

Part I.a

The mean vector is:

```
[ 97.69496      3.8018749    21.686573    40.259743    20.341219    40.420425
 22.267612    39.2425      20.855335    39.026905    19.592106    50.949284
  7.9109387    54.60908     20.267107    35.3882     22.029108    42.936165
 19.485828    41.552402     7.4116645   755.5226     79.75042     4.0397515
 38.330833     3.7607067    24.988033 ]
```

The total variance is:

12504.28821890043

Part I.b

The inner form covariance matrix is:

```
[[ 1.05108330e+04  1.60503891e+02  9.12960911e+00  3.50970650e+01
 2.69952335e+01 -2.52280788e+01  1.74939156e+01  1.21090260e+01
 8.43628025e+00  7.55081463e+00  3.73679137e+00  6.43250513e+00
 7.34506912e+01 -2.65625061e+02  5.58117390e+00 -2.91737137e+01
 7.93596697e+00 -5.03670807e+01  2.06760049e+00 -2.19027596e+01
 5.40530777e+01 -2.64632320e+01 -2.32634918e+02  2.18936367e+01
 2.78560966e-01  6.60231781e+00 -1.65634727e+01 ]
[ 1.60503891e+02  6.29766846e+01 -2.99866378e-01  3.37784672e+00
-9.78320688e-02  1.64662969e+00 -1.55046415e+00  3.38748097e+00
-1.43611670e-01  3.95963907e+00 -1.15267682e+00  1.01116180e+01
-3.81949949e+00  3.80073509e+01 -2.26626086e+00  1.42326140e+00
-1.10925972e+00  5.35448372e-01 -2.51957726e+00 -2.88788438e-01
-3.14045858e+00 -6.21034920e-01  8.10511208e+00  1.17257810e+00
 1.87549388e+00 -1.20906377e+00  5.99487349e-02 ]
[ 9.12960911e+00 -2.99866378e-01  2.57931495e+00  1.04811037e+00
 2.94722939e+00 -1.63981076e-02  2.87512565e+00 -1.49226204e-01
 2.87730074e+00  6.82297647e-01  2.62248707e+00 -2.14178219e-01
 6.40429354e+00 -3.07682915e+01  2.84204984e+00  1.11029840e+00
 2.59309030e+00 -5.40439524e-02  2.73335624e+00  4.78411704e-01
 5.83128166e+00 -1.78933370e+00 -8.26768684e+00 -3.45058769e-01
-1.44357896e+00  3.84864759e+00 -1.44414812e-01 ]
[ 3.50970650e+01  3.37784672e+00  1.04811037e+00  1.58340168e+01
 2.35463190e+00  1.29154320e+01  2.02141047e+00  1.09387999e+01
 8.63116086e-01  1.52077875e+01  1.51053643e+00  1.08868361e+01
 7.66139412e+00  3.03829308e+01  1.79646537e-01  1.63027782e+01
-2.33925492e-01  1.53042154e+01  9.24035847e-01  1.26206970e+01
 7.21010590e+00 -8.65499878e+00  1.62537193e+01  1.99883866e+00
-9.88266528e-01  1.06672554e+01 -4.03386019e-02 ]
[ 2.69952335e+01 -9.78320688e-02  2.94722939e+00  2.35463190e+00
 4.80888987e+00 -1.47799337e+00  3.23443627e+00  8.67102206e-01
 3.41387653e+00  2.20445919e+00  2.91462946e+00  5.85513890e-01
 1.07000732e+01 -3.96435966e+01  3.07070565e+00  2.57055521e+00
 2.48020363e+00  7.85148382e-01  2.98450327e+00  1.43242753e+00
 9.23796272e+00 -2.15851164e+00 -1.65108986e+01  2.82171249e-01
-1.80328691e+00  5.35894012e+00 -3.52457136e-01 ]
[ -2.52280788e+01  1.64662969e+00 -1.63981076e-02  1.29154320e+01
-1.47799337e+00  1.65625305e+01  1.12108064e+00  8.98432922e+00
-3.93273830e-01  1.27459326e+01  8.28830481e-01  9.18897152e+00
-2.39682481e-01  4.94308167e+01 -4.41551238e-01  1.43730021e+01
-3.26578319e-01  1.44528055e+01  4.47214127e-01  1.14288807e+01
 7.28702009e-01 -7.69821835e+00  3.54698906e+01  6.90209508e-01
-2.57643431e-01  8.52080154e+00  3.70180964e-01 ]
[ 1.74939156e+01 -1.55046415e+00  2.87512565e+00  2.02141047e+00
 3.23443627e+00  1.12108064e+00  4.02427483e+00 -7.33431503e-02
 3.49472117e+00  1.06888628e+00  3.28651834e+00 -1.20091558e+00
 8.39184284e+00 -4.04709663e+01  3.58665133e+00  1.77097464e+00
 3.12075448e+00  4.65597540e-01  3.64272738e+00  1.12095833e+00
 7.46052074e+00 -2.81985497e+00 -8.42102623e+00 -4.95530874e-01
-2.42068172e+00  5.43481159e+00 -1.51056424e-01 ]
[ 1.21090260e+01  3.38748097e+00 -1.49226204e-01  1.09387999e+01
 8.67102206e-01  8.98432922e+00 -7.33431503e-02  1.05917368e+01
-9.33814228e-01  1.27011633e+01 -3.00533324e-01  1.10229263e+01
 1.52286839e+00  5.21988525e+01 -1.71731830e+00  1.38589907e+01
-1.80307376e+00  1.40918121e+01 -1.28032553e+00  1.12616644e+01
 2.04557705e+00 -5.61743832e+00  1.72732697e+01  2.09952235e+00
 6.54120088e-01  5.65684748e+00 -2.25259662e-02 ]
```

```

[ 8.43628025e+00 -1.43611670e-01 2.87730074e+00 8.63116086e-01
 3.41387653e+00 -3.93273830e-01 3.49472117e+00 -9.33814228e-01
 4.17316580e+00 -4.31449801e-01 3.28513408e+00 -1.40970075e+00
 8.11604309e+00 -4.47429085e+01 3.78338218e+00 4.54733223e-01
 3.18184590e+00 -1.01591229e+00 3.66058922e+00 -2.16671109e-01
 7.20690060e+00 -1.13806999e+00 -1.18289261e+01 -9.30089831e-01
-2.52429199e+00 4.45121336e+00 -5.37389070e-02]
[ 7.55081463e+00 3.95963907e+00 6.82297647e-01 1.52077875e+01
 2.20445919e+00 1.27459326e+01 1.06888628e+00 1.27011633e+01
-4.31449801e-01 1.88460999e+01 7.35201776e-01 1.38094215e+01
 6.84889936e+00 5.30320129e+01 -1.20178568e+00 1.98546467e+01
-1.41870987e+00 1.92153912e+01 -3.89354765e-01 1.54375429e+01
 6.77010870e+00 -8.05444050e+00 2.17874374e+01 3.19434547e+00
 1.34987041e-01 1.12262554e+01 -1.12427108e-01]
[ 3.73679137e+00 -1.15267682e+00 2.62248707e+00 1.51053643e+00
 2.91462946e+00 8.28830481e-01 3.28651834e+00 -3.00533324e-01
 3.28513408e+00 7.35201776e-01 3.40246201e+00 5.45597553e-01
 7.06788063e+00 -3.63347206e+01 3.38842154e+00 1.40467072e+00
 2.97669363e+00 1.57918185e-01 3.38566041e+00 5.53702056e-01
 6.38823652e+00 -2.33387613e+00 -7.52973080e+00 -6.55646503e-01
-1.83105814e+00 4.55224609e+00 -1.46805689e-01]
[ 6.43250513e+00 1.01116180e+01 -2.14178219e-01 1.08868361e+01
 5.85513890e-01 9.18897152e+00 -1.20091558e+00 1.10229263e+01
-1.40970075e+00 1.38094215e+01 5.45597553e-01 8.13930206e+01
-4.30419827e+00 7.41322098e+01 -2.71870899e+00 1.50321827e+01
-1.53518128e+00 1.69599514e+01 -2.51752257e+00 1.01946125e+01
-2.54852653e+00 -7.96565819e+00 2.49962902e+01 1.81430006e+00
-1.39747512e+00 2.95833182e+00 -1.44596040e+00]
[ 7.34506912e+01 -3.81949949e+00 6.40429354e+00 7.66139412e+00
 1.07000732e+01 -2.39682481e-01 8.39184284e+00 1.52286839e+00
 8.11604309e+00 6.84889936e+00 7.06788063e+00 -4.30419827e+00
 3.70904427e+01 -1.27506767e+02 7.95520401e+00 7.97568798e+00
 5.75206709e+00 2.34556031e+00 8.18604565e+00 4.66275835e+00
 3.15667343e+01 -6.38283396e+00 -5.16465187e+01 2.52560043e+00
-5.84071398e+00 1.95229931e+01 -1.33188486e+00]
[ -2.65625061e+02 3.80073509e+01 -3.07682915e+01 3.03829308e+01
-3.96435966e+01 4.94308167e+01 -4.04709663e+01 5.21988525e+01
-4.47429085e+01 5.30320129e+01 -3.63347206e+01 7.41322098e+01
-1.27506767e+02 9.70261353e+02 -4.95530357e+01 5.69048767e+01
-4.05720482e+01 7.96691971e+01 -4.63719826e+01 5.06829033e+01
-1.06262199e+02 -1.51688118e+01 3.33526642e+02 7.50659275e+00
 3.99367104e+01 -3.40249596e+01 5.27013731e+00]
[ 5.58117390e+00 -2.26626086e+00 2.84204984e+00 1.79646537e-01
 3.07070565e+00 -4.41551238e-01 3.58665133e+00 -1.71731830e+00
 3.78338218e+00 -1.20178568e+00 3.38842154e+00 -2.71870899e+00
 7.95520401e+00 -4.95530357e+01 4.45184612e+00 -3.66310805e-01
 3.64076877e+00 -2.31435800e+00 4.01606989e+00 -6.80499077e-01
 7.08255243e+00 -1.52566314e+00 -1.29283819e+01 -9.61396039e-01
-2.73960948e+00 4.12973833e+00 -1.19275719e-01]
[ -2.91737137e+01 1.42326140e+00 1.11029840e+00 1.63027782e+01
 2.57055521e+00 1.43730021e+01 1.77097464e+00 1.38589907e+01
 4.54733223e-01 1.98546467e+01 1.40467072e+00 1.50321827e+01
 7.97568798e+00 5.69048767e+01 -3.66310805e-01 2.61538086e+01
-1.24148369e+00 2.36174984e+01 2.89051950e-01 1.82303810e+01
 8.00014973e+00 -1.00598497e+01 2.88444424e+01 2.66977739e+00
-4.33349639e-01 1.37686157e+01 1.34904385e-01]
[ 7.93596697e+00 -1.10925972e+00 2.59309030e+00 -2.33925492e-01
 2.48020363e+00 -3.26578319e-01 3.12075448e+00 -1.80307376e+00
 3.18184590e+00 -1.41870987e+00 2.97669363e+00 -1.53518128e+00
 5.75206709e+00 -4.05720482e+01 3.64076877e+00 -1.24148369e+00
 3.82637167e+00 -2.14124894e+00 3.42597628e+00 -1.27347100e+00
 5.23015404e+00 -2.35712028e+00 -8.75699043e+00 -1.04945338e+00
-1.38653624e+00 3.21479559e+00 -9.10323858e-02]
[ -5.03670807e+01 5.35448372e-01 -5.40439524e-02 1.53042154e+01
 7.85148382e-01 1.44528055e+01 4.65597540e-01 1.40918121e+01
-1.01591229e+00 1.92153912e+01 1.57918185e-01 1.69599514e+01
 2.34556031e+00 7.96691971e+01 -2.31435800e+00 2.36174984e+01
-2.14124894e+00 2.72925701e+01 -1.18947303e+00 1.85606918e+01
 3.25401735e+00 -8.72031689e+00 3.79379730e+01 2.59155846e+00

