EXACT SOLUTION FOR VISCOUS FLUID FLOW IN POROUS MEDIA WITH MAGNETIC FIELD

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The steady flow of viscous, incompressible, conducting fluid flow past a spherical solid core embedded in another spherical porous medium is considered. The exact solution is obtained for the flow in the presence of transverse magnetic field. The considered fluid flow is governed by Brinkman equation in porous region and by Stokes equation in the fluid region with additional Lorentz’s force due to applied magnetic field. The flows in the two regions are matched across the interface by assuming continuity of velocity and stress across the interface. Further, no-slip condition at the solid surface and uniform velocity far from the flow region are used. The solutions are obtained by similarity transformation method in terms of modified Bessel’s functions. The expression for tangential shear stress, normal and tangential velocity is obtained. The results are demonstrated by graphs for various non-dimensional parameters. It is noticed that diffusion of the fluid into porous region is more as magnetic field strength is amplified. This shows the suppression of the flow in the presence of magnetic field. Also, the amplitude of the shearing stress intensifies with increase in the magnetic field strength and lessens with raise in porous parameter.