Annexure – I

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Title of the Thesis: **Study of 1-D flow in porous media**

Abstract

The fluid flow through porous media is one of the most important concept in many areas of applied science and engineering such as hydrogeology, petroleum engineering, water resource engineering, soil mechanics, environmental engineering, chemical engineering, construction engineering, civil engineering, geophysics, biophysics etc.

In recent years, extensive research works have been carried out to study the fluid flow through porous media. This field has gained extensive attention due to its broad range of applications in science and industry. In particular, the modeling of fluid flow through porous media is a central problem within the field of various applications in such areas. The scope of the present study lies in an increasing importance of the hydrodynamics of single phase flow and multiphase flow through porous media. Due to vast scope of multiphase flow through porous media, the specific problems are almost unlimited and therefore it is reasonable to select such types of problems for discussion here. Accordingly a selection of more interesting problems of current interest have been made for mathematical treatment in the work. The investigated problems of the present study are concerned with the flow of immiscible and incompressible fluids.

This work has been devoted to study of 1-D flow in porous media and the development of mathematical model of fluid flow through porous media. The physical phenomena like as fingering phenomenon, imbibition phenomenon, fingero-imbibition phenomenon, infiltration phenomenon arise in fluid flow through porous medium which are encountered in many fields of science and engineering. The mathematical problems of different physical phenomena give us one dimensional nonlinear partial differential equations. These equations are solved using homotopy analysis method whose convergence is discussed by choosing proper value of convergence control parameter. The solution of the problems have been studied numerically and graphically with the help of Mathematica coding. This PhD Thesis would be useful for solving nonlinear problems arising in fluid flow through porous media.

List of Publication(s):

1) Homotopy analysis solution of countercurrent imbibition phenomenon in inclined homogeneous porous medium, Global Journal of Pure and Applied Mathematics, ISSN: 0973-1768, Vol. 12 (1), (2016), pp. 1035-1052.
2) Mathematical modelling of fingero-imbibition phenomenon in heterogeneous porous medium with magnetic field effect, PRAJNA - Journal of Pure and Applied Sciences, ISSN: 0975-2595, Vol. 24-25, (2017), pp. 15-22.