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Unsteady helical flows of Oldroyd-B fluids. (English) Zbl 1221.76017
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Summary: The unsteady helical flow of an Oldroyd-B fluid, in an infinite circular cylinder, is studied by using finite Hankel transforms. The motion is produced by the cylinder that, at time $t = 0^+$, is subject to torsional and longitudinal time-dependent shear stresses. The solutions that have been obtained, presented under series form, satisfy all imposed initial and boundary conditions. The corresponding solutions for Maxwell, second grade and Newtonian fluids are obtained as limiting cases of general solutions. Finally, the influence of the pertinent parameters on the fluid motion is underlined by graphical illustrations.

MSC:

76A05 Non-Newtonian fluids

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Keywords:

Oldroyd-B fluid; helical flows; velocity field; time-dependent shear stresses; Hankel transforms

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