Optimization_Method_HW2_Report

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Question 1:

a) 3-days: MTW, TWR, WRF, RFS;

   4-days: MTRF, MTFS, TWFS;

b) Decision Variables:

   X11: # of high skill agents working on MTW
   X12: # of high skill agents working on TWR
   X13: # of high skill agents working on WRF
   X14: # of high skill agents working on RFS
   X21: # of high skill agents working on MTRF
   X22: # of high skill agents working on MTFS
   X23: # of high skill agents working on TWFS

   Y11: # of low skill agents working on MTW
   Y12: # of low skill agents working on TWR
   Y13: # of low skill agents working on WRF
   Y14: # of low skill agents working on RFS
   Y21: # of low skill agents working on MTRF
   Y22: # of low skill agents working on MTFS
   Y23: # of low skill agents working on TWFS

   Objective Function:

   Min
   (X11+X12+X13+X14)*450+(X21+X22+X23)*540+(Y11+Y12+Y13+Y14)*300+(Y21+Y22+Y23)*360

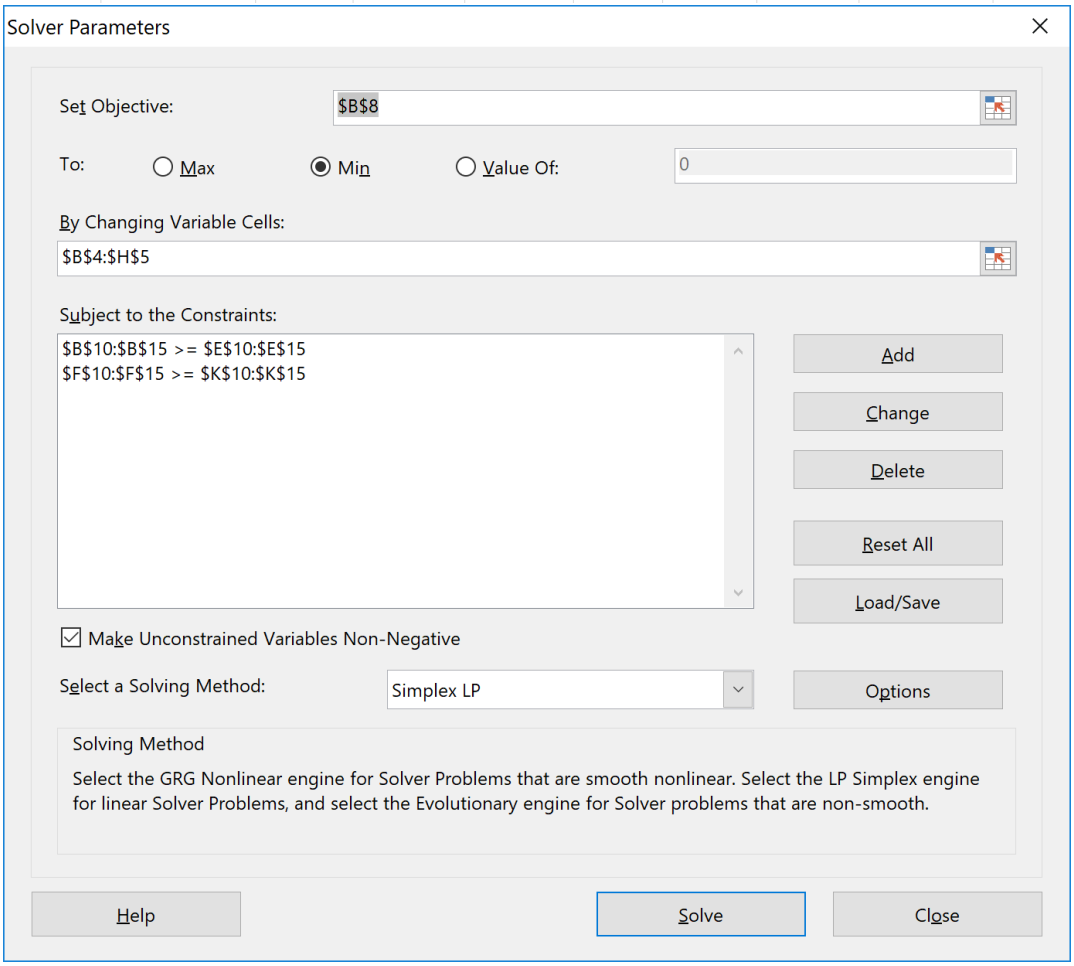
   Constraints:

