**Team - The Eigenists**

**Solution to Question 1**

The given 1-D wave equation is to be discretised with 2nd order spatial accuracy and 1st order time accuracy with Implicit time integration scheme.

The given equation is a *linear, one dimensional* wave equation as:

The discretised equation for temporal part is ,

where the subscript index ‘*i’* denotes the spatial location and the superscript ‘*n’* denotes the temporal instant.

The spatial part is discretised with a 2nd order central difference scheme with implicit time as

The complete discretised equation is

Rearranging and writing in terms of primary unknown on L.H.S. we get the equation as

Here is the Courant number (from CFL stability condition). The stencil for such discretization is given below as.

