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## MIXED CONVECTION BOUNDARY LAYER FLOW TOWARDS HORIZONTAL CIRCULAR CYLINDER SATURATED IN POROUS REGION USING BRINKMAN MODEL


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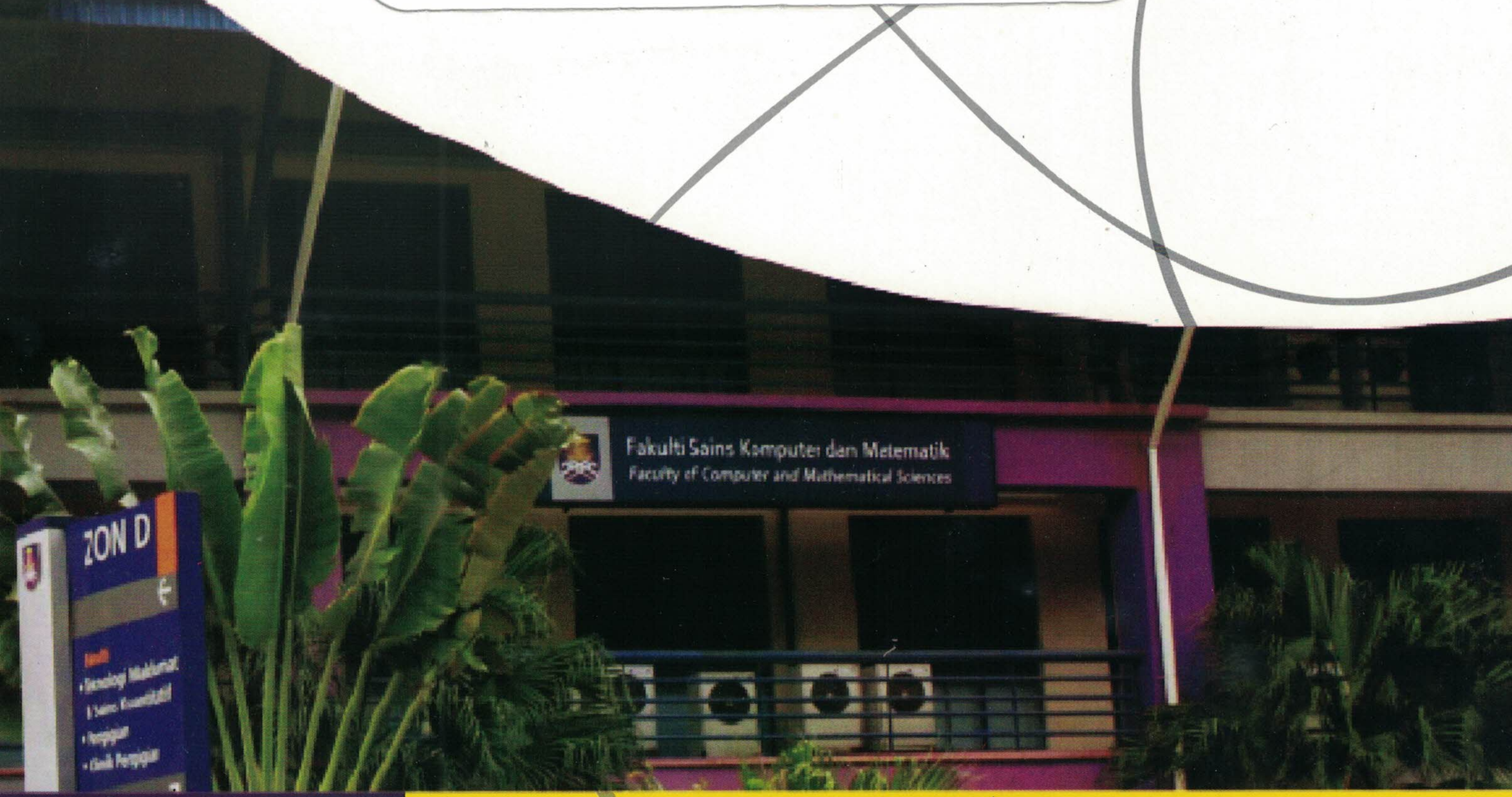

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# ABSTRACT

Convective Heat Transfer is the conduction process where it combines heat diffusion and advection which is heat transfer by bulk fluid flow. The boundary layer is a thin layer that runs along the edge of the solid boundary. This research investigated the mixed convection flow at the lowest stagnation point towards horizontal circular cylinder saturated in the porous region using the Brinkman model with constant wall temperature boundary condition. An appropriate similarity transformation is used to decrease the complexity of the equations. The effect of velocity and temperature profile on mixed convection and Brinkman parameters are calculated using BVP4C in Matlab. The purposes of the study are to transform partial differential equation to ordinary differential equation and to determine whether the Brinkman parameter and the mixed convection parameter affect the temperature and velocity. The result shows that the velocity profile appears to be decreasing as the Brinkman parameter value rises. Other than that, the finding also highlights the effect of the temperature profile, which appears to be increasing in correlation with the value of the Brinkman parameter which is also increasing. For the mixed convection parameter, when it is increased, the velocity profile increases but the temperature profile decreases. The results in the table are obtained by comparing with other research articles to confirm that they are accurate. These tables are crucial, as they may be used as a reference against which further accurate or approximate answers can be compared.

# 1 INTRODUCTION

## 1.1 Research Background

### a) Convection Heat Transfer

Convection is also known as convective heat transfer is the movement of fluid that enables heat to be transferred from one spot to another. Convective heat transfer merges the processes of conduction which is heat diffusion and advection that is heat transfer by bulk fluid flow. Other than that, it is also frequently addressed as a separate form of heat transfer. In liquids and gases, convection is typically the dominant mode of heat transfer. Based on Nazar et al. (2003), over the last several decades, convective heat transfer in porous medium has caught the interest of many researchers. Numerous thermal engineering applications in various disciplines sparked this interest, including geophysical thermal and insulation engineering, cooling of electronic systems, groundwater hydrology, ceramic processes, grain storage devices, petroleum reservoirs, coal combustors, groundwater pollution, and many more.

Apart from buoyancy forces, convection can be forced by fluid flow such as a water pump in an automobile engine. Convection may also be generated by the thermal expansion of fluids. There are three types of convection which are natural convection or free convection, force convection, and mixed convection. Natural convection happens when the heat is being heated, natural buoyancy forces alone are solely responsible for fluid motion while force convection is a type of heat where the fluid is forced to pass so that the heat transfer will arise. Mixed convection is a combined force from forced convection and natural convection. It happens when both force convection and natural convection mechanisms act together to transfer heat. There is many simple application that are using convection heat transfer in daily life, one of them including convection of heat in liquids. The particles in liquids and gases are moving and fill the spaces in an object. For example, when we fill water in half of a beaker and put small pieces of paper and the beaker is heated by a spirit lamp. After a few minutes, we will notice that the