Investigation of boundary value problems of the measuring of viscoelastic properties of fluids

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based on the boundary value problem of the two eccentric cylinders. that the first one after the cone-plate rheometer which is able to determine more materialconstants other than the viscosity, However, the eccentric cylinder rheometer shows to be one of the future instruments which is capable to further developments without the difficulties due to the effect of inertia encountered in the cone-and-plate rheometer.the preliminary results obtained by this apparatus proved to be sufficient for the determination of the viscosity coefficient p and the second order coefficient as over a range of shearing which overcomes the range coverd by the cone-and-plate. Further invesigation are required* which is expected to allow the determination of other material constants.The theoretical basis of the present problem is this he subject of a current work in Faculty of Science Benha University, dscussed in details (1,2 where the fluid performs rotational and axial motions. In the present thesis the rotational part of the motion is considered and the stream function for this motion is determined.The stream function [1,21 is not sufficient scince an additional term is required which enables one to satisfy the condition of a singlevalued pressure term. Based on this stream function, the components of force acting on the outer cylinder are calculated and formulated in the proper form for the determination of the material constants from the experimental measurements of the rheometer, due to the use of guard rings in the new apparatus, no error in the measurements of the viscosity as well as the measurements of the first normal stress difference coefficient arises from the edge effect as well as from the free surface. Furthermore, the eccentric cylinder rheometer does not need any calbiration to measure the material constans. Besides this two advantages the first normal stress difference coefficient determined by the new apparatus is more precise than that determined by cone-and-plate system.