

1. The continuity equation for one dimensional unsteady open channel flow may be written as

$$\frac{\partial y}{\partial t} + \frac{\partial yu}{\partial x} = 0$$

where, y and u are the flow depth and velocity of flow, respectively.

Determine whether this PDE is parabolic, hyperbolic or elliptic.

2. Irrotational steady flow may be represented by the Laplace equation

$$\frac{\partial^2 \phi}{\partial x^2} + \frac{\partial^2 \phi}{\partial y^2} = 0$$

where, ϕ is the velocity potential. The velocity field is given by

$$u = \frac{\partial \phi}{\partial x}; v = \frac{\partial \phi}{\partial y}$$

Find the velocity field for the following configuration.

$$\Delta x = \Delta y = 1 \text{ m}$$

