**Assignment 06**

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# **Problem 10.8.1**

## **Inputs**

|  |  |
| --- | --- |
| **Parameter** | **Value** |
| Simulation Input | |
| Problem | 1 |
| NONLIN | 0 (Linear) |
| ITERMAX | 25 |
| Epsilon | 0.001 |
| GAMA1 (Acceleration Parameter) | 0.5 |
| GAMA2 (Penalty Term) | 10^8 |
| Domain Input | |
| X0 | 0 |
| Y0 | 0 |
| X\_length | 6 |
| Y\_length | 2 |
| Mesh Input | |
| NX | 10 |
| NY | 6 |
| NPE | 4 |
| DX | [1 1 1 1 0.5 0.5 0.25 0.25 0.25 0.25] |
| DY | [0.25 0.25 0.5 0.5 0.25 0.25] |
| NDF | 2 |
| IEL | 1 |
| NGPF | 2 |
| NGPR | 1 |
| Loading Condition | |
| DP | 1 |
| F = [FX FY] | [0 0] |
| MU | 1 |
| Essential Boundary Conditions | |
| NSPV | 39 |
| ISPV | [1 77 76 75 74 73 72 71 70 69 68 67 56 45 34 23 12 1 2 3 4 5 6 7 8 9 10 11 77 76 75 74 73 72 71 70 69 68 67; 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2]' |
| VSPV | [0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1]' |
|  |  |
| Natural Boundary Condition | |
| NSSV | 31 |
| ISSV | [1 2 3 4 5 6 7 8 9 10 11 22 33 44 55 66 77 1 11 22 33 44 55 66 77 67 56 45 34 23 12; 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2]' |
| VSSV | zeros(max(size(ISSV)),1) |

## **Results**

Table

Description automatically generated

Table 1: Vx (x,0)

Table

Description automatically generated

Table 2: Horizontal velocity Vx (x,y) vs vertical distance y

Table

Description automatically generated

Table 3: Pressure vs Horizontal distance x (Near top plate & centerline)

Chart, line chart

Description automatically generated

Figure 1: Horizontal Velocity field Vx at x = 4 & x = 6

Chart, line chart

Description automatically generated

Figure 2: Top Plate Pressure vs x

Chart, line chart

Description automatically generated

Figure 3: Centerline Pressure vs x

# **Problem 10.8.4**

## **Inputs**

|  |  |
| --- | --- |
| **Parameter** | **Value** |
| Simulation Input | |
| Problem | 2 |
| NONLIN | 1 |
| ITERMAX | 25 |
| Epsilon | 0.001 |
| GAMA1 (Acceleration Parameter) | 0.5 |
| GAMA2 (Penalty Term) | 10^8 |
| Domain Input | |
| X0 | 0 |
| Y0 | 0 |
| X\_length |  |
| Y\_length | 1 |
| Mesh Input | |
| NX | 8 |
| NY | 10 |
| NPE | 9 |
| DX | 0.125\*ones(1,NX) |
| DY | [0.125 0.125 0.125 0.125 0.125 0.125 0.0625 0.0625 0.0625 0.0625] |
| NDF | 2 |
| IEL | 2 |
| NGPF | 3 |
| NGPR | 2 |
| Loading Condition | |
| DP | [0 500 1000] |
| F = [FX FY] | [0 0] |
| MU | 1 |
| Essential Boundary Conditions | |
| NSPV | 144 |
| ISPV | [1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 34 51 68 85 102 119 136 153 170 187 204 221 238 255 272 289 306 323 340 357 356 355 354 353 352 351 350 349 348 347 346 345 344 343 342 341 324 307 290 273 256 239 222 205 188 171 154 137 120 103 86 69 52 35 18 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 34 51 68 85 102 119 136 153 170 187 204 221 238 255 272 289 306 323 340 357 356 355 354 353 352 351 350 349 348 347 346 345 344 343 342 341 324 307 290 273 256 239 222 205 188 171 154 137 120 103 86 69 52 35 18; 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2]' |
| VSPV | [0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0]' |
| Natural Boundary Condition | |
| NSSV | 0 |
| ISSV | [ ] |
| VSSV | [ ] |

## **Results**

Table

Description automatically generated

Table 4: velocity Vx(0.5,y) for different Reynold’s number

Chart

Description automatically generated

Figure 4: Horizontal Velocity Vx(0.5,y) vs y for Re = 0,500,1000

Chart, line chart

Description automatically generated

Figure 5: Plot of Pressure P along the top wall of the cavity