```

```

2.84533978e+00 1.09955139e+01 3.39253157e-01]
[ 2.06760049e+00 -2.51957726e+00 2.73335624e+00 9.24035847e-01
 2.98450327e+00 4.47214127e-01 3.64272738e+00 -1.28032553e+00
 3.66058922e+00 -3.89354765e-01 3.38566041e+00 -2.51752257e+00
 8.18604565e+00 -4.63719826e+01 4.01606989e+00 2.89051950e-01
 3.42597628e+00 -1.18947303e+00 4.05886078e+00 -7.26248622e-02
 7.15831089e+00 -2.33782887e+00 -9.57178879e+00 -8.77806127e-01
-2.46920848e+00 4.91387272e+00 -3.58389765e-02]
[ -2.19027596e+01 -2.88788438e-01 4.78411704e-01 1.26206970e+01
 1.43242753e+00 1.14288807e+01 1.12095833e+00 1.12616644e+01
-2.16671109e-01 1.54375429e+01 5.53702056e-01 1.01946125e+01
 4.66275835e+00 5.06829033e+01 -6.80499077e-01 1.82303810e+01
-1.27347100e+00 1.85606918e+01 -7.26248622e-02 1.72340508e+01
 4.92847157e+00 -5.64395666e+00 2.22305908e+01 2.42848229e+00
 4.24352348e-01 9.40883541e+00 -1.77801028e-01]
[ 5.40530777e+01 -3.14045858e+00 5.83128166e+00 7.21010590e+00
 9.23796272e+00 7.28702009e-01 7.46052074e+00 2.04557705e+00
 7.20690060e+00 6.77010870e+00 6.38823652e+00 -2.54852653e+00
 3.15667343e+01 -1.06262199e+02 7.08255243e+00 8.00014973e+00
 5.23015404e+00 3.25401735e+00 7.15831089e+00 4.92847157e+00
 2.82733974e+01 -5.63596153e+00 -4.54942665e+01 2.51462817e+00
-4.85197687e+00 1.76345387e+01 -1.17289054e+00]
[ -2.64632320e+01 -6.21034920e-01 -1.78933370e+00 -8.65499878e+00
-2.15851164e+00 -7.69821835e+00 -2.81985497e+00 -5.61743832e+00
-1.13806999e+00 -8.05444050e+00 -2.33387613e+00 -7.96565819e+00
-6.38283396e+00 -1.51688118e+01 -1.52566314e+00 -1.00598497e+01
-2.35712028e+00 -8.72031689e+00 -2.33782887e+00 -5.64395666e+00
-5.63596153e+00 5.47489548e+01 -1.01451960e+01 -4.26271963e+00
 3.51827407e+00 -7.57593012e+00 7.50254318e-02]
[ -2.32634918e+02 8.10511208e+00 -8.26768684e+00 1.62537193e+01
-1.65108986e+01 3.54698906e+01 -8.42102623e+00 1.72732697e+01
-1.18289261e+01 2.17874374e+01 -7.52973080e+00 2.49962902e+01
-5.16465187e+01 3.33526642e+02 -1.29283819e+01 2.88444424e+01
-8.75699043e+00 3.79379730e+01 -9.57178879e+00 2.22305908e+01
-4.54942665e+01 -1.01451960e+01 2.22031143e+02 -6.44496393e+00
 1.46088314e+01 2.28166032e+00 4.41528130e+00]
[ 2.18936367e+01 1.17257810e+00 -3.45058769e-01 1.99883866e+00
 2.82171249e-01 6.90209508e-01 -4.95530874e-01 2.09952235e+00
-9.30089831e-01 3.19434547e+00 -6.55646503e-01 1.81430006e+00
 2.52560043e+00 7.50659275e+00 -9.61396039e-01 2.66977739e+00
-1.04945338e+00 2.59155846e+00 -8.77806127e-01 2.42848229e+00
 2.51462817e+00 -4.26271963e+00 -6.44496393e+00 6.00817251e+00
-2.17281640e-01 1.29518151e+00 -4.03005213e-01]
[ 2.78560966e-01 1.87549388e+00 -1.44357896e+00 -9.88266528e-01
-1.80328691e+00 -2.57643431e-01 -2.42068172e+00 6.54120088e-01
-2.52429199e+00 1.34987041e-01 -1.83105814e+00 -1.39747512e+00
-5.84071398e+00 3.99367104e+01 -2.73960948e+00 -4.33349639e-01
-1.38653624e+00 2.84533978e+00 -2.46920848e+00 4.24352348e-01
-4.85197687e+00 3.51827407e+00 1.46088314e+01 -2.17281640e-01
 1.39108826e+02 -2.08723545e+00 -1.00679684e+00]
[ 6.60231781e+00 -1.20906377e+00 3.84864759e+00 1.06672554e+01
 5.35894012e+00 8.52080154e+00 5.43481159e+00 5.65684748e+00
 4.45121336e+00 1.12262554e+01 4.55224609e+00 2.95833182e+00
 1.95229931e+01 -3.40249596e+01 4.12973833e+00 1.37686157e+01
 3.21479559e+00 1.09955139e+01 4.91387272e+00 9.40883541e+00
 1.76345387e+01 -7.57593012e+00 2.28166032e+00 1.29518151e+00
-2.08723545e+00 1.75941830e+01 -2.39730090e-01]
[ -1.65634727e+01 5.99487349e-02 -1.44414812e-01 -4.03386019e-02
-3.52457136e-01 3.70180964e-01 -1.51056424e-01 -2.25259662e-02
-5.37389070e-02 -1.12427108e-01 -1.46805689e-01 -1.44596040e+00
-1.33188486e+00 5.27013731e+00 -1.19275719e-01 1.34904385e-01
-9.10323858e-02 3.39253157e-01 -3.58389765e-02 -1.77801028e-01
-1.17289054e+00 7.50254318e-02 4.41528130e+00 -4.03005213e-01
-1.00679684e+00 -2.39730090e-01 2.10141785e+02]]

