Prob 1

Decision Variable:

1. Amount borrowed each month: Bi, i = 1~5
2. Amount of payment delayed each month: Di, i = 1~6
3. Short-term loan taken at the beginning: Loan

Objective:

Minimize the total cost =

MIN($\sum_{i=1}^{5} Bi * 0.015 + \frac{\sum_{i=1}^{6} Di}{.98}$ + Loan*(1.01^6) - Mi)

Note: Mi = Monthly interest earned, i = 2~6

Constraints:

The beginning balance of the month = The ending balance of the previous month

Bi <= Accounts Receivable i * 0.75

Di < Planned Payments of the Month i

$Balance_i = Balance_{i-1} + Accounts\ Receivable_i + delay_i + borrow_i + Interest\ Earned_i - Planned\ Payment_i - Loan\ Repayment_i$

Optimal Solution:

	Borrow	Payment	Payment Delayed	Monthly Balance
1	0.000000	1.8	0.0	0.609594
2	0.242486	1.6	0.0	0.250000
3	1.050000	2.2	0.0	0.250000
4	0.000000	1.2	0.0	0.280373
5	0.000000	0.8	0.0	1.476650
6	0.000000	1.2	0.0	0.766183

Prob 2

Decision Variable:

Ui: Number of untrained programmers to be retained in month i

Ti: Number of programmers to be trained in month i

Li: Number of untrained programmers to be laid off in month i

Note: i = 1 ~ 6

Objective:

Minimize $Z=\sum i=16(3000Ui+3300Ti)$

Constraints:

Layoff Constraints: $Ui-Li \geq 0$ for $i \in \{1,2,\ldots,6\}$

Training Completion Constraints: $Ti \leq 0.9(Ui-Li)$for $i\in\{1,2,\ldots,6\}$

Initial Workforce Constraint: U1+T1=145

Turnover Constraints: $0.95(Ui-Li)\geq Ui+1$for $i\in\{1,2,\ldots,5\}$

Additional Constraints for Part (b):

If June demand = 125 and April demand = 150:

T4=T6=0 && U4+1.2T4≥150

Optimal Solution:

Part(a)

```
Status: Optimal
Layoff_1 = 8.113
Layoff_2 = 0.0
Layoff_3 = 0.0
Layoff_4 = 0.0
Layoff_5 = 0.0
Layoff_6 = 0.0
Trained_1 = 0.0
Trained_2 = 33.1983
Trained_3 = 67.8723
Trained_4 = 92.5803
Trained_5 = 111.226
Trained_6 = 119.102
Trainee_1 = 36.887
Trainee_2 = 38.5267
Trainee_3 = 27.4534
Trainee_4 = 20.7173
Trainee_5 = 8.75123
Trainee_6 = 0.0
Untrained_1 = 145.0
Untrained_2 = 98.6887
Untrained_3 = 61.0066
Untrained_4 = 34.6209
Untrained_5 = 15.2802
Untrained_6 = 7.07763
```

Part(b)

```
Status: Optimal
Layoff_1 = 5.76564
Layoff_2 = 0.0
Layoff_3 = 0.0
Layoff_4 = 0.0
Layoff_5 = 8.51449
Layoff_6 = 14.0145
Trained_1 = 0.0
Trained_2 = 35.3109
Trained_3 = 72.4778
Trained_4 = 100.242
Trained_5 = 100.242
Trained_6 = 100.242
Trainee_1 = 39.2344
Trainee_2 = 41.2966
Trainee_3 = 30.8486
Trainee_4 = 0.0
Trainee_5 = 0.0
Trainee_6 = 0.0
Untrained_1 = 145.0
Untrained_2 = 98.9234
Untrained_3 = 58.8752
Untrained_4 = 29.7101
Untrained_5 = 28.2246
Untrained_6 = 18.7246
```