

## Assignment-5

**Note:** Create a separate file for the input matrix and call it in the program. Please don't type your matrix while executing your code in the lab. Also print your results up to 6<sup>th</sup> decimal point.

**Problem-1:** Write a program to determine the largest eigenvalue of the following matrix using the power method.

$$A = \begin{bmatrix} -30 & 10 & 20 \\ 10 & 40 & -50 \\ 20 & -50 & -10 \end{bmatrix}$$

Print results at each step of iteration till the last converged result.

Also obtain the smallest eigenvalue of the above matrix using the inverse power method.

**Ans:** Largest eigenvalue = **70.943483**, smallest eigenvalue = **-12.553045**.

**Problem-2:** Use the above code to obtain the largest and smallest eigenvalues of the following banded matrix.

$$A = \begin{bmatrix} 4 & 2 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 2 & 4 & 2 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 1 & 2 & 4 & 2 & 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 2 & 4 & 2 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 2 & 4 & 2 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 2 & 4 & 2 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 2 & 4 & 2 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 & 2 & 4 & 2 & 1 \\ 0 & 0 & 0 & 0 & 0 & 0 & 1 & 2 & 4 & 2 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 2 & 4 \end{bmatrix}$$

Try not to read this file from some external source. You can generate this matrix by simply writing four three vectors with appropriate indices and then use this elements for the calculation. This way you save memory in case the matrix is large.