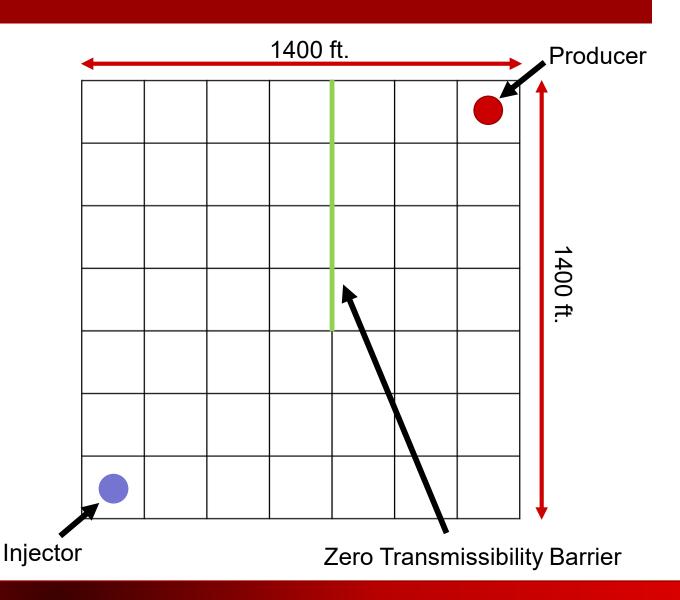
HW7 – 2D Implicit PETR 5309

Homework Problem

2D Implicit Solver Homework

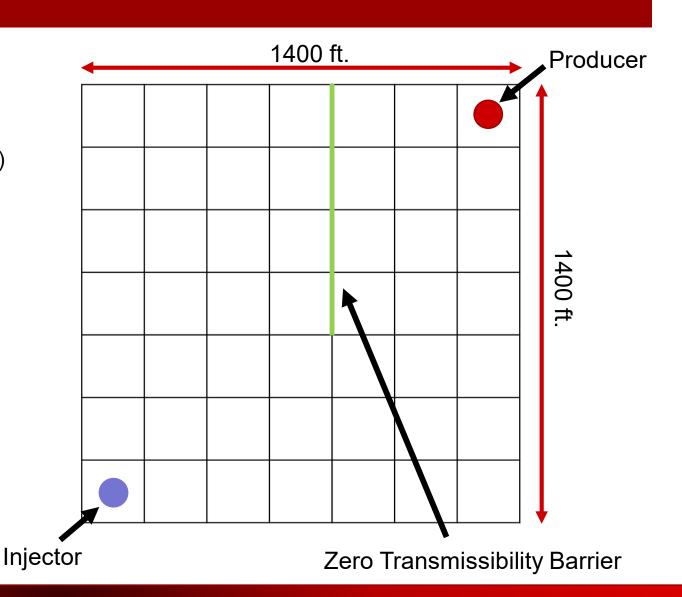
- Create a 7x7 grid reservoir with properties on the following page.
- Within this reservoir is a fault, depicted within the reservoir picture.
- Included are slides from lecture that should help guide you through the problem.
- You may use your Gaussian solver from the previous homework to find the pressure solution at each time step.
 - NOTE: Remember that to define a zero transmissibility barrier, the matrix cell defining the transmissibility between two cells will be zero



Problem Data

Consider

- Homogenous, 2D, Single Phase
- Fluid is flowing into the system with a pressure constrained Injector (Pinlet) and Producer (Poutlet)
- Properties:
 - Pinlet=6000 psi
 - Poutlet=3000 psi
 - Reservoir Pressure: 4500
 - Length=1400 feet
 - Permx=250 md
 - Height(Grid Thickness) =60 feet
 - Width=1400 Feet
 - Viscosity=1 cp
 - FVF= 1 RB/STB
 - Porosity = 18%
- What is the steady state flow rate?



- Upload your code, and a pressure matrix of the field once the field reaches steady state flow.
- Did your code mange to reach the precise inlet and outlet pressures?
- If not why do you think it did not?