```

The outer form covariance matrix is:

```

[[ 1.05107656e+04 -2.75957568e+08 9.12972069e+00 3.50972443e+01
 2.69953575e+01 -1.69464417e+01 1.74939251e+01 1.21089573e+01
 8.43622971e+00 7.14993940e+29 3.73682141e+00 6.43250513e+00

```

3.29860751e+10	-2.65625702e+02	-4.44667624e+20	-5.60853386e+00
-1.56720565e+15	-5.03670540e+01	2.06758642e+00	-2.19028969e+01
5.40530396e+01	9.30345281e+24	6.34496165e+18	8.29107422e+03
2.78423399e-01	6.60231781e+00	-1.65634785e+01]	
[ 1.60478226e+02	6.29829102e+01	-2.99879193e-01	7.55263127e+17
-9.78311971e-02	1.64662635e+00	-1.54582977e+00	3.62083459e+00
-1.43619418e-01	3.95968652e+00	-1.15266776e+00	1.01116619e+01
-3.88129463e+12	3.80074120e+01	-2.26626348e+00	1.13908377e+01
-1.10925233e+00	5.48054436e+14	-2.51955223e+00	-2.88793296e-01
-3.13985062e+00	-6.21039271e-01	8.10509491e+00	3.87384199e+28
1.87538552e+00	-1.20906150e+00	5.99483252e-02]	
[ 9.12905884e+00	-2.99879193e-01	2.57930875e+00	1.04811120e+00
2.94723868e+00	-1.63990092e-02	-1.01910794e+28	2.22114574e+27
2.34029783e+16	-6.17140571e+20	2.62250137e+00	-2.14177996e-01
6.40430355e+00	-3.07683048e+01	2.84204102e+00	1.11029673e+00
2.59653950e+00	-5.40467538e-02	2.73515892e+00	4.78412747e-01
5.83128500e+00	-5.26974659e+23	-8.26772118e+00	-5.67202615e+16
-1.44358754e+00	3.01511288e+00	-1.44414529e-01]	
[ 3.50972443e+01	-2.27552159e+12	1.04811120e+00	1.58339005e+01
2.35462403e+00	8.94280957e+03	2.02070880e+00	1.09387674e+01
6.32197166e+22	1.52077465e+01	-2.48798239e+31	1.08868160e+01
4.30793589e+11	3.03829021e+01	1.79645374e-01	1.63027859e+01
-2.33922869e-01	1.53042297e+01	9.24029112e-01	1.26206818e+01
7.21010828e+00	-8.65497494e+00	1.62537212e+01	1.99883556e+00
-9.88902867e-01	1.06672459e+01	-1.16479429e+13]	
[ 2.69953575e+01	-9.78311971e-02	2.94723868e+00	2.34377503e+00
3.83009845e+18	-1.47799373e+00	2.85568810e+00	8.67099941e-01
3.41386819e+00	2.20445418e+00	2.91461611e+00	5.85512161e-01
1.06999397e+01	-3.96435509e+01	3.07070446e+00	2.57055402e+00
1.30939225e+06	7.85146594e-01	2.98451018e+00	1.43242848e+00
9.23795986e+00	7.47286838e+32	-1.65108738e+01	2.82168299e-01
-1.17362869e+00	5.35894060e+00	-4.55181156e+05]	
[-2.52281456e+01	6.55630500e+10	-1.63982175e-02	1.71249027e+01
2.32679219e+10	1.37881120e+16	1.12108064e+00	8.98432064e+00
-9.85302712e+10	2.37405952e+08	8.28831673e-01	1.73314009e+25
2.73155371e+03	1.27294753e+28	-4.41551924e-01	1.43730097e+01
2.52112979e+28	1.44528122e+01	4.47213024e-01	4.81980211e+10
2.11181851e+15	-1.47690525e+01	3.54698601e+01	6.90199614e-01
-2.57644504e-01	1.24918914e+19	3.35268288e+01]	
[ 1.74936657e+01	-1.43778229e+23	1.16999616e+09	2.02141261e+00
3.23444247e+00	1.12108064e+00	2.31003770e+32	1.21896016e+08
3.50775838e+00	1.06888938e+00	3.28650784e+00	-1.20091164e+00
8.39183617e+00	-4.04707947e+01	3.58664417e+00	4.37004063e+19
3.12074900e+00	4.65592533e-01	2.19870190e+03	1.12095797e+00
7.46053553e+00	-2.81985688e+00	-9.25355469e+03	-1.03367579e+16
-2.42066312e+00	2.51915817e+01	-1.51056454e-01]	
[ 1.21089573e+01	3.38748741e+00	-2.77563035e-01	2.40104122e+01
-3.51632539e+04	8.98432064e+00	-3.31931504e+28	7.15600688e+05
-9.33819115e-01	1.27011652e+01	-3.00522029e-01	1.10229549e+01
1.52286828e+00	5.21989326e+01	5.45519043e+16	1.38590183e+01
-1.80307448e+00	1.40918131e+01	-1.85489736e+11	3.48994026e+01
2.04557443e+00	-5.61743689e+00	1.24345743e+25	2.12241268e+00
6.54122472e-01	5.65686941e+00	1.13743100e+06]	
[-6.44219500e+05	-6.79543996e+20	2.87728691e+00	8.63119423e-01
3.41386819e+00	-3.93276095e-01	3.49472070e+00	6.37629318e+00
-4.48445469e+05	-4.31449085e-01	5.50972072e+23	-1.40964460e+00
8.11605835e+00	-4.47428017e+01	3.79807925e+00	4.54731643e-01
1.13215410e+07	1.68507933e+20	3.66058326e+00	-2.16672599e-01
7.35657930e+00	-1.13806796e+00	-1.18311357e+01	-9.30088401e-01
-2.52428794e+00	-1.42580330e+07	-5.12231477e-02]	
[ 7.55082893e+00	-5.08156550e+12	6.82298779e-01	1.52077465e+01
-9.28043303e+11	1.27459459e+01	1.06888938e+00	1.27011652e+01
-4.31840986e-01	1.36362762e+06	7.35203743e-01	1.38093567e+01
-1.58341825e+32	7.20255982e+17	4.86942239e+15	1.98546391e+01
-1.41871631e+00	1.92152805e+01	-1.32531509e-01	1.54374886e+01
6.77008390e+00	-8.05445004e+00	-9.87989639e+29	3.19431567e+00
1.34981081e-01	1.12262068e+01	9.46342782e+25]	
[ 3.73682141e+00	4.33729025e+18	2.62250137e+00	1.51053417e+00
-5.63746598e+32	8.28831673e-01	-1.43990464e+32	-3.00522029e-01

