Cankaya University
Faculty of Engineering
Mechanical engineering Department

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HW 4
Spring 2017

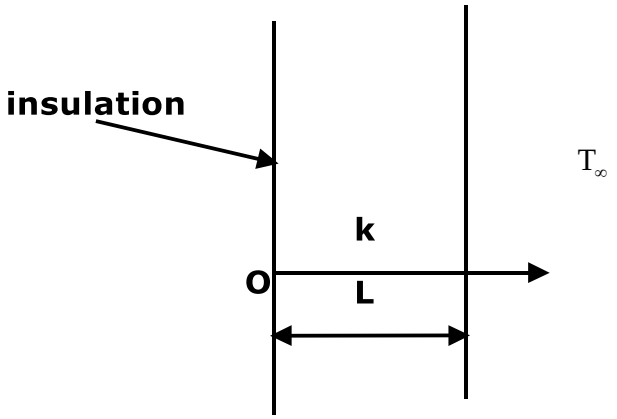
1) A semi-infinite medium, $0 \le x < \infty$, is initially at a uniform temperature T_0 . For times $t > 0$, the region is subjected to a prescribed heat flux at the boundary surface x=0

$-k\frac{\partial T}{\partial x} = f_0$ at x=0

where f_0 is a constant. Obtain an expression for the temperature distribution T(x,t) in the medium for times $t > 0$ by using Laplace transformation.

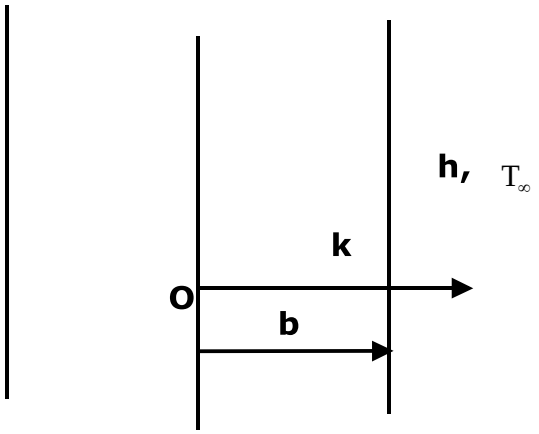
2) A slab, $0 \le x \le L$ is initially at zero temperature. For times t>0 , heat is generated in the slab at a constant rate of $g_0(W/m^3)$, while theboundary surface at x=0 is kept insulated and the boundary surface at x=L is kept at zero temperature. Obtain an expression for the temperature distribution T(x,t) in the slab using the Laplace transform technique that is valid for all times .

3) A plane wall , initially at a high temperature T_0 , immediately after is manufactured , is immersed in a cold liquid bath of temperature T_∞ .Heat transfer coefficient between plate



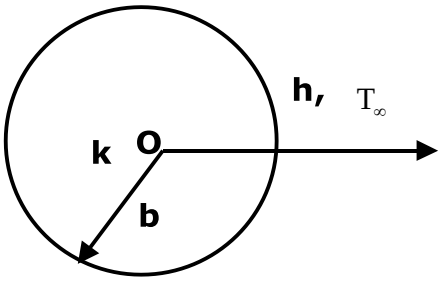
surface and fluid is very large. Determine the temperature distribution T(x,t) by Laplace transform method.

4) A solid cylinder , initially at a high temperature T_0 , immediately after is manufactured , is immersed in a cold liquid bath of temperature T_∞ .Radius of the cylinder is b. Heat



transfer coefficient between the cylinder surface surface and fluid is very large. Determine the temperature distribution T(r,t) by Laplace transform method.

5) A solid sphere , initially at a high temperature T_0 , immediately after is manufactured , is immersed in a cold liquid bath of temperature T_∞ .Radius of the sphere is b .Heat transfer



coefficient between sphere surface and fluid is very large. Determine the temperature distribution T(r,t) by Laplace transform method.