Pregunta **1**

No s'ha respost encara

Puntuat sobre 10,00

Let D be the domain meshed in the file **RadiantTubing.m** (lengths measured in mm as the length unity for the problem), and $u(x, y)$ the solution to the heat propagation equation on the domain D, satisfying the conditions that

- $u = 30^\circ C$ on the circular boundary section, of radius $r = 10/3$, of D,
- $Q = 0$ on the straight lateral left and right sides of the domain,
- there is convection transfer of heat across the top and bottom sides of the domain, with convection coefficients $\beta_{top} = 9.28 \frac{W}{m^{2}\cdot^\circ C}$ and $\beta_{bot} = 2.67 \frac{W}{m^{2}\cdot^\circ C}$ respectively, with ambient temperature $T_\infty = 6^\circ C$ on both sides.

The domain is made of concrete, and has a thermal conductivity of $0.92 \frac{W}{m\cdot^\circ C}$.

Hint: Check the units.

(a)(3 points) The final temperature for node 311 is:

- 2.9473e+01
- 2.9180e+01
- 2.8191e+01
- 2.9077e+01
- Leave it empty (no penalty)

Hint: The minimum computed temperature is $2.7854e+01^\circ C$

(b) (4 points) Considering that the total heat flow across a boundary is the sum of the heat flux of all its nodes, that is, the Q's (computed as a postprocess). Then, the **propagation waste** of the system is defined as the quotient of the heat flow across the bottom boundary divided by the total heat flow across the top and bottom boundaries. Find it.

- 0.23353
- 0.30467
- 0.31017
- 0.22803
- Leave it empty (no penalty)

Hint: node 39 is on the top boundary, and has Q_{39}=-1.650527e-04.

(c) (3 points) Changing only the constant temperature on the circular stretch of boundary (with the rest of boundary conditions unchanged), the temperature of the nodes in the top boundary also changes. Starting with $u = 24^\circ C$ on the circular boundary and increasing the temperature in 0.5 every step, choose the first value that makes the minimal value of u on the top boundary bigger or equal to $24^\circ C$

- 26
- 26.5
- 25.5
- 25
- Leave it empty (no penalty)

Hint: when the temperature in the central circle boundary is set at $30^\circ C$ C, the coldest top node has temperature $27.8544^\circ C$.

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

Informació tècnica

Comportament que s'està utilitzant: Retroalimentació diferida

Fracció mínima: 0

Fracció màxima: 1

Variant de pregunta: 1

Resum de la pregunta: Let \(D\) be the domain meshed in the file RADIANTTUBING.M (lengths measured in \(mm\) as the length unity for the problem), and \(u(x,y)\) the solution to the heat propagation equation on the domain \(D\), satisfying the conditions that * \(u=30^\circ C\) on the circular boundary section, of radius \(r=10/3\), of \(D\), * \(Q=0\) on the straight lateral left and right sides of the domain, * there is convection transfer of heat across the top and bottom sides of the domain, with convection coefficients \(\beta _{top}=9.28 \frac {W}{m^2 \cdot ^\circ C}\) and \(\beta _{bot}=2.67 \frac {W}{m^2 \cdot ^\circ C}\) respectively, with ambient temperature \(T_{\infty }=6^\circ C\) on both sides. The domain is made of concrete, and has a thermal conductivity of \(0.92 \frac {W}{m \cdot ^\circ C}\). Hint: Check the units. (a)(3 points) The final temperature for node 311 is: {2.9473e+01; 2.9180e+01; 2.8191e+01; 2.9077e+01; Leave it empty (no penalty)} HINT: The minimum computed temperature is \(2.7854e+01^\circ C\) (b) (4 points) Considering that the total heat flow across a boundary is the sum of the heat flux of all its nodes, that is, the Q's (computed as a postprocess). Then, the PROPAGATION WASTE of the system is defined as the quotient of the heat flow across the bottom boundary divided by the total heat flow across the top and bottom boundaries. Find it. {0.23353; 0.30467; 0.31017; 0.22803; Leave it empty (no penalty)} HINT: node 39 is on the top boundary, and has \(Q_{39}\)=-1.650527e-04. (c) (3 points) Changing only the constant temperature on the circular stretch of boundary (with the rest of boundary conditions unchanged), the temperature of the nodes in the top boundary also changes. Starting with \(u=24^\circ C\) on the circular boundary and increasing the temperature in 0.5 every step, choose the first value that makes the minimal value of \(u\) on the top boundary bigger or equal to \(24^\circ C\) {26; 26.5; 25.5; 25; Leave it empty (no penalty)} HINT: when the temperature in the central circle boundary is set at \(30^\circ C\) C, the coldest top node has temperature \(27.8544^\circ C\).

Resum de la resposta correcta: part 1: 2.9473e+01; part 2: 0.23353; part 3: 26

Resum de respostes:

Estat de la pregunta: todo

Download this question in Moodle XML format

Contreu-ho tot

Opcions de l'intent

Com es comporten les preguntes

Retroalimentació diferida

Puntuat sobre

10

Torna a començar amb aquestes opcions

Opcions de visualització

Si és correcte

Mostrat

Puntuacions

Mostra la puntuació i el màxim

Xifres decimals en les puntuacions

2

Retroacció específica

Mostrat

Retroacció general

Mostrat

Resposta correcta

Mostrat

Historial de les respostes

No es mostra

Actualitza les opcions de visualització