ABSTRACT

The Mathematical Modelling of Two-Layered Blood Flow Through Microcirculation

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Blood is essential to the survival of man. In this thesis, a two-layered model for blood in microcirculation (consisting of a core region containing all the red blood cells suspended in plasma and a cell-free plasma layer near to the vessel walls) was utilized. Blood flow through a composite stenosis was investigated. In order to study their effects, the presence of an external magnetic field and convective heat transfer were also included as research progressed. In these flows examined, the presence of rigid walls and permeable walls were considered since the permeability of these walls may vary.

A vital process that occurs in microcirculation is oxygen transfer to its surrounding tissue. The effect of an external magnetic field and wall permeability on oxygen transfer was studied. Where appropriate, plots were provided to examine the velocity, shear stress, temperature, rate of heat transfer and the partial pressure of oxygen. These studies pave the way for future research on different diseased blood vessel systems and for other blood flow studies in microcirculation.

Keywords: Blood; microcirculation; stenosis; magnetic field; heat transfer; oxygen transfer; Alana Sankar-Ramkarran; Alana Sankar.