**Statement of the Problem**

We are expected to find the eigenvalues of the 8 storeyed building described in previous questions using the Subspace iteration method.

**Algorithm**

**Jacobi Method**

* We do consecutive orthogonal similarity transformations on the A matrix, to convert it more and more diagonal
* As the matrix converts more and more diagonal, we see that the diagonal elements become the eigenvalues themselves.
* Only used for symmetric matrices.

**Subspace Iteration Method**

* Let X1 be the q starting vectors so that the search is confined to q×q space instead of N×N space. X1 has size N×q.
* Iterate to find Xhat
* Use Xhat to find projection of K and M on the limited search space
* Find the solution of the resulting q-order eigenvalue problem
* Find improved approximation of eigenvectors by iterating till errors are less than tolerance

**Results**

The results presented by the program are as follows:

**Eigenval\_JACOBI =**

**0.000711909483248**

**0.011545325881776**

**0.082975188938587**

**0.100983067319276**

**0.218617864814489**

**0.292537662269235**

**0.300560521934562**

**0.360968459358827**

**MATLAB\_EigenVal =**

**0.000711909483248**

**0.011545325881776**

**0.082975188938587**

**0.100983067319276**

**0.218617864814489**

**0.292537662269235**

**0.300560521934563**

**0.360968459358826**

**SUBSPACE\_EIGENVAL=**

**0.000711909483248**

**0.011545325881776**

**0.082975188938587**

**0.100983067319276**

**0.218617864814489**

**0.292537662269235**

**0.300560521934562**

**0.360968459358826**

**Relative Error in Jacobi =**

**0.189575557961883**

**0.716360661752260**

**0.200984271106024**

**0.000000000000001**

**0.000000000000002**

**0.000000000000017**

**2.622293914353345**

**0.000000000000001**

**Relative error in Subspace =**

**1.0e+02 \***

**0.009980277792566**

**0.009605338820574**

**0.007239318443935**

**0.005380841021160**

**0.179356166342231**

**4.099197435248342**

**0.026222939143533**

**0.025745444156253**

**Comments**

1. ***The subspace iteration method requires fewer number of iterations compared to Jacobi method ( 4:78 )***
2. ***It however takes significantly more time than Jacobi method to execute as it has higher time complexity***
3. ***The relative error of subspace iteration eigenvalues is very less for initial values however increases for latter values.***
4. ***This implies that subspace iteration is a good method for finding some out of all eigenvalues, however jacobi could be better possibly for finding all eigenvalues.***