Review

Remember: Setup of Implicit Solution

alphac	5.615						Areax	75000						
betac	1.127		T -	(0	$A_{\chi}k_{\chi}$		Vb	75000000						
dx	1000		l_{lx}	$(P_c - \mu)$	$\left(\frac{A_{\mathcal{X}}k_{\mathcal{X}}}{a_{l}B_{l}\Delta x}\right)$		Perm_D	0.0150						
dy	1000						(VT)	1.7825						
dz	75			/	D() ()		Tlx	0.1268						
visc	10		(VT)	$=\left(\frac{\alpha_0}{3}\right)$	$\left(\frac{B_l^0 \Delta t}{b \otimes c_l}\right)$		(TV)	0.5610						
perm	15			()	$p \emptyset c_l$									
FVF	1													
	0.18		Γ_		n±1	(``		m	1	n+1 .		n+1]	
por								1 '		13		1.	n: '- I	= -
por cl	3.50E-06		$ T_{l}\rangle$	$x_{i+1/2}p$	$_{i+1}^{n+1}$ –	(IV	$) + I_{l}$	$x_{i+1/2} + 1$	$l lx_{i-1/2}$	2 J F	θ_i +	$lx_{i-1/2}$	P_{i-1}	_
			T_{l}	$x_{i+1/2}p$	i+1 -	(IV) + I _{l:}	$x_{i+1/2} + x_{i+1/2}$	$l lx_{i-1/2}$	2) F	σ_i +	$lx_{i-1/2}$	Pi-1]	
cl	3.50E-06			$x_{i+1/2}p$	i+1 —	(IV) + I _{l:}	$x_{i+1/2} + x_{i+1/2}$	$I_{lx_{i-1/l}}$	2) F	σ_i +	$lx_{i-1/2}$	Pi-1	
cl Pinit	3.50E-06 6000			$x_{i+1/2}p$	i+1 —	(IV) + I _{l:}	$x_{i+1/2} + x_{i+1/2}$	$I_{ x_{i-1} }$	2) F	σ_i +		Pi-1	
cl Pinit	3.50E-06 6000			$x_{i+1/2}p$	i+1 —	(IV) + I _{l:}	$x_{i+1/2} + x_{i+1/2}$	$l_{ lx_{i-1} }$	2) F	σ_i +	$lx_{i-1/2}$	Pi-1	
cl Pinit	3.50E-06 6000			$x_{i+1/2}p$	i+1 -	(IV) + I _{1:}	x _{i+1/2} + /	$l_{ lx_{i-1} }$	2) F	σ_i +	$lx_{i-1/2}$	-	Qi
cl Pinit dt	3.50E-06 6000		P2(n+1)	$x_{i+1/2}p$	i+1 -	(IV) + 11:	x _{i+1/2} + /		2) F	-3365.98		-	Qi
Pinit dt	3.50E-06 6000 15	0.1268			P3(n+1)	(IV) + I _{1:}	x _{i+1/2} + /					Pn	Qi 0
Pinit dt	3.50E-06 6000 15 P1(n+1) +	0.1268 -0.8146	P2(n+1)	0.1268) + 1 (:	x _{i+1/2} + /		=	-3365.98		Pn 6000.00	Qi 0 0
Pinit dt	3.50E-06 6000 15 P1(n+1) +	0.1268 -0.8146	P2(n+1) P2(n+1) +	0.1268	P3(n+1)	0.1268			P5(n+1)	= =	-3365.98 -3365.98		Pn 6000.00 6000.00	Qi 0 0 0

Implicit Setup as a Matrix equation

-0.6878	0.1268			-	P1(n+1)	=	-3365.98	
0.1268	-0.8146	0.1268			P2(n+1)	=	-3365.98	
	0.1268	-0.8146	0.1268		P3(n+1)	=	-3365.98	
	0.0000	0.1268	-0.8146	0.1268	P4(n+1)	=	-3215.98	
			0.1268	-0.6878	P5(n+1)	=	-3365.98	

From Reference "Basic Applied Reservoir Simulation", Ertekin. Et. Al.