3.28513002e+00	7.35203743e-01	3.40238166e+00	5.45598149e-01
7.06786966e+00	-3.63346863e+01	3.38841414e+00	3.84784631e+28
2.97669339e+00	3.98151844e+10	1.68421123e+32	7.21756500e+05
6.38823891e+00	-2.33388019e+00	-7.52973604e+00	2.96352350e+11
-7.00411861e+21	4.55223417e+00	-1.46805599e-01]	
[ 6.43250513e+00	1.37660830e+07	2.72436690e+00	1.08868160e+01
-2.41356322e+12	9.18893814e+00	-1.20011365e+00	-1.57996680e+03
-7.32822227e+00	1.38093567e+01	5.45598149e-01	-5.80862083e+11
5.51382075e+29	7.41324387e+01	4.19069092e+10	4.37506521e+15
-2.03741332e+32	1.69599323e+01	3.00669434e+02	-7.72536197e+16
-2.54851913e+00	9.75257454e+23	2.49961758e+01	1.81432056e+00
-1.39747608e+00	-3.29374685e+17	-1.44595921e+00]	
[ 7.34504471e+01	-3.81950212e+00	6.40430355e+00	3.80780692e+29
1.07000685e+01	-2.39689335e-01	8.39183617e+00	1.52286828e+00
-7.49238845e+15	6.84891224e+00	7.06786966e+00	-7.48661387e+15
3.70911255e+01	-1.27506790e+02	7.95520353e+00	9.39779453e+28
2.05571175e+06	2.34568906e+00	2.12155549e+22	2.01911888e+01
3.15668125e+01	-6.38283730e+00	-7.89855051e+16	4.05374280e+07
-5.84072447e+00	1.95228462e+01	-1.33869374e+00]	
[ -2.65625702e+02	3.80072250e+01	6.98481190e+15	3.03829021e+01
-3.96435509e+01	6.25179749e+01	-4.04707947e+01	5.21989326e+01
-1.48226566e+01	-2.02297004e+32	-3.63346863e+01	7.41323318e+01
-1.27506790e+02	9.70265198e+02	-6.41878281e+01	5.69049721e+01
-4.03446732e+01	7.96684113e+01	-4.63721046e+01	5.06830902e+01
-1.06262329e+02	-1.51688051e+01	3.33526276e+02	7.50663805e+00
3.98882332e+01	1.21719749e+16	5.27013826e+00]	
[ -1.56935862e+06	-2.26626348e+00	2.06198543e+28	1.79645374e-01
1.60451801e+17	-4.41551924e-01	3.58664417e+00	1.20979488e+00
3.81500506e+00	-1.20178258e+00	3.38841414e+00	-2.71872187e+00
7.95520353e+00	-4.95532112e+01	3.64581992e+04	-3.66319150e-01
3.64078283e+00	-2.31435800e+00	1.10708541e+18	-6.80504143e-01
-1.20653821e+12	1.60757484e+01	-1.17125463e+01	-9.61401582e-01
-2.73961425e+00	-2.03056524e+15	-1.19276471e-01]	
[ -2.91735821e+01	-1.03295620e+13	1.11029673e+00	1.63027859e+01
2.57055402e+00	1.43730097e+01	1.77097046e+00	1.38590183e+01
4.54731643e-01	1.27434788e+06	1.39489579e+00	1.49174948e+01
7.97569752e+00	3.30705811e+02	-3.66319150e-01	2.61533699e+01
-1.24147904e+00	2.36174583e+01	2.89054751e-01	1.82303371e+01
-1.28437379e+11	-1.00598669e+01	-1.02485496e+29	2.66978168e+00
-9.82788500e+06	1.37686119e+01	1.35088563e-01]	
[ 6.75859022e+00	-1.10925233e+00	-1.05916730e+09	1.96809427e+15
1.19332989e+24	4.39978530e+14	3.12074900e+00	-6.50680208e+00
3.18183398e+00	-1.41871631e+00	2.97669339e+00	-1.53517866e+00
5.75206995e+00	-2.22313008e+04	1.28772086e+19	-1.24147904e+00
-6.03388480e+08	-2.14126682e+00	3.42597818e+00	-1.27346575e+00
5.23014784e+00	-2.35711551e+00	2.86746324e+15	-6.27187375e+05
1.51371175e+17	-2.74103379e+00	-9.10315439e-02]	
[ -5.03619347e+01	5.35446048e-01	-5.40467538e-02	1.53042297e+01
-9.42056301e+15	1.44528122e+01	5.44730365e-01	1.40918131e+01
-1.01591206e+00	1.92152805e+01	-1.19768441e+00	2.20906516e+15
1.78858913e+29	7.96690369e+01	-2.31435800e+00	2.36174583e+01
-2.14126682e+00	2.72924080e+01	-1.18948615e+00	-1.89723953e+15
-5.16214866e+10	-8.72034359e+00	3.79380112e+01	7.54763965e+03
2.84535146e+00	1.09955072e+01	3.39252263e-01]	
[ 2.06758642e+00	4.24190592e+08	2.73336077e+00	9.24029112e-01
2.98451018e+00	8.89338140e+23	3.64273190e+00	6.57818775e+29
3.66058326e+00	-3.89358550e-01	3.38567066e+00	-2.51752687e+00
8.18602467e+00	-4.63721046e+01	4.01605511e+00	2.89044470e-01
3.42597818e+00	-1.18948615e+00	7.51872036e+12	3.42065515e+25
-2.68779297e+03	-4.70550031e+05	-9.57179832e+00	-8.77804816e-01
-2.46919513e+00	4.91387796e+00	-3.58387306e-02]	
[ -1.68430330e+14	3.11578424e+32	4.78412747e-01	1.26206818e+01
3.20316211e+09	-1.99290137e+30	-1.16776940e+10	1.12616768e+01
-2.16672599e-01	1.54374886e+01	-1.69922183e+23	-4.85574371e+02
4.68298149e+00	5.06830902e+01	1.25728189e+23	1.82303371e+01
-1.27346575e+00	1.85632935e+01	-4.78327908e-02	1.72340260e+01
4.92847157e+00	1.07186258e+10	2.22305965e+01	2.42848682e+00
4.24358785e-01	9.40882015e+00	-1.77801296e-01]	
[ 1.48556274e+02	-3.73032909e+09	5.83128500e+00	4.88764658e+16

