Investigations of fluid flows in open rectangular and triangular channels

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ABSTRACT

This study is on investigations of open rectangular and triangular channel flows. The aim is to determine the more hydraulically efficient channel between open rectangular and triangular channels. The laws of conservation of mass and momentum have led to partial differential equations which are non-linear. Analytical methods cannot be used to solve such equations hence finite difference method has been used.

Velocity and depth of flow play a major role in determining discharge. Effects of varying various parameters on velocity have been investigated. Variation of velocity of the fluid with depth has also been investigated.

Graphs of velocity profiles obtained by varying parameters such as channel slope, energy coefficient, channel top width and roughness coefficient have been drawn. More graphs of variation of velocity with depth and also for comparison of velocity profiles for both open rectangular and triangular channels have been plotted. It is found out that the velocity of flow increases as depth increases and the velocity becomes maximum slightly below the free surface. Moreover, increase in the channel slope, energy coefficient and top-width leads to an increase in flow velocity whereas increase in roughness coefficient leads to a decrease in flow velocity. It is also found out that for a fixed flow depth and width an open rectangular channel is more hydraulically efficient than an open triangular channel.

This study goes a long way in control of floods, irrigation and in construction of channels such as house gutters.