$$\mathbf{T}_{lx_{i+\frac{1}{2}}}^{n}p_{i+1}^{n+1} - \left[\left(\frac{V_{b}\phi c_{l}}{\alpha_{c}B_{l}^{o}\Delta t} \right)_{i} + \mathbf{T}_{lx_{i+\frac{1}{2}}}^{n} + \mathbf{T}_{lx_{i-\frac{1}{2}}}^{n} \right] p_{i}^{n+1} + \mathbf{T}_{lx_{i-\frac{1}{2}}}^{n}$$

$$\times p_{i-1}^{n+1} = -\left[q_{lsc_i} + \left(\frac{V_b \phi c_i}{\alpha_c B_i^{\circ} \Delta t}\right) p_i^n\right], \quad \dots \quad (5.105)$$

TABLE 5.6—SYSTEM OF EQUATIONS IN EXAMPLE 5.11 $\begin{bmatrix} -0.6878 \, \rho_1^{n+1} + 0.1268 \, \rho_2^{n+1} \\ +0.1268 \, \rho_1^{n+1} - 0.8146 \, \rho_2^{n+1} + 0.1268 \, \rho_3^{n+1} \\ +0.1268 \, \rho_2^{n+1} - 0.8146 \, \rho_3^{n+1} + 0.1268 \, \rho_4^{n+1} \\ +0.1268 \, \rho_3^{n+1} - 0.8146 \, \rho_4^{n+1} + 0.1268 \, \rho_5^{n+1} \\ +0.1268 \, \rho_4^{n+1} - 0.6878 \, \rho_5^{n+1} \end{bmatrix} = \begin{bmatrix} -3,365.98 \\ -3,365.98 \\ -3,215.98 \\ -3,365.98 \end{bmatrix}$

From Reference "Basic Applied Reservoir Simulation", Ertekin. Et. Al.

TABLE 5.6—SYSTEM OF EQUATIONS IN EXAMPLE 5.11	
$\begin{bmatrix} -0.6878 p_1^{n+1} + 0.1268 p_2^{n+1} \\ +0.1268 p_1^{n+1} - 0.8146 p_2^{n+1} + 0.1268 p_3^{n+1} \\ +0.1268 p_2^{n+1} - 0.8146 p_3^{n+1} + 0.1268 p_4^{n+1} \\ +0.1268 p_3^{n+1} - 0.8146 p_4^{n+1} + 0.1268 p_5^{n+1} \\ +0.1268 p_4^{n+1} - 0.6878 p_5^{n+1} \end{bmatrix}$	I = 3.365.98 I

-0.6878	0.1268				P1(n+1)	=	-3365.98
0.1268	-0.8146	0.1268			P2(n+1)	=	-3365.98
	0.1268	-0.8146	0.1268		P3(n+1)	=	-3365.98
	0.0000	0.1268	-0.8146	0.1268	P4(n+1)	=	-3215.98
			0.1268	-0.6878	P5(n+1)	=	-3365.98
_							

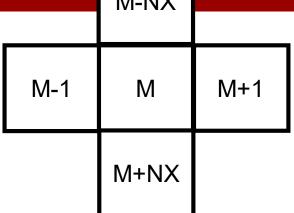
Solution Process

- 1. Specify well rates, dt, number of gridblocks, gridblock properties
- 2. Initialize Pressure
- 3. Initialize t=0
- 4. Update t = t + dt
- 5. If t > tmax go to Step 11
- 6. Set Pressure old = Pressure
- 7. Calculate Matrix Equation Coefficients
- 8. Calculate RHS using Pressure_old, rates, dt
- 9. Use Linear Solver to calculate Pressure at current time
- 10. Go to step 4
- 11. Stop

