**­­­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>

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

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| --- | --- | --- | --- | --- | --- | --- | --- |
|  | 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 | 1.034e+01  8.003e+00 | MatMult 1034 1.0 2.4930e+00 24%  MatMult 1034 1.0 2.0186e+00 19% |
| 2 | -ksp\_type cg  -pc\_type none  -ksp\_max\_it 1000 | 1  4 | 5.21693e-05  5.21693e-05 | 840  840 | 4.996e+00  2.913e+00 | 3.954e+00  2.732e+00 | MatMult 841 1.0 2.0422e+00 52%  MatMult 841 1.0 1.5918e+00 51% |
| 3 | -ksp\_type gmres  -pc\_type bjacobi  -sub\_pc\_type ilu | 1  4 | 0.00793242  0.792953 | 1710  1000 | 2.339e+01  1.653e+01 | 2.357e+01  1.434e+01 | MatMult 1767 1.0 4.2263e+00 18%  MatSolve 1767 1.0 5.6875e+00 24%  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 | 0.00793242  0.00680816 | 1710  1438 | 2.356e+01  1.537e+01 | 2.431e+01  1.403e+01 | MatMult 1767 1.0 4.2931e+00 18%  MatSolve 1767 1.0 5.8025e+00 24%  MatMult 1486 1.0 3.1340e+00 17%  MatSolve 1486 1.0 2.2843e+00 15% |
| 5 | -ksp\_type cg  -pc\_type bjacobi  -sub\_pc\_type icc | 1  4 | 0.000182336  0.000138671 | 278  330 | 2.694e+00  3.849e+00 | 2.269e+00  1.647e+00 | MatMult 279 1.0 6.8183e-01 30%  MatSolve 279 1.0 8.9309e-01 39%  MatMult 331 1.0 5.1950e-01 28%  MatSolve 331 1.0 5.3854e-01 29% |
| 6 | -ksp\_type gmres  -pc\_type asm  -sub\_pc\_type lu | 1  4 | 0.00793242  .008348 | 1710  2822 | 3.027e+01  4.152e+01 | 2.789e+01  3.947e+01 | MatMult 1767 1.0 4.2503e+00 15%  MatSolve 1767 1.0 5.6818e+00 20%  MatMult 2917 1.0 8.7585e+00 15%  MatSolve 2917 1.0 5.0460e+00 13% |
| 7 | -ksp\_type gmres  -pc\_type asm  -sub\_pc\_type lu  -pc\_asm\_overlap 2 | 1  4  12 | 0.00793242  0.00826525  0.00838079 | 1710  1574  2272 | 3.577e+01  2.489e+01  4.778e+01 | 3.014e+01  2.257e+01  4.318e+01 | MatMult 1767 1.0 4.5047e+00 15%  MatSolve 1767 1.0 6.1007e+00 20%  MatMult 1627 1.0 4.9358e+00 15%  MatSolve 1627 1.0 2.9003e+00 13%  MatMult 2348 1.0 1.7270e+01 17%  MatSolve 2348 1.0 1.8059e+00 4% |
| 8 | -ksp\_type cg  -pc\_type sor  -pc\_sor\_local\_symmetric | 1  4  12 | 0.000270909  0.000260308  0.000317699 | 329  371  379 | 3.737e+00  3.041e+00  3.718e+00 | 3.621e+00  2.580e+00  2.990e+00 | MatMult 330 1.0 8.6950e-01 24%  MatSOR 330 1.0 1.9404e+00 54%  MatMult 372 1.0 5.4604e-01 17%  MatSOR 372 1.0 1.2619e+00 42%  MatMult 380 1.0 7.2719e-01 13%  MatSOR 380 1.0 8.5536e-01 22% |