \in \mathcal{K}_\theta := H^2 \Theta \theta H^2$, is the function of model operator of the Sz.-Nagy and Foias. In terms of Berezin symbols we study some properties of these operators. We also describe the invariant subspaces of some isometric multiplication operators on the Hilbert spaces with reproducing kernels in terms of so-called distance function of N.K. Nikolski. Some other problems also are considered.

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