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Aditi Ghosh* (amathematics@gmail.com), Bryan, TX 77801, and **Prabir Daripa** (daripa@math.tamu.edu), College Station, TX 77840. *A Fast Algorithm to solve the Biharmonic equation with application to slow viscous flow.*

We present here a very accurate fast algorithm to solve the inhomogeneous Biharmonic equation with different boundary conditions in the interior of a unitdisk of the complex plane. The fast algorithm is based on the representation of the solution in terms of Green functions, fast Fourier transform and some recursive relation derived in the Fourier space. The fast solver is derived through exact analysis and properties of convolution of integrals using Greens function and hence is very accurate. The numerical evaluation of the double integrals has been optimized giving an asymptotic operation count $O(\ln N)$ per point on the average and requires no additional memory storage except the initial data. It has been implemented, validated and applied to solve several interesting applied problems from fluid mechanics and electrostatics. (Received August 14, 2012)