**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

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | 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 | 2.3735e+01  1.3202e+01 | MatMult      1034 1.0 7.9144e+00 33%  MatMult      1034 1.0 3.1413e+00 23% |
| 2 | -ksp\_type cg  -pc\_type none  -ksp\_max\_it 1000 | 1  4 | 5.21693e-05  5.21693e-05 | 840  840 | 1.088e+01  5.828e+00 | 1.0661e+01  5.6964e+00 | MatMult       841 1.0 6.4341e+00 59%  MatMult      841 1.0 2.7946e+00 44% |
| 3 | -ksp\_type gmres  -pc\_type bjacobi  -sub\_pc\_type ilu | 1  4 | 0.00793242  0.792953 | 1710  1000 | 5.744e+01  1.653e+01 | 5.7217e+01  1.6829e+01  (with max=1000) | MatMult      1767 1.0 1.3517e+01 24%  MatSolve    1767 1.0 1.5449e+01 27%  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  (When 1 processor,  m 480 –n 480,  if 500 it shows error) | 1  4 | 6.7601e-10  0.00191413 | 1(error)  132 | 8.790e+00  5.778e+00 | 8.5879e+00  5.6960e+00 | MatLUFactorNum 1 1.0 6.9012e+00 79%  MatLUFactorSym  1 1.0 1.0739e+00 12%  MatLUFactorNum  1 1.0 8.6497e-01 14%  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 | 6.645e+00  3.849e+00 | 6.4263e+00  3.8222e+00 | MatMult      279 1.0 2.1349e+00 32%  MatSolve      279 1.0 2.6879e+00 40%  MatMult       331 1.0 1.1466e+00 26%  MatSolve     331 1.0 1.3096e+00 31% |
| 6 | -ksp\_type gmres  -pc\_type asm  -sub\_pc\_type lu | 1  4 | 6.7601e-10  0.000268303 | 1(error)  58 | 8.880e+00  3.734e+00 | 8.6806e+0  3.6544e+00 | MatLUFactorNum 1 1.0 6.8533e+00 77%  MatLUFactorSym  1 1.0 1.1014e+00 12%  MatSolve    60 1.0 1.2854e+00 33%  MatLUFactorNum   1 1.0 8.3874e-01 22% |
| 7 | -ksp\_type gmres  -pc\_type asm  -sub\_pc\_type lu  -pc\_asm\_overlap 2 | 1  4  12 | 6.7601e-10  5.76526e-05  0.000326972 | 1(error)  37  84 | 8.887e+00  2.896e+00  4.357e+00 | 8.6852e+00  2.8050e+00  4.2764e+00 | MatLUFactorNum   1 1.0 6.8805e+00 77%  MatLUFactorSym   1 1.0 1.0720e+00 12%  MatLUFactorNum   1 1.0 8.5128e-01 29%  MatSolve        39 1.0 7.6818e-01 25%  MatSolve      87 1.0 6.5757e-01 14%  MatLUFactorNum   1 1.0 4.1967e-01 7% |
| 8 | -ksp\_type cg  -pc\_type sor  -pc\_sor\_local\_symmetric | 1  4  12 | 0.000270909  0.000260308  0.000317699 | 329  371  379 | 8.127e+00  4.530e+00  5.757e+00 | 7.9109e+00  4.4480e+00  5.6725e+00 | MatMult        330 1.0 2.5213e+00 31%  MatSOR         330 1.0 3.7805e+00 47%  MatSOR         372 1.0 1.7572e+00 36%  MatMult        372 1.0 1.2864e+00 25%  MatSOR         380 1.0 8.0797e-01 32%  MatMult        380 1.0 1.6938e+00 29% |