9.23795986e+00	7.28699148e-01	7.46078730e+00	2.04557443e+00
7.20688200e+00	1.91027700e+07	1.04585114e+27	-2.54153991e+00
6.35297585e+01	-1.06262329e+02	7.08253813e+00	8.00016499e+00
2.10948696e+01	3.25400901e+00	2.25482884e+15	4.92847157e+00
2.82734585e+01	9.12857563e+11	-4.54941406e+01	-1.43273811e+01
-7.93109120e+08	1.76345520e+01	-1.17288947e+00]	
[-2.64280872e+01	4.94559094e+05	1.31026962e+06	8.17243725e+22
-2.15851378e+00	-8.88329467e+20	-1.72465946e+24	-5.61743689e+00
-1.10362089e+00	-8.05445004e+00	-2.33387995e+00	-7.96567345e+00
4.28494763e+12	1.11488532e+10	-1.52566397e+00	-1.04008913e+01
-2.35711551e+00	-8.72034359e+00	-6.89364802e+27	-5.64395189e+00
-5.63596582e+00	1.89222028e+20	-1.01451683e+01	-4.26275587e+00
3.51824999e+00	-7.57590818e+00	7.50260949e-02]	
[-2.32634659e+02	-2.57569467e+27	-8.26772118e+00	1.62537212e+01
-1.65108738e+01	3.54698601e+01	-8.42157936e+00	1.72731667e+01
-1.18289270e+01	3.60672650e+06	-7.39446402e+00	2.49961758e+01
-6.24483010e+14	3.33526276e+02	-4.46569125e+05	9.25192600e+06
-8.75697327e+00	3.79855270e+01	-9.57179832e+00	-3.77074648e+04
-1.12898998e+12	-1.01451693e+01	2.22016617e+02	-6.44497347e+00
1.46490574e+01	8.94533825e+00	-4.70157099e+00]	
[ 4.28329200e+07	4.25942050e+06	-3.45059693e-01	1.99883556e+00
2.82168299e-01	6.90199614e-01	-4.95531172e-01	2.09952068e+00
-9.30088401e-01	3.19431567e+00	-5.26576636e+28	1.81432056e+00
-1.11276026e+01	7.50663805e+00	-9.61402357e-01	-1.91933928e+17
-1.04945087e+00	2.59155607e+00	6.09052829e+13	2.42848682e+00
5.88255514e+16	1.02148139e+24	-6.44497347e+00	6.00841284e+00
-2.17279732e-01	1.29518044e+00	-4.03005779e-01]	
[ 2.79712349e-01	1.87538552e+00	-1.44358754e+00	2.21296919e+11
6.64064938e+05	-2.57644504e-01	-2.42066312e+00	2.51679372e+28
-2.52428794e+00	1.34981081e-01	-1.83104885e+00	-1.39747608e+00
-5.84072447e+00	3.99357605e+01	-1.37776421e+32	4.16260451e+30
4.29276593e+30	2.84535146e+00	7.20129579e+28	4.24358785e-01
-1.11292120e+07	1.18324961e+05	1.46087980e+01	-2.17279732e-01
-3.27900191e+15	-2.08723593e+00	7.82952940e+10]	
[ 6.60231781e+00	9.97230600e+06	3.84864736e+00	-8.24876774e+21
5.35894060e+00	6.79408187e+32	5.43481827e+00	5.65686941e+00
8.57282762e+31	1.12262068e+01	4.59539270e+00	2.95833421e+00
1.95229855e+01	-3.40250092e+01	4.12973499e+00	1.37686119e+01
3.21478939e+00	1.09955072e+01	8.45488364e+17	-8.23886799e+13
1.76345520e+01	-7.57590818e+00	2.28166199e+00	1.29529035e+00
-2.08723593e+00	1.93073788e+12	2.67722534e+02]	
[-1.65634785e+01	6.02698959e-02	-1.44534126e-01	2.09720032e+15
-3.52457017e-01	3.70181918e-01	2.04453245e-01	-2.25260090e-02
-6.04409874e+16	1.84293811e+03	-1.46805599e-01	-1.44595921e+00
-1.33188438e+00	9.02604218e+01	-1.19276471e-01	1.34904027e-01
-9.10315439e-02	3.39252263e-01	-3.58387306e-02	2.28169402e+18
-1.90928828e+25	7.50260949e-02	4.41529083e+00	-4.03005779e-01
-1.00680220e+00	-2.47951537e-01	2.10141678e+02]]	

#### Part I.c

The correlation matrix is:

[ [ 1.00000000e+00	1.97277308e-01	5.54474331e-02	8.60313326e-02
1.20073207e-01	-6.04647510e-02	8.50598589e-02	3.62916775e-02
4.02809456e-02	1.69654172e-02	1.97598506e-02	6.95453305e-03
1.17637649e-01	-8.31775516e-02	2.58010235e-02	-5.56423776e-02
3.95719744e-02	-9.40385759e-02	1.00102760e-02	-5.14619909e-02
9.91545916e-02	-3.48848142e-02	-1.52282283e-01	8.71220678e-02
2.30369144e-04	1.53530035e-02	-1.11449109e-02]	
[ 1.97277308e-01	1.00000012e+00	-2.35280376e-02	1.06968150e-01
-5.62171685e-03	5.09850346e-02	-9.73930731e-02	1.31160602e-01
-8.85863975e-03	1.14935711e-01	-7.87446499e-02	1.41233325e-01
-7.90288374e-02	1.53756455e-01	-1.35347411e-01	3.50693204e-02
-7.14578256e-02	1.29153300e-02	-1.57592565e-01	-8.76589492e-03
-7.44241998e-02	-1.05764084e-02	6.85428530e-02	6.02810308e-02
2.00377256e-02	-3.63224223e-02	5.21115435e-04]	
[ 5.54474294e-02	-2.35280376e-02	1.00000012e+00	1.64005831e-01
8.36834013e-01	-2.50887009e-03	8.92402649e-01	-2.85502113e-02
8.77001405e-01	9.78612974e-02	8.85247171e-01	-1.47818746e-02
6.54768944e-01	-6.15045011e-01	8.38705361e-01	1.35182366e-01

8.25414121e-01	-6.44128816e-03	8.44776869e-01	7.17556179e-02
6.82846069e-01	-1.50574446e-01	-3.45481575e-01	-8.76535848e-02
-7.62098357e-02	5.71309507e-01	-6.20302279e-03]	
[ 8.60313326e-02	1.06968157e-01	1.64005831e-01	9.99999881e-01
2.69839197e-01	7.97535479e-01	2.53229976e-01	8.44676733e-01
1.06179543e-01	8.80358815e-01	2.05796987e-01	3.03258181e-01
3.16141307e-01	2.45126203e-01	2.13970151e-02	8.01121950e-01
-3.00530400e-02	7.36195743e-01	1.15263343e-01	7.64001310e-01
3.40766639e-01	-2.93956816e-01	2.74126023e-01	2.04932570e-01
-2.10572258e-02	6.39105558e-01	-6.99308934e-04]	
[ 1.20073207e-01	-5.62171638e-03	8.36834073e-01	2.69839197e-01
9.99999881e-01	-1.65610060e-01	7.35245526e-01	1.21496648e-01
7.62065947e-01	2.31562868e-01	7.20550299e-01	2.95951944e-02
8.01185906e-01	-5.80371737e-01	6.63660049e-01	2.29211837e-01
5.78191102e-01	6.85341656e-02	6.75534546e-01	1.57346308e-01
7.92254627e-01	-1.33028299e-01	-5.05290747e-01	5.24951406e-02
-6.97212368e-02	5.82601964e-01	-1.10873487e-02]	
[-6.04647510e-02	5.09850308e-02	-2.50887009e-03	7.97535479e-01
-1.65610060e-01	9.99999881e-01	1.37318715e-01	6.78326368e-01
-4.73041087e-02	7.21435487e-01	1.10409319e-01	2.50270635e-01
-9.67034418e-03	3.89933079e-01	-5.14218472e-02	6.90584183e-01
-4.10232842e-02	6.79777265e-01	5.45443892e-02	6.76467061e-01
3.36742252e-02	-2.55645961e-01	5.84910691e-01	6.91904873e-02
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7.35245526e-01	1.37318715e-01	1.00000000e+00	-1.12339417e-02
8.52777839e-01	1.22737408e-01	8.88168991e-01	-6.63552210e-02
6.86882615e-01	-6.47672415e-01	8.47374260e-01	1.72623947e-01
7.95283973e-01	4.44267616e-02	9.01323795e-01	1.34602144e-01
6.99417174e-01	-1.89974383e-01	-2.81717777e-01	-1.00775674e-01
-1.02309629e-01	6.45886421e-01	-5.19444561e-03]	
[ 3.62916812e-02	1.31160602e-01	-2.85502095e-02	8.44676733e-01
1.21496648e-01	6.78326368e-01	-1.12339407e-02	1.00000000e+00
-1.40457228e-01	8.98978233e-01	-5.00624888e-02	3.75422001e-01
7.68329948e-02	5.14912069e-01	-2.50090480e-01	8.32684636e-01
-2.83228129e-01	8.28821599e-01	-1.95269659e-01	8.33537757e-01
1.18207008e-01	-2.33274251e-01	3.56191874e-01	2.63187766e-01
1.70410573e-02	4.14387226e-01	-4.77467314e-04]	
[ 4.02809493e-02	-8.85863975e-03	8.77001405e-01	1.06179535e-01
7.62065947e-01	-4.73041087e-02	8.52777839e-01	-1.40457243e-01
1.00000012e+00	-4.86504361e-02	8.71813655e-01	-7.64892697e-02
6.52349770e-01	-7.03148544e-01	8.77763033e-01	4.35267687e-02
7.96256605e-01	-9.51921642e-02	8.89438927e-01	-2.55490374e-02
6.63478315e-01	-7.52918944e-02	-3.88602495e-01	-1.85746595e-01
-1.04768187e-01	5.19470692e-01	-1.81467901e-03]	
[ 1.69654172e-02	1.14935704e-01	9.78612974e-02	8.80358875e-01
2.31562868e-01	7.21435547e-01	1.22737408e-01	8.98978174e-01
-4.86504361e-02	1.00000000e+00	9.18119401e-02	3.52590919e-01
2.59047270e-01	3.92177820e-01	-1.31203726e-01	8.94301414e-01
-1.67066470e-01	8.47259223e-01	-4.45176959e-02	8.56591463e-01
2.93289065e-01	-2.50747561e-01	3.36812705e-01	3.00192535e-01
2.63635558e-03	6.16509318e-01	-1.78650441e-03]	
[ 1.97598506e-02	-7.87446424e-02	8.85247171e-01	2.05796972e-01
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8.71813655e-01	9.18119401e-02	1.00000000e+00	3.27855311e-02
6.29160643e-01	-6.32383943e-01	8.70624125e-01	1.48905382e-01
8.24980974e-01	1.63875241e-02	9.11055267e-01	7.23079070e-02
6.51321352e-01	-1.70998886e-01	-2.73952901e-01	-1.45011306e-01
-8.41643438e-02	5.88361919e-01	-5.49022388e-03]	
[ 6.95453351e-03	1.41233325e-01	-1.47818755e-02	3.03258181e-01
2.95951925e-02	2.50270665e-01	-6.63552135e-02	3.75422001e-01
-7.64892697e-02	3.52590948e-01	3.27855311e-02	9.99999881e-01
-7.83371255e-02	2.63796479e-01	-1.42823294e-01	3.25807422e-01
-8.69906396e-02	3.59839499e-01	-1.38508916e-01	2.72197038e-01
-5.31259291e-02	-1.19327396e-01	1.85940936e-01	8.20435211e-02
-1.31332781e-02	7.81751573e-02	-1.10562183e-02]	
[ 1.17637642e-01	-7.90288299e-02	6.54768884e-01	3.16141278e-01
8.01185906e-01	-9.67034418e-03	6.86882615e-01	7.68329948e-02
6.52349770e-01	2.59047270e-01	6.29160643e-01	-7.83371329e-02