M: X11+X21+X22 >= 60	X11+X21+X22+Y11+Y21+Y22 >= 100
T: X11+X12+X21+X22+X23 >= 90	X11+X12+X21+X22+X23+Y11+Y12+Y21+Y22+Y23 >= 120
W: X11+X12+X13+X23 >= 40	X11+X12+X13+X23+Y11+Y12+Y13+Y23 >= 90
R: X12+X13+X14+X21 >= 30	X12+X13+X14+X21+Y12+Y13+Y14+Y21 >=140
F: X13+X14+X21+X22+X23 >= 40	X13+X14+X21+X22+X23+Y13+Y14+Y21+Y22+Y23 >= 150
S: X14+X22+X23 >= 80	X14+X22+X23+Y14+Y22+Y23 >= 120

   X11,X12,X13,X14,X21,X22,X23,Y11,Y12,Y13,Y14,Y21,Y22,Y23 > 0

c) Solve with Excel Solver

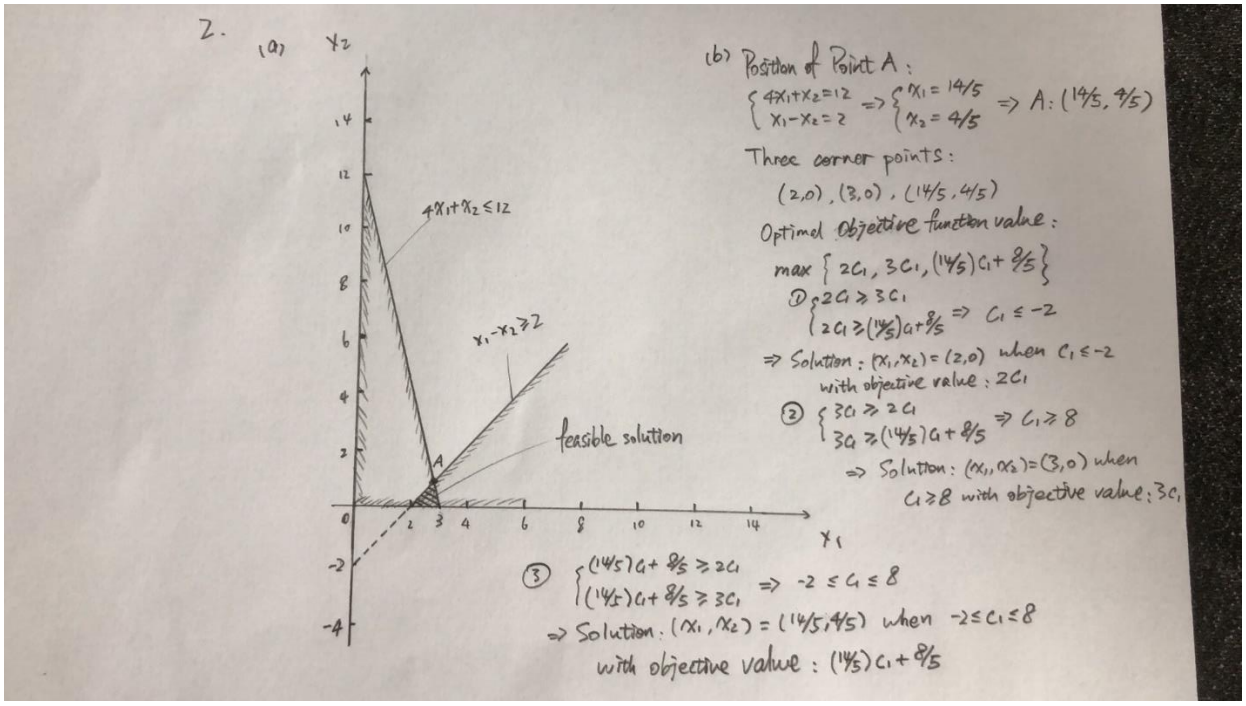
	A	B	C	D	E	F	G	H	I	J	K
1		Three days agents				Four days agents					
2		MTW	TWR	WRF	RFS	MTRF	MTFS	TWFS			
3		X11	X12	X13	X14	X21	X22	X23			
4	high-skill	35	5	0	30	0	50	0			
5	low-skill	0	35	15	40	15	0	0			
6		Y11	Y12	Y13	Y14	Y21	Y22	Y23			
7											
8	Objective	=SUM(B4:E4)*450+SUM(F4:H4)*540+SUM(B5:E5)*300+SUM(F5:H5)*360									
9											
10	constraints	=B4+F4+G4		>=	60	=B4+F4+G4+B5+F5+G5				>=	100
11		=B4+C4+F4+G4+H4		>=	90	=B4+C4+F4+G4+H4+B5+C5+F5+G5+H5				>=	120
12		=B4+C4+D4+H4		>=	40	=B4+C4+D4+H4+B5+C5+D5+H5				>=	90
13		=C4+D4+E4+F4		>=	30	=C4+D4+E4+F4+C5+D5+E5+F5				>=	140
14		=D4+E4+F4+G4+H4		>=	40	=D4+E4+F4+G4+H4+D5+E5+F5+G5+H5				>=	150
15		=E4+G4+H4		>=	80	=E4+G4+H4+E5+G5+H5				>=	120



The optimal solution to our optimization problem is: (X11,X12,X13,X14,X21,X22,X23,Y11,Y12,Y13)=(35,5,0,30,0,50,0,0,35,15,40,15,0,0), providing the objective value of 90900.

