Computational Optimization - MSc AIDA UoM

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A sparse matrix A is stored in the CSR (Compressed Sparse Row) format in the following way:

Compressed Sparse Row (CSR)

- Anz: Contains the real values a_{ij}, i, j = 1, 2, ..., n of matrix A. The real values $a_{ij}$are stored by "scanning" rows i = 1 to i = n. The number of elements of A is nz.
- JA: A list with integer values that includes the indices of the columns of the non-zero elements a_{ij} in the order they are stored in the list Anz. The number of elements in the JA list is nz.
- IA: A list with integer values that includes the indices which determine the start of each row in the lists Anz and JA. The number of elements in the IA list is n+1. At the n+1 element of IA, the value nz+1 is stored.

Compressed Sparse Column (CSC)

- Anz: Contains the real values a_{ij}, i, j = 1, 2, ..., n of matrix A. The real values a_{ij} are stored by "scanning" columns j = 1 to j = n. The number of elements of A is nz.
- JA: A list with integer values that includes the indices of the rows of the non-zero elements a_{ij} in the order they are stored in the list Anz. The number of elements of the JA list is nz.
- IA: A list with integer values that includes the indices which determine the start of each column in the lists Anz and JA. The number of elements in the IA list is n+1. At the n+1 element of IA, the value nz+1 is stored.

Tasks:

[A.] Write code in the Python programming language that implements the storage method for sparse matrices Compressed Sparse Row (CSR).

[**B.**] Write code in the Python programming language that implements the storage method for sparse matrices Compressed Sparse Column (CSC). **HINT**:

The formation of the one-dimensional matrices Anz, JA, IA for both questions should be done with one pass (one scan) of the sparse matrix A.