1.00000000e+00	-6.72137141e-01	6.19084954e-01	2.56076485e-01
4.82835740e-01	7.37213716e-02	6.67177081e-01	1.84424341e-01
9.74786818e-01	-1.41642839e-01	-5.69119036e-01	1.69185206e-01
-8.13125521e-02	7.64241874e-01	-1.50861870e-02]	
[-8.31775516e-02	1.53756455e-01	-6.15044951e-01	2.45126188e-01
-5.80371737e-01	3.89933079e-01	-6.47672415e-01	5.14912009e-01
-7.03148544e-01	3.92177790e-01	-6.32383883e-01	2.63796479e-01
-6.72137082e-01	1.00000012e+00	-7.53973067e-01	3.57221544e-01
-6.65869355e-01	4.89580244e-01	-7.38940120e-01	3.91943455e-01
-6.41572058e-01	-6.58141524e-02	7.18586743e-01	9.83167067e-02
1.08705267e-01	-2.60416627e-01	1.16713569e-02]	
[ 2.58010216e-02	-1.35347411e-01	8.38705301e-01	2.13970151e-02
6.63660049e-01	-5.14218435e-02	8.47374260e-01	-2.50090450e-01
8.77763093e-01	-1.31203726e-01	8.70624185e-01	-1.42823294e-01
6.19084954e-01	-7.53973067e-01	1.00000000e+00	-3.39478403e-02
8.82123590e-01	-2.09960803e-01	9.44776595e-01	-7.76897594e-02
6.31292582e-01	-9.77238640e-02	-4.11213309e-01	-1.85892135e-01
-1.10088319e-01	4.66624945e-01	-3.89965088e-03]	
[-5.56423776e-02	3.50693166e-02	1.35182366e-01	8.01121891e-01
2.29211837e-01	6.90584242e-01	1.72623947e-01	8.32684696e-01
4.35267650e-02	8.94301474e-01	1.48905396e-01	3.25807422e-01
2.56076485e-01	3.57221574e-01	-3.39478403e-02	1.00000000e+00
-1.24102339e-01	8.83983612e-01	2.80547459e-02	8.58686388e-01
2.94199288e-01	-2.65849650e-01	3.78519028e-01	2.12978795e-01
-7.18445098e-03	6.41856968e-01	1.81971095e-03]	
[ 3.95719782e-02	-7.14578256e-02	8.25414181e-01	-3.00530419e-02
5.78191042e-01	-4.10232842e-02	7.95283973e-01	-2.83228099e-01
7.96256065e-01	-1.67066470e-01	8.24980974e-01	-8.69906396e-02
4.82835710e-01	-6.65869296e-01	8.82123530e-01	-1.24102347e-01
1.00000012e+00	-2.09532484e-01	8.69338095e-01	-1.56820133e-01
5.02842367e-01	-1.62854686e-01	-3.00437659e-01	-2.18876123e-01
-6.00980408e-02	3.91809791e-01	-3.21030407e-03]	
[-9.40385759e-02	1.29153300e-02	-6.44128770e-03	7.36195743e-01
6.85341656e-02	6.79777205e-01	4.44267616e-02	8.28821599e-01
-9.51921642e-02	8.47259164e-01	1.63875222e-02	3.59839499e-01
7.37213716e-02	4.89580274e-01	-2.09960818e-01	8.83983612e-01
-2.09532484e-01	1.00000012e+00	-1.13013498e-01	8.55811775e-01
1.17140926e-01	-2.25591198e-01	4.87354457e-01	2.02379987e-01
4.61779423e-02	5.01774728e-01	4.47966438e-03]	
[ 1.00102760e-02	-1.57592565e-01	8.44776869e-01	1.15263335e-01
6.75534546e-01	5.45443892e-02	9.01323736e-01	-1.95269659e-01
8.89438927e-01	-4.45176959e-02	9.11055207e-01	-1.38508916e-01
6.67177081e-01	-7.38940120e-01	9.44776535e-01	2.80547459e-02
8.69338155e-01	-1.13013506e-01	1.00000012e+00	-8.68339557e-03
6.68220043e-01	-1.56827673e-01	-3.18848312e-01	-1.77756444e-01
-1.03915021e-01	5.81483364e-01	-1.22714904e-03]	
[-5.14619946e-02	-8.76589399e-03	7.17556253e-02	7.64001310e-01
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1.84424326e-01	3.91943455e-01	-7.76897520e-02	8.58686388e-01
-1.56820118e-01	8.55811775e-01	-8.68339557e-03	1.00000000e+00
2.23269597e-01	-1.83739305e-01	3.59377086e-01	2.38654718e-01
8.66673607e-03	5.40328205e-01	-2.95450236e-03]	
[ 9.91546065e-02	-7.44241998e-02	6.82846129e-01	3.40766639e-01
7.92254567e-01	3.36742252e-02	6.99417174e-01	1.18207008e-01
6.63478315e-01	2.93289065e-01	6.51321411e-01	-5.31259291e-02
9.74786818e-01	-6.41572058e-01	6.31292582e-01	2.94199288e-01
5.02842367e-01	1.17140919e-01	6.68220043e-01	2.23269582e-01
9.99999940e-01	-1.43248826e-01	-5.74196756e-01	1.92936137e-01
-7.73663893e-02	7.90661454e-01	-1.52164111e-02]	
[-3.48848142e-02	-1.05764084e-02	-1.50574446e-01	-2.93956816e-01
-1.33028299e-01	-2.55645961e-01	-1.89974383e-01	-2.33274251e-01
-7.52918944e-02	-2.50747561e-01	-1.70998871e-01	-1.19327389e-01
-1.41642839e-01	-6.58141449e-02	-9.77238566e-02	-2.65849680e-01
-1.62854686e-01	-2.25591183e-01	-1.56827673e-01	-1.83739305e-01
-1.43248826e-01	1.00000000e+00	-9.20164734e-02	-2.35032335e-01
4.03147899e-02	-2.44097605e-01	6.99462311e-04]	
[-1.52282283e-01	6.85428604e-02	-3.45481575e-01	2.74126023e-01
-5.05290806e-01	5.84910691e-01	-2.81717807e-01	3.56191874e-01



```

-3.88602465e-01  3.36812675e-01 -2.73952872e-01  1.85940936e-01
-5.69119036e-01  7.18586743e-01 -4.11213309e-01  3.78519058e-01
-3.00437659e-01  4.87354457e-01 -3.18848312e-01  3.59377086e-01
-5.74196756e-01 -9.20164734e-02  1.00000000e+00 -1.76458403e-01
  8.31249058e-02  3.65056023e-02  2.04406753e-02 ]
[  8.71220604e-02  6.02810308e-02 -8.76535922e-02  2.04932556e-01
  5.24951443e-02  6.91904873e-02 -1.00775674e-01  2.63187766e-01
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  1.69185221e-01  9.83166993e-02 -1.85892135e-01  2.12978795e-01
-2.18876123e-01  2.02380002e-01 -1.77756444e-01  2.38654718e-01
  1.92936122e-01 -2.35032350e-01 -1.76458403e-01  1.00000000e+00
-7.51578715e-03  1.25972256e-01 -1.13418326e-02 ]
[  2.30369158e-04  2.00377256e-02 -7.62098357e-02 -2.10572258e-02
-6.97212294e-02 -5.36757801e-03 -1.02309629e-01  1.70410573e-02
-1.04768187e-01  2.63635558e-03 -8.41643438e-02 -1.31332781e-02
-8.13125446e-02  1.08705267e-01 -1.10088319e-01 -7.18445145e-03
-6.00980408e-02  4.61779460e-02 -1.03915021e-01  8.66673607e-03
-7.73663968e-02  4.03147899e-02  8.31249058e-02 -7.51578715e-03
  1.00000000e+00 -4.21900004e-02 -5.88854868e-03 ]
[  1.53530026e-02 -3.63224223e-02  5.71309507e-01  6.39105499e-01
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  5.19470751e-01  6.16509318e-01  5.88361919e-01  7.81751573e-02
  7.64241934e-01 -2.60416627e-01  4.66624945e-01  6.41856968e-01
  3.91809791e-01  5.01774728e-01  5.81483364e-01  5.40328205e-01
  7.90661454e-01 -2.44097605e-01  3.65056023e-02  1.25972256e-01
-4.21900004e-02  1.00000000e+00 -3.94259160e-03 ]
[ -1.11449109e-02  5.21115435e-04 -6.20302232e-03 -6.99308934e-04
-1.10873478e-02  6.27472252e-03 -5.19444561e-03 -4.77467314e-04
-1.81467901e-03 -1.78650441e-03 -5.49022341e-03 -1.10562183e-02
-1.50861870e-02  1.16713559e-02 -3.89965111e-03  1.81971095e-03
-3.21030407e-03  4.47966438e-03 -1.22714916e-03 -2.95450259e-03
-1.52164120e-02  6.99462369e-04  2.04406753e-02 -1.13418326e-02
-5.88854821e-03 -3.94259160e-03  1.00000000e+00 ] ]

