A4M35KO, AE4M35KO
Test III – Pilots training

1 Test Assignment

Airline AirCrash must regularly organize training and certification of qualification for its pilots. It is required to train n pilots $\{P_1, \cdots, P_n\}$, whose license would expire otherwise. For these purposes m dates of training $\{T_1, \cdots, T_m\}$ were announced. Timing abilities of the pilots are given by parameters

$$A_{i,j} = \begin{cases} 1, & \text{if pilot } P_i \text{ can attend training date } T_j. \\ 0, & \text{otherwise.} \end{cases}$$

However, there must be commissioners present during the training, where one commissioner looks after one pilot. There are k commissioners available and the timing abilities of them are given by parameters

$$D_{l,j} = \begin{cases} 1, & \text{if commissioner } C_l \text{ can attend training date } T_j. \\ 0, & \text{otherwise.} \end{cases}$$

Using minimum cost flow problem formulation solve the described problem that is instantiated below or prove its infeasibility.

```
>> n = 12;
>> m = 4;
>> k = 5;
>> A =[
     1     0     0     1;
     0     1     0     1;
     0     0     1     1;
     0     0     1     1;
     1     1     0     1;
     0     1     0     0;
     1     1     1     1;
     0     0     0     1;
     0     0     1     1;
     1     0     1     0;
     0     1     0     1;
     0     1     1     1];
>> D =[
     0     1     1     1;
     0     0     1     1;
     1     0     0     1;
     0     1     1     1;
     1     1     0     1];
```

2 Solution requirements (max. 8 points)

a) Represent the problem using minimum cost flow problem formulation, so that **the number of vertices in the network is minimum**, i.e. there will be no joint source node. Display this number of vertices, e.g. as the size of vector b. [2p]

b) From general values (m,n,k,A,D) implement a matlab program that generates (C, L, U, b) parameters for `mincostflow`. Use this procedure to solve the given instance. [3p]

c) Display (using a matlab code) how many pilots come to each training date. [1p]

d) Display (using a matlab code) which training date pilot P_7 will attend. Furthermore, display which pilots will go to training date T_4. [1p]

e) Display (using a matlab code) which training dates commissioner C_2 will attend. Furthermore, display which commissioners will go to training date T_1. [1p]