Q1) Consider the following BVP
\[ \frac{\partial^2 u}{\partial x^2} = \frac{1}{a^2} \frac{\partial^2 u}{\partial t^2}, \quad 0 < x < L, t > 0, \]
\[ u(0, t) = 0, \quad u(L, t) = 0, \quad t > 0 \]
\[ u(x, 0) = 0, \quad \frac{\partial u}{\partial t}(x, 0) = 0, \quad 0 < x < a. \]

Assuming \( u(x, t) = F(x)G(t) \), obtain the Sturm Liouville problem in \( F(x) \) and solve this problem finding eigenvalues and eigenfunction.