```

i) The most correlated attributes are T6 and T\_out. Coefficient = 0.974787.

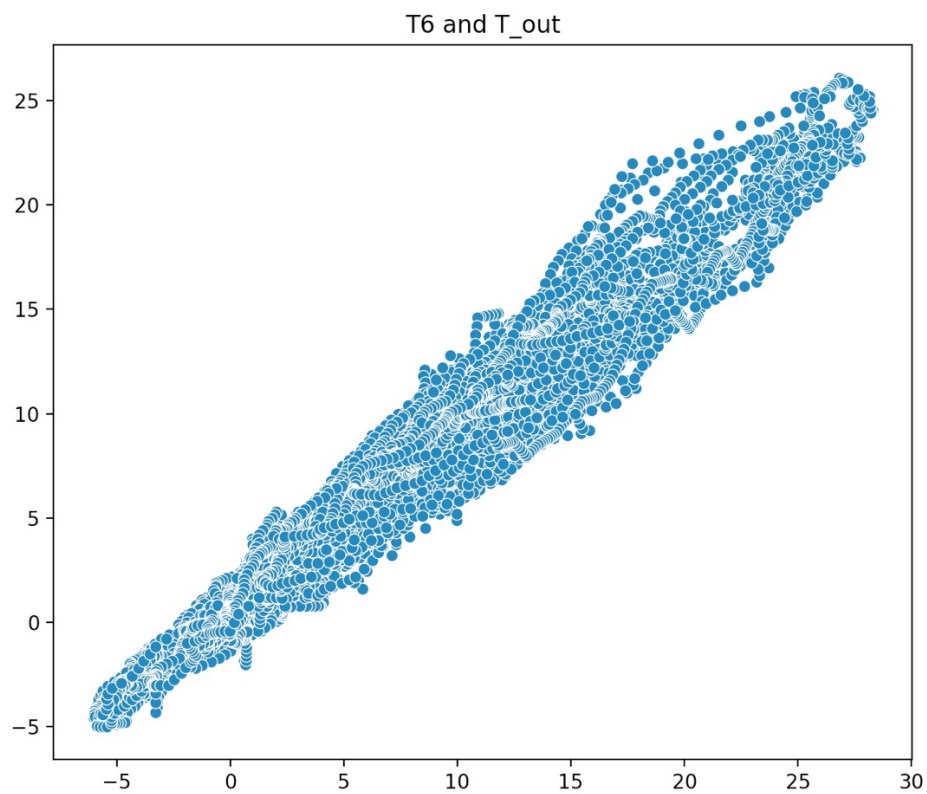
ii) The most anti-correlated attributes are T7 and RH\_6. Coefficient = -0.753973.

iii) The least correlated attributes are rv1 and Tdewpoint. Coefficient = 0.003943.

