**CS595, 2018. Homework 5**

1) Build PETSc in debug mode (configure with ‘--with-debugging=1 PETSC\_ARCH=arch-cs595’) and

in optimized mode (configure with ‘--with-debugging=0 PETSC\_ARCH=arch-cs595-o’)

2) Run $PETSC\_DIR/src/ksp/ksp/examples/tutorials/ex2.c:

mpiexec –n <np> ./ex2 –m 500 –n 500 –ksp\_type <ksp\_type> -pc\_type <pc\_type> -log\_view <log\_file>

mpiexec -n 1 ./ex2 -m 500 -n 500 -ksp\_type gmres -pc\_type asm -sub\_pc\_type lu -log\_view > log7-o

Machine: fourier.cs.iit.edu, 12 cpu cores

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Methods | np | Norm of  Error | No. of  Iterations | Total Time  (sec)  g mode | Total Time  (sec)  O mode | Dominating Mat Operations  O mode |
| 1 | -ksp\_type gmres  -pc\_type none  -ksp\_max\_it 1000 | 1  4 | 237.138  237.138 | 1000  1000 | 2.380e+01  1.324e+01 | 1.096e+01  9.361e+00 | MatMult      1034 1.0 2.5842e+00 24%  MatMult      1034 1.0 2.2520e+00 20% |
| 2 | -ksp\_type cg  -pc\_type none  -ksp\_max\_it 1000 | 1  4 | 5.21693e-05  5.21693e-05 | 840  840 | 1.085e+01  5.808e+00 | 3.951e+00  2.814e+00 | MatMult       841 1.0 2.0510e+00 52%  MatMult      841 1.0 1.6310e+00 50% |
| 3 | -ksp\_type gmres  -pc\_type bjacobi  -sub\_pc\_type ilu | 1  4 | 0.00793242  0.792953 | 1710  1000 | 5.752e+01  1.653e+01 | 2.381e+01  1.007e+01  (with max=1000) | MatMult      1767 1.0 4.3255e+00 18%  MatSolve    1767 1.0 5.5684e+00 23%  MatMult 1034 1.0 3.2378e+00 19%  MatSolve 1034 1.0 3.1830e+00 19% |
| 4 | -ksp\_type gmres  -pc\_type bjacobi  -sub\_pc\_type lu | 1  4 | error  0.00191413 | error  132 | error  5.876e+00 | error  3.341e+00 | Error  MatMult       137 1.0 5.3758e-01 10%  MatSolve     137 1.0 2.5827e+00 44% |
| 5 | -ksp\_type cg  -pc\_type bjacobi  -sub\_pc\_type icc | 1  4 | 0.000182336  0.000138671 | 278  330 | 6.746e+00  3.849e+00 | 2.619e+00    1.841e+00 | MatMult      279 1.0 7.7610e-01 30%  MatSolve      279 1.0 9.8036e-01 37%  MatMult       331 1.0 5.2751e-01 26%  MatSolve     331 1.0 6.0545e-01 30% |
| 6 | -ksp\_type gmres  -pc\_type asm  -sub\_pc\_type lu | 1  4 | error  0.000268303 | error  58 | error  3.761e+00 | error  1.997e+00 | Error  MatSolve    60 1.0 7.3140e-01 34%  MatLUFactorNum   1 1.0 2.7027e-01 13% |
| 7 | -ksp\_type gmres  -pc\_type asm  -sub\_pc\_type lu  -pc\_asm\_overlap 2 | 1  4  12 | error  5.76526e-05  0.000326972 | error  37  84 | error  2.960e+0    4.615e+00 | error  1.505e+00  2.773e+00 | Error  MatLUFactorNum   1 1.0 2.6664e-01 17%  MatSolve        39 1.0 4.4205e-01 26%  MatSolve      87 1.0 8.9745e-01 14%  MatLUFactorNum   1 1.0 4.0002e-01 13% |
| 8 | -ksp\_type cg  -pc\_type sor  -pc\_sor\_local\_symmetric | 1  4  12 | 0.000270909  0.000260308  0.000317699 | 329  371  379 | 8.235e+00  4.798e+00  5.780e+00 | 3.192e+00  2.591e+00  3.570e+00 | MatMult        330 1.0 7.9081e-01 25%  MatSOR         330 1.0 1.6713e+00 52%  MatSOR         372 1.0 1.2433e+00 44%  MatMult        372 1.0 4.9608e-01 17%  MatSOR         380 1.0 5.8906e-01 13%  MatMult        380 1.0 1.4637e+00 18% |