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DATE 15-11-2025 21 23 52 USER FRTRN90 JOB BNCHMRK PAGE 0000

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4 BNCHMRK FRTRN90 FILE NAME/TYPE TESTIN/TEST4.F90  
5 BNCHMRK FRTRN90  
6 BNCHMRK FRTRN90 CREATION DATE/TIME 15-11-2025 21 23 52  
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13 BNCHMRK FRTRN90  
14 BNCHMRK FRTRN90 FORM SMALL  
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18 BNCHMRK FRTRN90 PRT1403 VERSION 1.5.PRE-RELEASE  
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DATE 15-11-2025 21 23 52

USER FRTRN90

JOB BNCHMRK

PAGE 0001

```
1 PROGRAM LID DRIVEN CAVITY
2 IMPLICIT NONE
3 INTEGER, PARAMETER N = 50      GRID SIZE NXN GRID
4 REAL DX, DY, DT, RE           GRID SPACING, TIME STEP, REYNOLDS NUMBER
5 REAL U(N, N), V(N, N), P(N, N) VELOCITY AND PRESSURE FIELDS
6 INTEGER I, J, STEP
7 REAL START TIME, END TIME, ELAPSED TIME
8
9     PARAMETERS
10    DX 1.0 / N-1             GRID SPACING IN X DIRECTION
11    DY 1.0 / N-1             GRID SPACING IN Y DIRECTION
12    DT 0.001                 TIME STEP SIZE
13    RE 100                   REYNOLDS NUMBER
14
15     INITIALIZE ARRAYS
16    U 0.0
17    V 0.0
18    P 0.0
19
20     INITIALIZE THE TOP BOUNDARY LID VELOCITY
21    U(N, 1) = 1.0
22
23     START TIMING
24    CALL CPU TIME START TIME
25
26     MAIN LOOP FOR TIME STEPPING
27    DO STEP 1, 1000
28        CALL COMPUTE VELOCITY U, V, P, DX, DY, DT, RE
29        CALL UPDATE PRESSURE P, DX, DY
30
31        OUTPUT OR CHECK CONVERGENCE
32        IF MOD STEP, 100 = 0 THEN
33            PRINT *, STEP, STEP
34        END IF
35    END DO
36
37     STOP TIMING
38    CALL CPU TIME END TIME
39    ELAPSED TIME = END TIME - START TIME
40    PRINT *, ELAPSED TIME FOR CFD SIMULATION, ELAPSED TIME, SECONDS
41
42     CONTAINS
43
44         FUNCTION TO UPDATE THE VELOCITY AND PRESSURE FIELDS SIMPLIFIED
45         SUBROUTINE COMPUTE VELOCITY U, V, P, DX, DY, DT, RE
46             REAL, DIMENSION( , ), INTENT INOUT U, V, P
47             REAL, INTENT IN DX, DY, DT, RE
48             INTEGER I, J
49
50         SIMPLE EXPLICIT METHOD FOR VELOCITY SIMPLIFIED
51         DO I = 2, N-1
52             DO J = 2, N-1
53                 U(I, J) = U(I, J) - DT * (U(I, J) * U(I+1, J) - U(I-1, J)) / (2*DX)
54                                     + (V(I, J) * U(I, J+1) - U(I, J-1)) / (2*DY)
55             END DO
56         END DO
57
58         SIMPLE VELOCITY UPDATE FOR V SIMILAR
59         DO I = 2, N-1
60             DO J = 2, N-1
```

DATE 15-11-2025 21 23 52

USER FRTRN90

JOB BNCHMRK

PAGE 0002

```
1      V I, J    V I, J - DT *    U I, J * V I+1, J - V I-1, J / 2*DX
2      V I, J * V I, J+1 - V I, J-1 / 2*DY
```

3 END DO

4 END DO

5 END SUBROUTINE COMPUTE VELOCITY

6

7 FUNCTION TO SOLVE FOR PRESSURE SIMPLIFIED POISSON EQUATION SOLVER

8 SUBROUTINE UPDATE PRESSURE P, DX, DY

9 REAL, DIMENSION , , INTENT INOUT P

10 REAL, INTENT IN DX, DY

11 INTEGER I, J

12

13 SIMPLE PRESSURE POISSON EQUATION JACOBI ITERATION

14 DO I 2, N-1

15 DO J 2, N-1

16 P I, J 0.25 \* P I+1, J + P I-1, J + P I, J+1 + P I, J-1

17 END DO

18 END DO

19 END SUBROUTINE UPDATE PRESSURE

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21 END PROGRAM LID DRIVEN CAVITY

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