2D Implicit Formulation

M-NX

For Grid Block M = I + (J-1) * NX



$$(T_{M+1,M}^n P_{M+1}^{n+1}) + (T_{M-1,M}^n P_{M-1}^{n+1}) + (T_{M+NX,M}^n P_{M+NX}^{n+1}) + (T_{M-NX,M}^n P_{M-NX}^{n+1})$$

$$-\left[\left(T_{M+1,M}^{n}+T_{M-1,M}^{n}+T_{M+NX,M}^{n}+T_{M-NX,M}^{n}\right)+\left(\frac{Vb \otimes c}{\alpha_{c} B \Delta t}\right)_{M}\right] P_{M}^{n+1}$$

$$= -\left[Q_M + \left(\frac{Vb \otimes c}{\alpha_c B \Delta t}\right)_M P_M^n\right]$$

$$T_{x} = \left(\beta_{c} \frac{A_{x} k_{x}}{\mu_{l} B_{l} \Delta x}\right)$$

Initial Pressure Matrix for 5x5 problem well in center

	-	<u></u>		_	_	_		-	_		_																		
	_	block	1	2	3	4	5	6	7	8	9	10	11	12		14	15	16	17	18	19	20	21	22	23	24	25		
		i	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	RHS	
		j	1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5		
block	İ	j																											
1	1	1	-0.534	0.127	0.000	0.000	0.000	0.127	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-16	83.0
2	2	1	0.127	-0.661	0.127	0.000	0.000	0.000	0.127	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-16	83.0
3	3	1	0.000	0.127	-0.661	0.127	0.000	0.000	0.000	0.127	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-16	83.0
4	4	1	0.000	0.000	0.127	-0.661	0.127	0.000	0.000	0.000	0.127	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-16	583.0
5	5	1	0.000	0.000	0.000	0.127	-0.534	0.000	0.000	0.000	0.000	0.127	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-16	583.0
6	1	2	0.127	0.000	0.000	0.000	0.000	-0.661	0.127	0.000	0.000	0.000	0.127	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-16	583.0
7	2	2	0.000	0.127	0.000	0.000	0.000	0.127	-0. 7 88	0.127	0.000	0.000	0.000	0.127	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-16	583.0
8	3	2	0.000	0.000	0.127	0.000	0.000	0.000	0.127	-0. 7 88	0.127	0.000	0.000	0.000	0.127	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-16	583.0
9	4	2	0.000	0.000	0.000	0.127	0.000	0.000	0.000	0.127	-0.788	0.127	0.000	0.000	0.000	0.127	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-16	83.0
	5	2	0.000	0.000	0.000	0.000	0.127	0.000	0.000	0.000	0.127	-0.661	0.000	0.000	0.000	0.000	0.127	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-16	583.0
	1	3	0.000	0.000	0.000	0.000	0.000	0.127	0.000	0.000	0.000	0.000	-0.661	0.127	0.000	0.000	0.000	0.127	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		583.0
12	2	3	0.000	0.000	0.000	0.000	0.000	0.000	0.127	0.000	0.000	0.000	0.127	-0. 7 88	0.127	0.000	0.000	0.000	0.127	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-16	83.0
13	3	3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.127	0.000	0.000	0.000	0.127	-0. 7 88	0.127	0.000	0.000	0.000	0.127	0.000	0.000	0.000	0.000	0.000	0.000	0.000		783.0
	4	3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.127	0.000	0.000	0.000	0.127	-0. 7 88	0.127	0.000	0.000	0.000	0.127	0.000	0.000	0.000	0.000	0.000	0.000	-16	83.0
	5	3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.127	0.000	0.000	0.000	0.127	-0.661	0.000	0.000	0.000	0.000	0.127	0.000	0.000	0.000	0.000	0.000	-16	
	1	4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.127	0.000	0.000	0.000	0.000	-0.661	0.127	0.000	0.000	0.000	0.127	0.000	0.000	0.000	0.000		583.0
	2	4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.127	0.000	0.000	0.000	0.127	-0. 7 88	0.127	0.000	0.000	0.000	0.127	0.000	0.000	0.000		583.0
	3	4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.127	0.000	0.000	0.000	0.127	-0. 7 88	0.127	0.000	0.000	0.000	0.127	0.000	0.000	-16	83.0
19	4	4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.127	0.000	0.000	0.000	0.127	-0. 7 88	0.127	0.000	0.000	0.000	0.127	0.000		583.0
	5	4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.127	0.000	0.000	0.000	0.127	-0.661	0.000	0.000	0.000	0.000	0.127		583.0
	1	5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.127	0.000	0.000	0.000	0.000	-0.534	0.127	0.000	0.000	0.000		583.0
	2	5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.127	0.000	0.000	0.000	0.127	-0.661	0.127	0.000	0.000		583.0
	3	5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.127	0.000	0.000	0.000	0.127	-0.661	0.127	0.000	-16	
	4	5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.127	0.000	0.000	0.000	0.127	-0.661	0.127	-16	
25	5	5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.127	0.000	0.000	0.000	0.127	-0.534	-16	583.0

