

Abstract

Mohamed Abd El Fatah Mohamed Teamah

Numerical Study of Mixed Convection Heat Transfer and Fluid Flow in Cubical Lid-Driven Cavity,

Flow and heat transfer analysis in lid-driven cavities is one of the most widely studied problems in thermo-fluids area. Three dimensional mixed convection in a cubical lid driven cavity is studied numerically; the medium applied in this study is air ($Pr = 0.71$). All vertical walls of the cavity are assumed adiabatic. While the base and lid of the cubical cavity are assumed isothermal. The base plane is fixed at higher temperature on the other hand the lid is movable at a lower temperature. Through this investigation, a wide range for Richardson number was studied from 0.1 to 10 to cover pure forced convection, mixed convection and natural convection. The results showed the streamlines distributions and isothermals at three vertical planes in the direction of the motion of the lid. The locations of these planes are at X/H equals 1/2, 1/4 and 1/8. The results also showed the velocity distribution, local Nusselt number as well as average Nusselt number. Comparisons between two dimensional results with the published results were made. Good agreement was found. Also, to show the importance of using three dimensional solutions, comparison between two dimensional and three dimensional results were made.