

Problem 112B

Consider the flow of a fluid in which the fluid elements are travelling with velocity, u , in the x direction (this is the only non-zero velocity of the fluid which it is necessary to consider in this problem). A succession of fluid elements travel through the Eulerian point, $x = x_o$ with a velocity $u = u_o$ and subsequently accelerate according to

$$u = (u_o/x_o^2)x^2$$

However the flow is **steady**. Chemical constituents within the fluid are reacting in such a way that the concentration, c , of one of the constituents is increasing with time at a rate denoted by α (a constant). If the concentration at the point $x = x_o$ has a known and constant value denoted by c_o find an expression for the concentration elsewhere as a function of x , x_o , u_o , c_o and α .