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Solutions for some families of Fuchsian differential equations free from accessory parameters in terms of the integral of Euler type

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An ordinary differential equation of regular singular type defined on the Riemann sphere is called the *Fuchsian differential equation free from accessory parameters* or the *rigid Fuchsian differential equation*, if the equation is determined by the set of local data on monodromy, in particular, its spectral type.

About two decades ago, Yokoyama [29] classified such equations into eight types, I, II, III, IV, I*, II*, III*, and IV*, under some conditions from the viewpoint of the differential equation of Okubo type [23] (see also [8]). While the equation of type I is nothing but the generalized hypergeometric equation ${}_{n+1}E_n$ and that of type I* the Jordan–Pochhammer equation, the equations of the other types are new ones. Concerning the latter cases, very little has been understood: a restriction into one variable case of Appel's F_3 satisfies the equation II* of rank 4, the function satisfying the equation II of rank 4 is found in [16], and the functions satisfying the equation III* of rank 5 and of rank 7, the functions satisfying the equation II* of rank 4 and of rank 6, and the functions satisfying the equation II of rank 6 are found in [9].

The purpose of the present paper is to give solutions for the equations of types II, III, IV, II*, III*, and IV* in terms of the integral of Euler type.

In this paper, we frequantly use the symbol

$$e(A) = \exp(2\pi\sqrt{-1}A)$$

for abbreviation.

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