Library's Problem

A university library must cut annual subscription expenses s_j to some scientific journals j=1,…,40 to absorb a \$5000 - \$6000 per year budget cut. One consideration will be the impact factor c_j of journal j, which is a measure of how seminal a journal is to research. Another is the usefulness rating of a journal r_j (1=low to 10=high) solicited from university faculty. Finally, the library wants to consider the ratings a_j of the relative availability (1=low to 8=high) in nearby libraries, believing that journals readily available elsewhere need not be retained. Journal data is given in a file "library_data.csv".

(a) Formulate a weighted-sum multiobjective integer linear programming problem to choose which journals to drop. The weights are as follows 0.2 for the impact factor, 0.3 for the usefulness, and 0.5 for the availability.

(b) Code the weighted-sum multiobjective integer linear programming problem using Python and Gurobi and solve your model. Which journals will be cut and how much costs can be saved?

(c) Formulate and solve the same problem using preemptive (lexicographic) programming. Priority order is as follows availability, usefulness, impacts factor. Compare results to those obtained in part (b).