Assignment 4

Task-1

$$AX \leq b$$

$$No\ of\ Rows\ in\ A = 2 * n + m$$

$$No\ of\ Columns\ in\ A = n * m$$

$$Objective: Maximize \sum_{i=1}^{i=n} \sum_{j=1}^{j=m} asc[i][j] * X_{ij}$$

Where,n is no of students, m is no of courses, asc is preference array, and $X_{ij} = X[(i-1) * m + j]$

3 types of constraints:

1) Maximum no of courses a student can take is N.
2) Maximum b[i] students can take i course.
3) Students will not take courses other than their preferences.

Task-2

LP1: (Slot allocation)

No of students=n, no of courses=m, no of slots=o

Types of Variables:

First m*o variable of type CiTj, Course i is assigned to slot j.

C1T1 C1T2 …., C2T1,C2T2,….., CmT1,CmT2,…..,CmTo.

Next (m*(m-1)*o/2) variable of type CiCjTk, Course i and j are clashing through slot k.

C1C2T1,C1C2T2,…,C1C3T1,C1C3T2,…,Cm-1CmT1,Cm-1CmT2,…,Cm-1CmTo

Total no of columns: m*o+(m*(m-1)*o/2)

Total no of rows: m+(m*(m-1)*o/2)

Constraints and objective functions are same as provided in the question.

LP2: (Course allocation)

No of students=n, no of courses=m, no of slots=o

Types of Variables:

First m*n variable of type CiSj, Course i is assigned to student j.

C1S1 C1S2 …., C2S1,C2S2,….., CmS1,CmS2,…..,CmSn.

Next (m*(m-1)*n/2) variable of type CiCjSk, Course i and j both allocated to student k.

C1C2S1,C1C2S2,…,C1C3S1,C1C3S2,…,Cm-1CmS1,Cm-1CmS2,…,Cm-1CmSn

Total no of columns: m*n+(m*(m-1)*n/2)

Total no of rows: 2*n+m+(m*(m-1)*n/2)

Constraints and objective functions are same as provided in the question.

Procedure:

LP2 and LP1 will run iteratively with gradually increasing the value of λ until no of clashes become zero.

As λ increases, LP2 gives more importance to minimizing no of clashes over maximizing course allocation.