UNIVERSITI TEKNOLOGI MARA

TECHNICAL REPORT

INFLUENCE OF TEMPERATURE CONDITION ON THE ONSET OF RAYLEIGH-BENARD CONVECTION IN A BINARY FLUID-SATURATED ANISOTROPIC POROUS LAYER USING GALERKIN METHOD

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IN THE NAME OF ALLAH, THE MOST GRACIOUS, THE MOST MERCIFUL

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ABSTRACT

Rayleigh-Benard convection due to buoyancy that occurred in a horizontal binary fluid layer saturated anisotropic porous media is investigated numerically. The system is heated from below and cooled from above. The temperature-dependent viscosity effect was applied to the double-diffusive binary fluid, and the Galerkin method was used to determine the critical Rayleigh numbers for the free-free, rigid-free, and rigid-rigid representing the lower-upper boundaries. The lower boundary was set as conducting to temperature, while the upper boundary was set to be either conducting or insulating to temperature. The problem of this study is to study the stability of Rayleigh-Benard convection with different temperature conditions at the upper boundary in a saturated anisotropic porous layer with temperature-dependent viscosity effects. The governing equation are subjected to the linear stability analysis. The obtained eigenvalue is numerically solved with respect to various temperatures and velocities using the single-term Galerkin technique. The effect of temperature conditions, anisotropic parameters on the onset f Rayleigh-Benard in the system are analyzed and presented graphically. It is found that the temperature dependent viscosity, β, Soret, Sr, Dufour, Df, mechanical anisotropic parameter, ξ and thermal anisotropic parameter, η are decrease the critical Rayleigh number.