

**THERMAL BOUNDARY LAYER OVER A VERTICAL PLATE IN POROUS MEDIUM WITH A CONVECTIVE SURFACE BOUNDARY CONDITION**  
(*Lapisan Sempadan Haba Terhadap Plat Menegak dalam Bahantara Berliang dengan Syarat Sempadan Permukaan Berolak*)

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*ABSTRACT*

This study aims to investigate the thermal boundary layer over a vertical plate in porous medium with a convective surface boundary condition. The governing systems of partial differential equations subject to the boundary conditions are transformed into the system of ordinary differential equations by employing the similarity transformation. The bvp4c method in Matlab software is used to numerically solve the equations. With the use of graphical and tabular data, the velocity and temperature profiles for various parameter values is obtained, analyzed, and discussed. The effects of the governing parameters involved including permeability parameter  $K$  and the buoyancy parameter  $\lambda$  are examined and discussed. The local Nusselt number and skin friction coefficient increase as the permeability parameter's  $K$  value rises. The results suggest that dual solutions for opposing flow and the solution is unique for assisting flow. The results also shown that by increasing  $K$ , the permeability parameter, will increase the range of solutions. Lastly, the permeability parameter,  $K$ , has the consequence of expanding the range values of buoyancy parameter,  $\lambda$  for which solutions are discovered.

*Keywords:* porous medium; vertical plate; surface boundary conditions

*ABSTRAK*

Tujuan kajian ini adalah untuk menyelidik lapisan sempadan haba terhadap permukaan plat menegak di dalam bahantara berliang dengan syarat sempadan permukaan berolak. Sistem persamaan pembezaan separa menakluk yang tertakluk kepada syarat sempadan dijelmakan ke dalam sistem persamaan pembezaan biasa dengan menggunakan penjelmaan keserupaan. Kaedah bvp4c di dalam perisian Matlab digunakan untuk menyelesaikan persamaan secara berangka. Dengan menggunakan graf dan data berjadual, profil halaju dan profil suhu untuk nilai parameter yang berbeza diperolehi, dianalisis dan dibincangkan. Kesan parameter menakluk yang terlibat termasuk parameter ketelapan,  $K$  dan parameter keapungan,  $\lambda$  dikaji dan dibincangkan. Nombor Nusselt setempat dan pekali geseran kulit meningkat apabila nilai parameter ketelapan,  $K$  meningkat. Keputusan menunjukkan terdapat penyelesaian dual bagi aliran menentang dan penyelesaian adalah unik bagi aliran membantu. Keputusan juga menunjukkan bahawa dengan meningkatkan parameter ketelapan,  $K$  akan meningkatkan julat penyelesaian. Akhir sekali, parameter ketelapan,  $K$ , memberi kesan meluaskan julat nilai parameter keapungan,  $\lambda$  di mana penyelesaian wujud.

*Kata kunci:* bahantara berliang; plat menegak; syarat sempadan permukaan berolak

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Received: 5 May 2023

Accepted: 4 August 2023

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