Well Model for Horizontal Well

Well Model for Vertical Wells

$$q_{sc} = -J_w \left(\bar{p} - p_{wf} \right)$$

$$J_{w} = \frac{-2 \pi \beta_{c} k_{H} h}{\mu B \left[log_{e} \left(\frac{r_{eq}}{r_{w}} \right) + s - F \right]}$$

$$r_{eq} = 0.28 \frac{\left\{ \left[\binom{k_y}{k_x}^{1/2} (\Delta x)^2 \right] + \left[\left[\binom{k_x}{k_y}^{1/2} (\Delta y)^2 \right] \right] \right\}^{1/2}}{\binom{k_y}{k_x}^{1/4} + \binom{k_x}{k_y}^{1/4}}$$

- J_w is different for horizontal wells
 - k_h which is average horizontal perm for vertical wells gets replaced with an average which includes perm in the z direction
 - h, which is the gridblock thickness for vertical wells, gets replaced with the length of the completion in the gridblock, i. e. gridblock length
 - r_{eq} which is the equivalent radius, must include perm in z direction

Example

```
do i=1,nx
    do j=1,ny
          k=1
         m=i+(j-1)*nx+(k-1)*nx*ny
         if (i.eq. 1) then
          tx minus(m)=0
         else
           tx_minus(m)=betac*areax*permx/(visc*fvf*dx)
         endif
         if (i .eq. nx ) then
           tx_plus(m)=0
         else
           tx plus(m)=betac*areax*permx/(visc*fvf*dx)
         endif
         if (j .eq. 1) then
          ty minus(m)=0
         else
          ty minus(m)=betac*areay*permy/(visc*fvf*dy)
         endif
         if (j .eq. ny ) then
          ty_plus(m)=0
         else
          ty plus(m)=betac*areay(*permy/(visc*fvf*dy)
         endif
     enddo
   enddo
```

Calculate transmissibility

- 2 D
- Constant properties
- Calculate:
 - tx_minus,
 - tx_plus,
 - ty_minus,
 - ty_plus

Set up each row of Matrix

```
do ii=1,nx
  do jj=1,ny
      kk=1
      mm=ii+(jj-1)*nx+ (kk-1)*nx*ny
      if (ii .gt. 1) then
          amatrix(mm,mm-1)=tx_minus(mm)
      endif
      if (ii .lt. nx) then
          amatrix(mm,mm+1)=tx plus(mm)
      endif
      if (jj .gt. 1) then
          amatrix(mm,mm-nx)=ty minus(mm)
      endif
      if (jj .lt. ny) then
          amatrix(mm,mm+nx)=ty plus(mm)
      endif
     amatrix(mm,mm)=-1.0*( (1/term1) + tx_minus(mm) +
tx_plus(mm) + ty_minus(mm) + ty_plus(mm) )
   enddo
end do
```

term1=alphac*const_fvf*dt/(vb*por*compress)

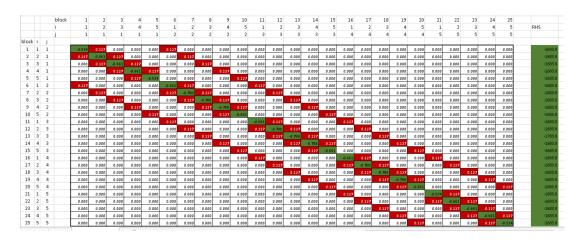
Set up Right Hand Side of Equation

term1=alphac*const_fvf*dt/(vb*por*compress)

```
do i=1,nx
  do j=1,ny
     m=i+(J-1)*nx
      rhs(m)=-1.0* ( (pressure_old(m)/term1) + rate(m) )
   end do
end do
```

