# STOR 415 - HW6

1) Original Formulation

Variables: $t_i$: # of trainees hired on 1st of month $i$
$s_i$: # of skilled workers on 1st of month $i$

Objective: $\min \sum_{i=1}^{n} w_i s_i + \sum_{i=1}^{n} t_i$

Constraints: $s_0 = 50$, $s_i = t_{i-1} + 0.9 s_{i-1}$ for $i = 2, \ldots, n$
$s_i \geq d_i$ for all $i$, $a_i$ is the demand in period $i$

a) Replace the constraints with $s_1 = 50$
$s_i = t_{i-1} + 0.9 s_{i-1}$ for $i = 2, \ldots, n$

b) Replace constraints with
$s_1 = 50$
$s_i = 0.8 t_{i-1} + 0.9 s_{i-1}$, $(i = 2, \ldots, n)$

2a) Variables
$p_i$: # of litres of oil purchased at beginning of month $i$ ($i$ is $1, \ldots, n$)
$d_i$: demand of oil in month $i$ ($i$ is $1, \ldots, n$)
$s_i$: Amount of oil in the tank after day 1 of month $i$ ($i$ is $1, \ldots, n$)
$b_i$: # litres of oil bought on day 1 of month $i$

Objective: $\min \sum_{i=1}^{n} p_i b_i$

Constraints:
0) $s_{i-1} + b_i = d_i + s_i$ for $i = \{1, \ldots, n\}$
1) $s_{n-1} + b_n \geq d_n$ for month 'n' (demand)
2) $s_0 = s_0$
3) $s_i \leq$ tank capacity for $i = \{1, \ldots, n-1\}$
4) $s_i \geq 0$ for $\{0 \leq i \leq n\}$
5) $b_i \geq 0$ for $\{1 \leq i \leq n\}$ → Non-negativity

2c) Modify the "in = out" constraints so that

$$0.95 s_{i-1} + b_i = d_i + s_i \quad \{i = 2, \ldots, n$$

* $s_0 + b_1 = d_1 + s_1$ ← initial month remains the same

$0.95 s_{i-1} + b_i \geq d_i$ for $i = n$ ← change demand constraint

2b)

Values of variables

| n | b | s |
|---|---|---|
| 1) | 3000 | 0 |
| | 12000 | 4000 |
| | 10000 | 4000 |
| | 7000 | 0 |
| | 9000 | 0 |
| | 7000 | 0 |