

# **Cooling of a Cube with Convective Boundary Condition**

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[http://www.giacomo.lorenzoni.name/PEEI\\_4.0.0.1/Cooling\\_of\\_a\\_cube\\_with\\_convective\\_boundary\\_condition/](http://www.giacomo.lorenzoni.name/PEEI_4.0.0.1/Cooling_of_a_cube_with_convective_boundary_condition/)

[http://www.giacomo.lorenzoni.name/PEEI\\_4.0.0.1/PEEIapplDown.aspx?var=5](http://www.giacomo.lorenzoni.name/PEEI_4.0.0.1/PEEIapplDown.aspx?var=5)

# Cooling of a cube with convective boundary condition

This text is integrating part of the homonymous link in [PEEI: a computer program for the numerical solution of systems of partial differential equations](#).

**Coordinate system:** Cartesian

**System of measurement:** International System of Units

**Coordinates of Cartesian system:**  $\underline{x}$  of which  $\underline{x}=\{x_n;n=1,4\}=\{x,y,z,t\}$   $\underline{x}_v=\{x,y,z\}$   
 $\{[x_n]\equiv[\text{length}];n=1,3\}$   $[t]\equiv[\text{time}]$   $\{\Re(x_n)\equiv(-\infty,\infty);n=1,4\}$

**Unknown functions:**  $T(\underline{x})$  of which  $[T]\equiv[\text{temperature}]$

**Differential analytic model:**  $\psi \cdot \partial T(\underline{x}) / \partial t - \partial^2 T(\underline{x}) / \partial x^2 - \partial^2 T(\underline{x}) / \partial y^2 - \partial^2 T(\underline{x}) / \partial z^2 = 0$  of which  
 $\psi \equiv \rho \cdot c_s / K$   $\rho = 7933$   $c_s = 460$   $K = 20$

**Definition set:**  $\{\underline{x} / 0 \leq x_n \leq \#n; n=1,4\}$   $\{\#n=1;n=1,3\}$   $\#4=3600 \cdot 20$

**Conditions:**  $\{T(\underline{x}_v,0)=1; \forall \{0 \leq x_n \leq \#n; n=1,3\}\}$   $K \cdot (\partial T(0,y,z,t) / \partial x) - H \cdot (T(0,y,z,t) - T_\infty) =$   
 $K \cdot (\partial T(1,y,z,t) / \partial x) + H \cdot (T(1,y,z,t) - T_\infty) = K \cdot (\partial T(x,0,z,t) / \partial y) - H \cdot (T(x,0,z,t) - T_\infty) =$   
 $K \cdot (\partial T(x,1,z,t) / \partial y) + H \cdot (T(x,1,z,t) - T_\infty) = K \cdot (\partial T(x,y,0,t) / \partial z) - H \cdot (T(x,y,0,t) - T_\infty) =$   
 $K \cdot (\partial T(x,y,1,t) / \partial z) + H \cdot (T(x,y,1,t) - T_\infty) = 0$   $H=50$   $T_\infty=0$

**Related files:** [mad.txt](#)

## **Case 1-1:**

**Related files:** [points-1-1.txt](#), [PEEI-mem-1-1.bin](#), [cond-1-1.txt](#), [PEEI-sol-1-1.txt](#), [plot-1-1.jpg](#)

## **Case 1-2:**

**Related files:** [points-1-2.txt](#), [PEEI-mem-1-2.bin](#), [cond-1-2.txt](#), [PEEI-sol-1-2.txt](#), [plot-1-2.jpg](#)

## **Case 1-3:**

**Related files:** [points-1-3.txt](#), [PEEI-mem-1-3.bin](#), [cond-1-3.txt](#), [PEEI-sol-1-3.txt](#), [plot-1-3.jpg](#)

## **Case 1-4:**

**Related files:** [points-1-4.txt](#), [PEEI-mem-1-4.bin](#), [cond-1-4.txt](#), [PEEI-sol-1-4.txt](#), [plot-1-4.jpg](#)

## **Case 2-1:**

**Related files:** [points-2-1.txt](#), [PEEI-mem-2-1.bin](#), [cond-2-1.txt](#), [PEEI-sol-2-1.txt](#), [plot-2-1.jpg](#)

## **Case 2-2:**

**Related files:** [points-2-2.txt](#), [PEEI-mem-2-2.bin](#), [cond-2-2.txt](#), [PEEI-sol-2-2.txt](#), [plot-2-2.jpg](#)

**Case 2-3:**

***Related files:*** [points-2-3.txt](#), PEEI-mem-2-3.bin, [cond-2-3.txt](#), [PEEI-sol-2-3.txt](#), [plot-2-3.jpg](#)

**Case 2-4:**

***Related files:*** [points-2-4.txt](#), PEEI-mem-2-4.bin, [cond-2-4.txt](#), [PEEI-sol-2-4.txt](#), [plot-2-4.jpg](#)

**Case 3-1:**

***Related files:*** [points-3-1.txt](#), PEEI-mem-3-1.bin, [cond-3-1.txt](#), [PEEI-sol-3-1.txt](#), [plot-3-1.jpg](#)

**Case 3-2:**

***Related files:*** [points-3-2.txt](#), PEEI-mem-3-2.bin, [cond-3-2.txt](#), [PEEI-sol-3-2.txt](#), [plot-3-2.jpg](#)

**Case 3-3:**

***Related files:*** [points-3-3.txt](#), PEEI-mem-3-3.bin, [cond-3-3.txt](#), [PEEI-sol-3-3.txt](#), [plot-3-3.jpg](#)

**Case 3-4:**

***Related files:*** [points-3-4.txt](#), PEEI-mem-3-4.bin, [cond-3-4.txt](#), [PEEI-sol-3-4.txt](#), [plot-3-4.jpg](#)