

**UNIVERSITI TEKNOLOGI MARA**

**MIXED CONVECTION ON  
BOUNDARY LAYER FLOW IN A  
DARCY-BRINKMAN POROUS  
MEDIUM WITH SLIP EFFECTS  
AND POROUS DISSIPATION**

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## ABSTRACT

Mixed convection plays a pivotal role in fluid flow and heat transfer phenomena, especially within porous media commonly encountered in industrial and environmental systems. This study investigates the combined effects of mixed convection, slip boundary conditions and porous dissipation on boundary layer flow over a permeable stretching surface embedded in a Darcy-Brinkman porous medium. These mechanisms are particularly relevant for enhancing thermal performance in applications such as geothermal systems, filtration technologies and thermal insulation processes. The governing partial differential equations for continuity, momentum and energy were transformed into ordinary differential equations using similarity transformations and numerically solved via the Runge-Kutta-Fehlberg method in Maple software. The study evaluates the effects of several dimensionless parameters which are mixed convection parameter, Brinkman parameter, porosity parameter, suction parameter, velocity slip parameter, thermal slip parameter, Prandtl number and Eckert number on skin friction coefficient, local Nusselt number, velocity profile and temperature profile. The findings show that an increased variation of mixed convection parameter promotes the effect of buoyancy, decreasing the skin friction and improving the heat transfer. Enhancement of Brinkman parameter and Eckert number lowers the magnitude of skin friction and heat transfer due to amplified viscous and thermal diffusion. Higher porosity parameter and thermal slip parameter results in stronger skin friction and decreased thermal temperature gradients. Both skin friction and heat transfer increase as the suction parameter and Prandtl number increase. Raising velocity slip parameter leads to a rise in heat transfer, with a subsequent decrease in velocity gradient. These results provide an opportunity for optimising thermal-fluid systems where porous structures are involved.

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