1 Q1

It is easy to derive from the text that:

f = [4,15,10,12.5];

A = [-0.03,-0.3, 0,-0.15;

0.14, 0, 0, 0.07];

b = [-32,42];

Aeq = [0.05, 0, 0.2, 0.1];

beq = 24;

plug the conditions into `linprog()` , we get the result that

$$X = [300, 76.7, 45, 0]$$

and the lowest cost is 2800

2 Q2

Let x_1 x_2 x_3 x_4 x_5 be the part-time workers that start working at 9 a.m. to 1 p.m. and let x_6 x_7 devote the full-time workers that take lunch break at 11 a.m. or 12 a.m. We can get the following inequality constrains:

$$\begin{array}{rcrcrcrcrcrcl}
 & & & & & & & & x_6 & + & x_7 & \leqslant & 12 \\
 & & & & & & & & x_6 & - & x_7 & \leqslant & 1 \\
 & & & & & & & - & x_6 & + & x_7 & \leqslant & 1 \\
x_1 & + & x_2 & + & x_3 & + & x_4 & + & x_5 & - & x_6 & - & x_7 & \leqslant & 0 \\
x_1 & & & & & & & & & + & x_6 & + & x_7 & \geqslant & 10 \\
x_1 & + & x_2 & & & & & & & + & x_6 & + & x_7 & \geqslant & 11 \\
x_1 & + & x_2 & + & x_3 & & & & & + & x_6 & + & x_7 & \geqslant & 15 \\
x_1 & + & x_2 & + & x_3 & + & x_4 & & & + & x_6 & + & x_7 & \geqslant & 15 \\
 & & x_2 & + & x_3 & + & x_4 & + & x_5 & + & x_6 & + & x_7 & \geqslant & 19 \\
 & & & & x_3 & + & x_4 & + & x_5 & + & x_6 & + & x_7 & \geqslant & 16 \\
 & & & & & & x_4 & + & x_5 & + & x_6 & + & x_7 & \geqslant & 14 \\
 & & & & & & & & x_5 & + & x_6 & + & x_7 & \geqslant & 11
\end{array}$$

and the optimization function is given by:

$$f = 120(\ x_1\ +\ x_2\ +\ x_3\ +\ x_4\ +\ x_5\ +\ 3x_6\ +\ 3x_7\ )$$

plug the inequalities to the `intlinprog()` , we can solve out the result for x is:

$$X = [0\ \ 0\ \ 9\ \ 2\ \ 0\ \ 6\ \ 6]$$

where the lowest cost is 5640