Linear Solver Step

- Call Linear solver
 - Pass to solver:
 - Dimensions of Matrix
 - Matrix Coefficients
 - RHS
 - Receive back from solver:
 - Updated Pressures



			block	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	
			i	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	RHS
			j	1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	
ock i		j																											
1 :	L	1		1.000	-0.237	0.000	0.000	0.000	-0.237	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3158
2 :	2	1		0.000	1.000	-0.201	0.000	0.000	-0.048	-0.201	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3312
3 3	3	1		0.000	0.000	1.000	-0.200	0.000			-0.200	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3323
4	1	1		0.000	0.000	0.000	1.000				-0.040	-0.200	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3320
5 5	5	1		0.000	0.000	0.000	0.000	1.000	0.000	-0.002	-0.010	-0.050	-0.249	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	4142
6 :	L	2		0.000	0.000	0.000	0.000	0.000	1.000	-0.212	-0.002	0.000	0.000	-0.202	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3518
7 :	2	2		0.000	0.000	0.000	0.000	0.000	0.000	1.000	-0.181	-0.002	0.000	-0.037	-0.173	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3668
8 3	3	2		0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	-0.179	-0.002	-0.007	-0.031	-0.172	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3690
9 4	1	2		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	-0.181	-0.001	-0.006	-0.031	-0.172	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3680
.0 5	5	2		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000	-0.001	-0.007	-0.038	-0.210	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	447
1 :	L	3		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	-0.208	-0.001	0.000	0.000	-0.200	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	356
12 :	2	3		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	-0.178	-0.001	0.000	-0.036	-0.172	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	371
13 3	3	3		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	-0.177	-0.001	-0.007	-0.030	-0.171	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3930
4	1	3		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	-0.178	-0.001	-0.006	-0.030	-0.171	0.000	0.000	0.000	0.000	0.000	0.000	3765
15 5	5	3		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000	-0.001	-0.007	-0.037	-0.208	0.000	0.000	0.000	0.000	0.000	4518
16	L	4		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	-0.207	-0.001	0.000	0.000	-0.200	0.000	0.000	0.000	0.000	3564
7 :	2	4		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	-0.178	-0.001	0.000	-0.036	-0.172	0.000	0.000	0.000	3716
18 3	3	4		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	-0.176	-0.001	-0.007	-0.030	-0.171	0.000	0.000	3768
19 4	1	4		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	-0.177	-0.001	-0.006	-0.030	-0.171	0.000	3733
20 5	5	4		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000	-0.001	-0.007	-0.037	-0.207	4511
21 :	L	5		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	-0.259	-0.002	0.000	0.000	4448
22 :	2	5		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	-0.217	-0.001	0.000	4715
3 3	3	5		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	-0.215	-0.001	4741
24	1	5		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	-0.216	473
25 5	5	5		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	602

block	i	j		
1	1	1	Salution:	6022.2
2	2	1	Salution:	6032.4
3	3	1	Salution:	6044.2
4	4	1	Salution:	6032.4
5	5	1	Salution:	6022.2
6	1	2	Salution:	6032.4
7	2	2	Salution:	6056.6
8	3	2	Salution:	6098.5
9	4	2	Salution:	6056.6
10	5	2	Salution:	6032.4
11	1	3	Salution:	6044.2
12	2	3	Salution:	6098.5
13	3	3	Salution:	6280.7
14	4	3	Salution:	6098.5
15	5	3	Salution:	6044.2
16	1	4	Salution:	6032.4
17	2	4	Salution:	6056.6
18	3	4	Salution:	6098.5
19	4	4	Salution:	6056.6
20	5	4	Salution:	6032.4
21	1	5	Salution:	6022.2
22	2	5	Salution:	6032.4
23	3	5	Salution:	6044.2
24	4	5	Salution:	6032.4
25	5	5	Salution:	6022.2