

PDE are as following:

$$\frac{\partial^2 u}{\partial x^2} + \frac{\partial w}{\partial x} \frac{\partial^2 w}{\partial x^2} = \frac{1}{C^2} \frac{\partial^2 u}{\partial t^2}$$

$$\frac{\kappa}{2(1+\nu)} \left( \frac{\partial \phi}{\partial x} + \frac{\partial^2 w}{\partial x^2} \right) + \frac{\partial^2 u}{\partial x^2} \frac{\partial w}{\partial x} + \frac{\partial u}{\partial x} \frac{\partial^2 w}{\partial x^2} + \frac{3}{2} \frac{\partial^2 w}{\partial x^2} \left( \frac{\partial w}{\partial x} \right)^2 = \frac{1}{C^2} \frac{\partial^2 w}{\partial t^2}$$

$$\frac{\partial^2 \phi}{\partial x^2} - \frac{6\kappa}{(1+\nu)h^2} \left( \frac{\partial w}{\partial x} + \phi \right) = \frac{1}{C^2} \frac{\partial^2 \phi}{\partial t^2}$$

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The above equations are subjected to the following natural and geometric boundary conditions at,  $x = l$

$$\frac{\partial u}{\partial x} + \frac{1}{2} \left( \frac{\partial w}{\partial x} \right)^2 - \frac{M}{Ebh} \left( g - \frac{\partial^2 u}{\partial t^2} - s \frac{\partial^2 \phi}{\partial t^2} \right) = 0,$$

$$\frac{\partial \phi}{\partial x} - \frac{12Ms}{Ebh^3} \left( g - \frac{\partial^2 u}{\partial t^2} - s \frac{\partial^2 \phi}{\partial t^2} \right) = 0, \quad w = 0$$

Where,  $x=l$  is  $(La)$  in maple code. this means for example  $D_1(u)(La, t) = 0$

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And at,  $x = 0$

$$u = 0, \quad \text{and} \quad w = 0, \quad \frac{\partial \phi}{\partial x} = 0$$

this means for example  $D_1(u)(0, t) = 0$

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the initial conditions for Eqs

Are as following:

$$u(x,0) = \phi(x,0) = w(x,0) = 0$$

$$\left\{ \frac{\partial \phi}{\partial t}(x,0) = \frac{\partial w}{\partial t}(x,0) = 0, \right.$$


At  $x \in [0, l]$ , where  $l$  is La

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$$\left\{ \frac{\partial u}{\partial t}(x,0) = 0, \right.$$


At  $x \in [0, l]$  where  $l$  is La

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$$\frac{\partial u}{\partial t}(l,0) = -V_0$$

where  $l$  is La

