Question 1 Versió 1 (la més recent)

Pregunta 1

Correcte

Puntuació 10,00 sobre 10,00

Consider the stationary 2D heat equation $-k_c \Delta T = f$ on the square $\Omega = [0,1] \times [0,1]$. The thermal conductivity is $k_c = 2.0$ (W/(m˚C). The temperature is fixed at $T = 15.0$˚C at the top edge and $T = -10.0$˚C at the bottom edge. On the side edges there is convection: the media in contact with the left edge is at $T_\infty = 100.0$˚C and the convection coefficient is $\beta = 30.0$ whereas the media in contact with the right edge is at $T_\infty = 55.0$˚C and convection coefficient is $\beta = 45.0$.

Using the mesh defined in the file `mesh8x8Quad.m`, and assuming that there is a constant heat generation $f = 150.0$ W/m^3 at the region A made up by the union of the elements that have all their nodes at, or below the diagonal $y = x$ (region dashed in Yellow at the Figure), carry out the corresponding FEM analysis and answer the following questions.

(a) (4 points) The maximum nodal temperature on the region $B := \Omega \setminus A$ (in ˚C) is

Remark. Note that nodes in region B are those that do **not** belong to any of the elements tiling the region A.

- 9.2752e+01
- 8.7255e+01
- Leave it empty (no penalty)
- 9.1128e+01
- 8.8760e+01 ✔
- 9.1025e+01

Puntuació 4,00 sobre 4,00

La resposta correcta és: 8.8760e+01

Hint. The temperature at node 81 is 3.1243e+01 ˚C.

(b) (3 points) The interpolated temperature at point $P = (0.31250, 0.31250)$ is (in ˚C)

- 3.7232e+01 ✔
- 3.2725e+01
- 3.3244e+01
- 3.5946e+01
- 3.2877e+01
- Leave it empty (no penalty)

Puntuació 3,00 sobre 3,00

La resposta correcta és: 3.7232e+01

(c) (3 points) Now, consider just the nodes at the diagonal $y = x$. Using the temperatures T_i, $i = 1, \ldots, n_d$, at **all** these nodes, and their corresponding abscissas x_i, $i = 1, \ldots, n_d$, the temperature's approximation (in C˚) at the point $R = (0.81250, 0.81250)$ given by 1D-interpolation polynomial (computed, recall, taking **all** the nodes at the diagonal) is found to be

- 3.4212e+01
- 3.5752e+01
- 3.3239e+01 ✔
- 3.6042e+01
- Leave it empty (no penalty)
- 2.8327e+01

Puntuació 3,00 sobre 3,00

La resposta correcta és: 3.3239e+01

Hint. The averaged temperature of the nodes at the diagonal is $\langle T \rangle_d = 2.7500$e+01˚C

Torna a començar | Desa | Emplena amb les respostes correctes | Envia i acaba | Tanca la previsualització

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