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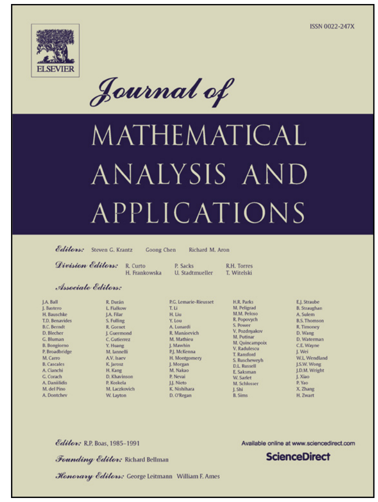

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SOME CHARACTERIZATIONS FOR COMPOSITION OPERATORS ON THE FOCK SPACES

LIANGYING JIANG, GABRIEL T. PRAJITURA, AND RUHAN ZHAO

ABSTRACT. We study composition operators on the Fock spaces $\mathcal{F}^2_\alpha(\mathbb{C}^n)$ for $\alpha > 0$, problems considered including the essential norm, normality, spectra, cyclicity and membership in the Schatten classes. We give perfect characterizations for these basic properties, which are different with those composition operators on the Hardy space and the weighted Bergman spaces.

1. INTRODUCTION AND PRELIMINARIES

Let $z = (z_1, \dots, z_n)$ and $w = (w_1, \dots, w_n)$ be the points in $\mathbb{C}^n$, the inner product is

$$\langle z, w\rangle = \sum_{j=1}^{n} z_j \overline{w_j}$$

and $|z| = \sqrt{\langle z, z\rangle}$.

For any $\alpha > 0$, consider the Gaussian probability measure

$$dv_\alpha(z) = \left(\frac{\alpha}{\pi}\right)^n e^{-\alpha|z|^2} dv(z)$$

on $\mathbb{C}^n$, where dv is the Lebesgue volume measure on $\mathbb{C}^n$. The Fock space $\mathcal{F}^2_\alpha(\mathbb{C}^n)$ consists of all holomorphic functions f on $\mathbb{C}^n$ with

$$\|f\|^2_\alpha \equiv \int_{\mathbb{C}^n} |f(z)|^2 dv_\alpha(z) < \infty.$$

Thus, $\mathcal{F}^2_\alpha(\mathbb{C}^n)$ is a Hilbert space with the following inner product

$$\langle f, g\rangle_\alpha = \int_{\mathbb{C}^n} f(z)\overline{g(z)} dv_\alpha(z).$$

Its reproducing kernels are given by

$$K(z, w) = K_w(z) = e^{\alpha\langle z, w\rangle}$$

with $\|K_w\|^2_\alpha = \exp(\alpha|w|^2)$.

For a given holomorphic mapping $\varphi : \mathbb{C}^n \to \mathbb{C}^n$, the composition operator C_φ acting on the Fock space $\mathcal{F}^2_\alpha(\mathbb{C}^n)$ is defined by $C_\varphi(f) = f \circ \varphi$.

In 2003, Carswell et al. [5] first studied composition operators on the classical Fock space $\mathcal{F}^2_\alpha(\mathbb{C}^n)$ when $\alpha = 1/2$, usually denoted by $\mathcal{F}^2(\mathbb{C}^n)$. They found the following information.

Theorem A. *Suppose $\varphi : \mathbb{C}^n \to \mathbb{C}^n$ is a holomorphic mapping.*

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Key words and phrases. Composition operators, Fock space, essential norm, spectrum, normal, cyclic, Schatten class.

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