Exercise 4

Consider waves in a resistant medium that satisfy the problem

$$\begin{gathered} u_{tt} = c^2 u_{xx} - r u_t \quad \text{for } 0 < x < l \\ u = 0 \quad \text{at both ends} \\ u(x,0) = \phi(x) \quad u_t(x,0) = \psi(x), \end{gathered}$$

where r is a constant, $0 < r < 2\pi c/l$. Write down the series expansion of the solution.