Question 2:

a)



b)

Optimal solution:

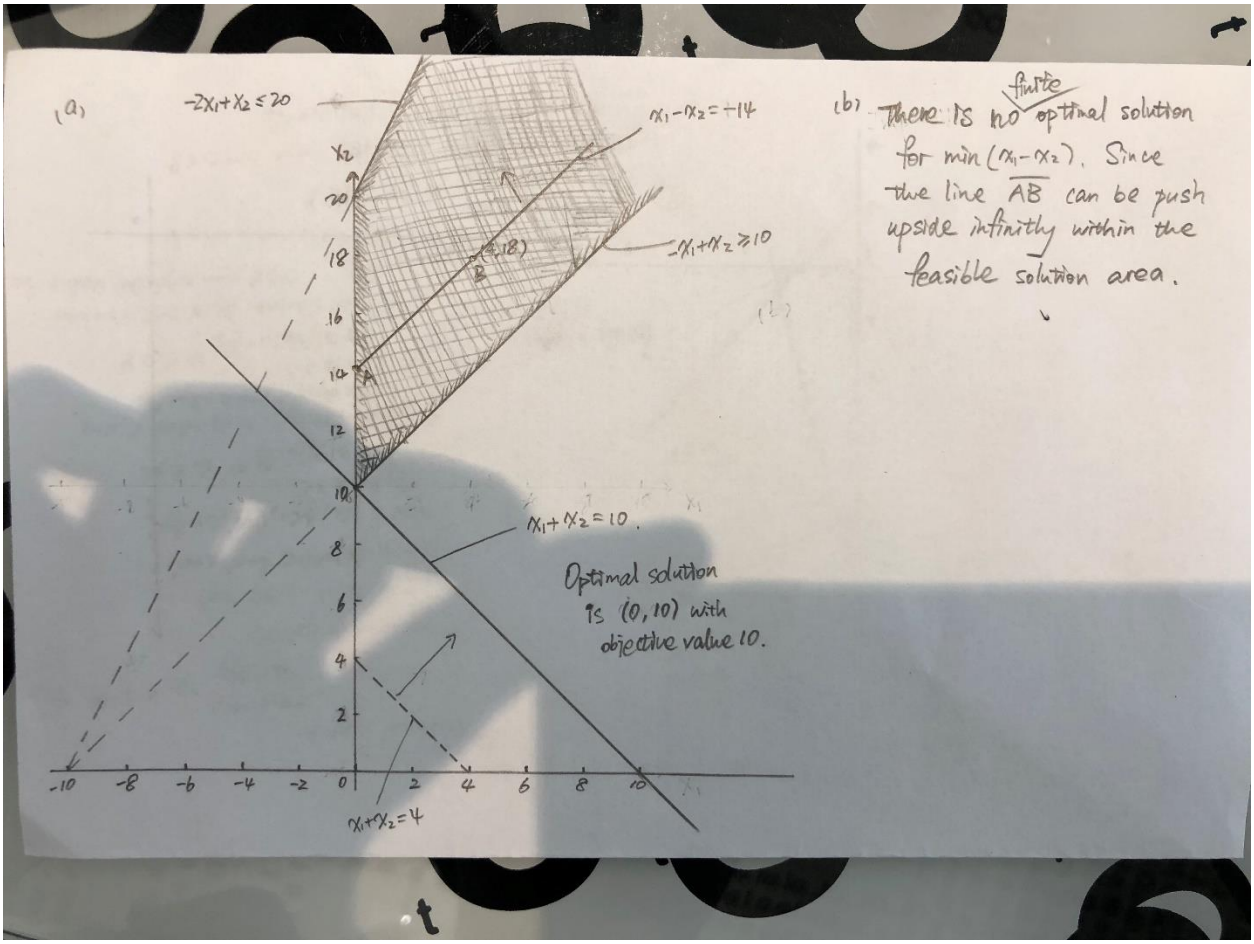
(x1, x2) = (2, 0) when c1<=-2, with objective value: 2*c1

(x1, x2) = (3, 0) when c1>=8, with objective value: 3*c1

(x1, x2) = (14/5, 4/5) when -2<=c1<=8, with objective value (14/5)*c1 + 8/5

Question 3:

a)



The Optimal solution is (0, 10) with objective value 10.

b) There is no finite optimal solution for min(x1-x2) since the line AB can be push upside infinitely within the feasible solution area.

Question 4: