Q1) Consider the following BVP
\[
\frac{\partial^2 u}{\partial x^2} = \frac{1}{k} \frac{\partial u}{\partial t}, \quad 0 < x < a, t > 0, k \text{ being a + ve constant}
\]
\[
u(0, t) = 0, \quad u(a, t) = 0, \quad t > 0
\]
\[
u(x, 0) = f(x), \quad 0 < x < a.
\]
Assuming \( u(x, t) = F(x)G(t) \), obtain the Sturm Liouville problem in \( F(x) \) and solve this problem finding eigenvalues and eigenfunction.