Guidelines of Assignment 5

The present assignment is dedicated to employing NumPy to facilitate and accelerate the building load calculation procedures. Accordingly, you should modify some of the procedures you had performed for Assignments 2, and 3 and employ NumPy arrays while carrying out calculations. Two files corresponding to the following two steps should be submitted:

Step1 (submitted file name: "Assignment5_step1_yourSurname.py"):

This step is a modification of step 1 of assignment 2 in which NumPy arrays should be utilized. Accordingly, you should solve Example D (presentation 1.1). The calculations should be first performed for the resistances in series (including Conductive and convective ones). NumPy arrays for the names, lengths (will be None for convective ones), k values (will be None for convective ones), and h values (will be None for conductive ones), should be first defined. Furthermore, the total area should be defined as a constant number. Next, an array including the resistance values of each resistance (initially zeros) should be first defined. Next, using index arrays, the R value of each resistance should be replaced. Finally, the total resistance of the resistances in series can be found by summing up the determined values (*)

* This procedure has partially been performed in the class and correlated guideline can also be found in the attached file: "Assignment5_guidelines.py"

Next, a similar procedure should be performed for the resistances in parallel (except the fact that the array of area of each resistance and array of inverse of Resistances should also be defined) and their total resistance should be calculated. The total resistance of the problem will eventually be determined by summing up the R value of the resistances in series and in parallel.

Step 2 (submitted file name: "Assignment5_step2_yourSurname.py"):

This step is the modification of step 1 of assignment 3 in which you are supposed to solve the multi-layer wall example (Ex. 1 in P. 1.3). In order to do so, you should first define the names of items of material library as one array, and the corresponding R Values as another array.

Next, you will need to define the material names of layers only in series as one array, material names of the two layers in parallel as another list, and define the ratio between the area of the first parallel layer to the total one (e.g. 0.75) as a float. Next, the unit thermal resistance for each layer should be looked up from the defined material array (using the index arrays*), and the total unit resistances for the layers in series should be found. Similarly, for the two layers in parallel the unit thermal resistances should be looked up. Afterwards, the total unit thermal resistance is first found once just considering the first layer of the parallel ones, and then by considering the second one. Finally, the U values of each case is found and total U value is eventually determined using the corresponding equation

* A similar example procedure has been provided in the attached file "Assignment5_guidelines.py"