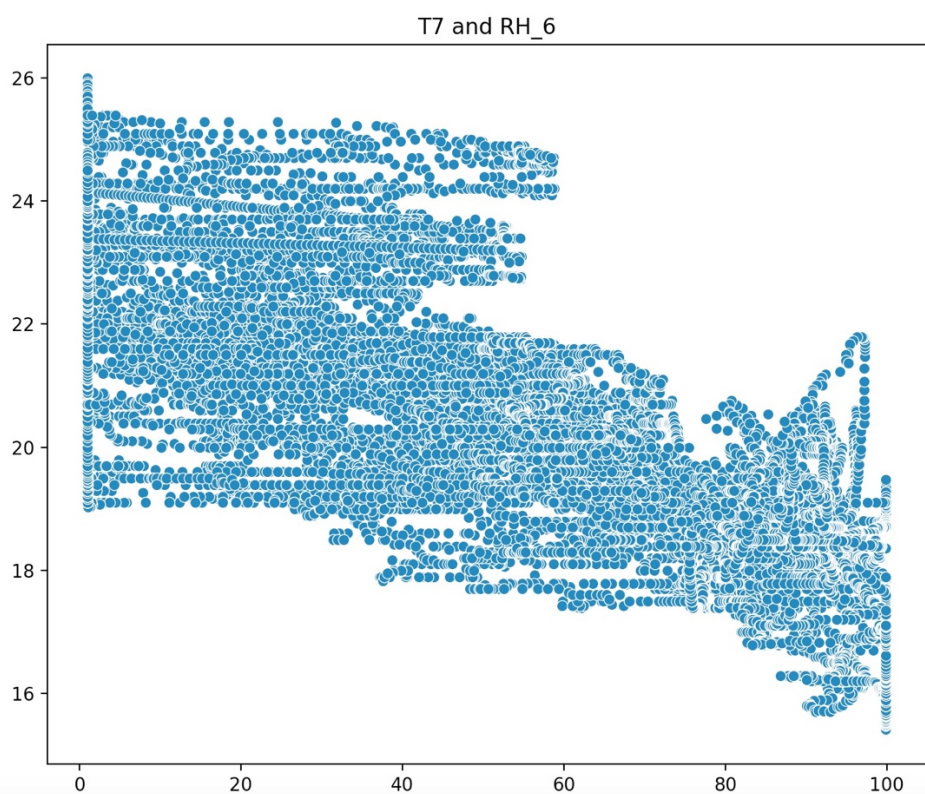
Plots are on pages that follow

Part I.c

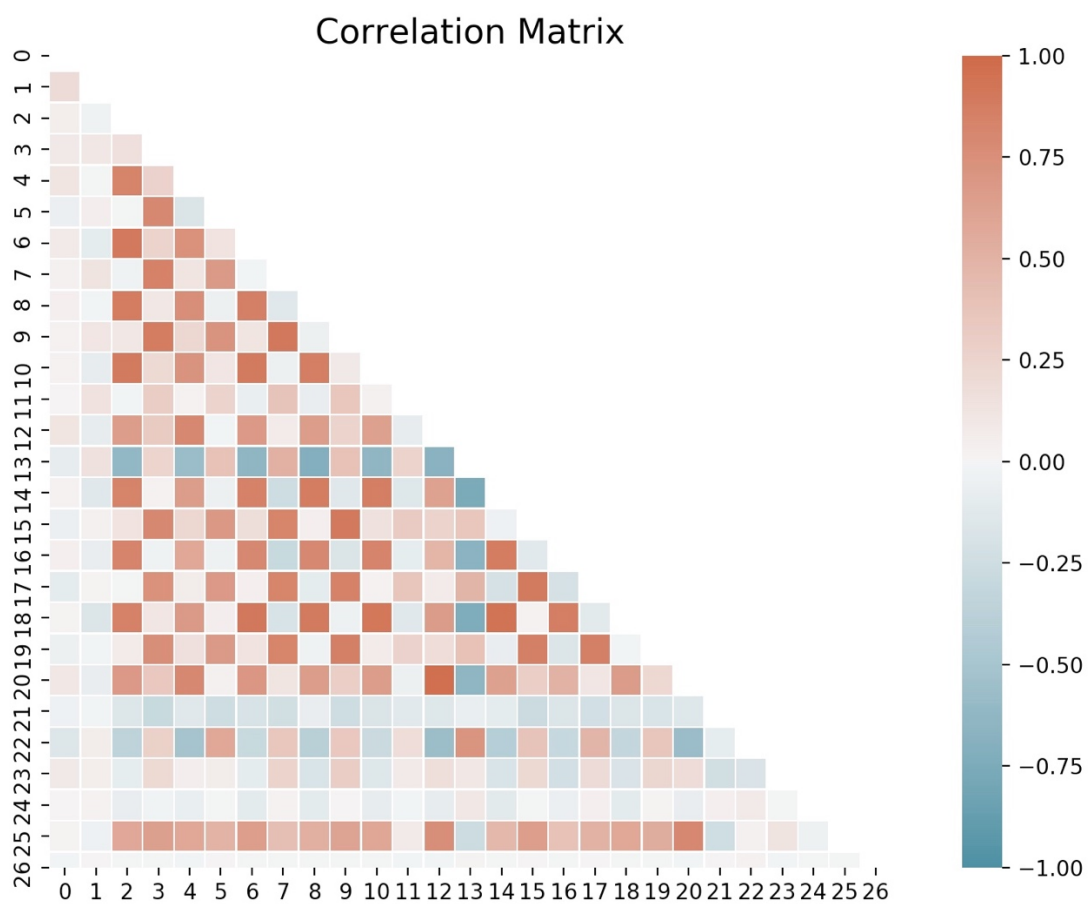
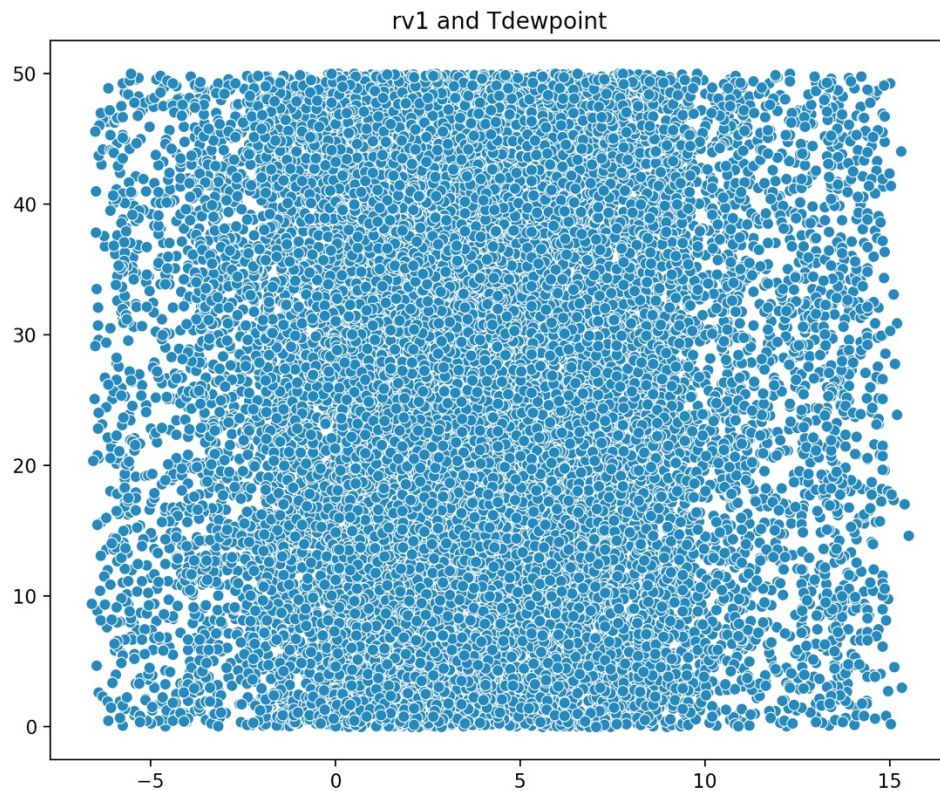
i) The most correlated attribute pair: T6 and T\_out



ii) The most anti-correlated attribute pair: T7 and RH\_6



iii) The least correlated attribute pair: rv1 and Tdewpoint:



Part II are on pages that follow

Part II.

The two eigenvectors are:

```
u1 = [ 9.99105099e-01  1.51964502e-02  9.79220626e-04  3.21871599e-03
       2.72345362e-03 -2.61580986e-03  1.80060053e-03  9.66570422e-04
       9.62773783e-04  5.26607587e-04  4.80647649e-04  3.54839554e-04
       7.48133475e-03 -2.87908902e-02  7.04873626e-04 -2.99052340e-03
       8.93430013e-04 -5.09538148e-03  3.54461308e-04 -2.27319517e-03
       5.56200613e-03 -2.46519855e-03 -2.35761110e-02  2.07670827e-03
       -1.25283520e-04  7.34311442e-04 -1.63076345e-03]
```

```
u2 = [ 0.03580635  0.0414222 -0.02793342  0.0330171 -0.03727893  0.
05281056
      -0.03574589  0.05052722 -0.04071391  0.05276296 -0.03235492  0.07589703
      -0.12014462  0.90309408 -0.04526068  0.0571933 -0.03635936  0.07860035
      -0.04165552  0.04976368 -0.10102199 -0.01750985  0.34020796  0.00525308
       0.04205823 -0.02721032  0.00618435]
```

The projected data points are:

```
[[-38.3934171  35.34700309]
 [-38.40129011 35.06389881]
 [-48.38569989 33.79221355]
 ...
 [174.53005232 -53.11792166]
 [324.41603571 -47.57419798]
 [334.34081837 -46.71549429]]
```

Process finished with exit code 0

Plots is on pages that follow



Part II Projected points on 2D:

