Homework (2) solution:

Task 1:

(a) Storage cost per ton of polystyrene A1: 3 * 200 + 400 * ½ * 300 = 1150 €

Storage cost per ton of polystyrene A2: 2 * 200 + 2 * 400 + 2 * 300 = 1800 €

(b) the profit made by manufacturing, storing and selling one ton of polystyrene A1: 1950-1150-600 = 200€

The profit made by manufacturing, storing and selling one ton of polystyrene A2: 2440-1800-400= 240 €

(c) Consider: x_1: the number of tons produced of polystyrene A1

x_2: the number of tons produced of polystyrene A2

The objective function: MAX (Z) = 200 x_1 + 240 x_2

Task 2:

(a) The production constraints:

$3x_1 + 2x_2 \leq 360$

$1x_1 + 2x_2 \leq 160$

$\frac{1}{2}x_1 + 2x_2 \leq 120$

$x_1 \leq 120$

$x_2 \leq 50$

Max Z = 200 x1 + 240 x2 + 0 S1 + 0 S2 + 0 S3 + 0 S4 + 0 S5

3 x1 + 2 x2 + S1 = 360

x1 + 2 x2 + S2 = 160

1/2 x1 + 2 x2 + S3 = 120

x1 + S4 = 120

x2 + S5 = 50

(b) (x1,x2,S1,S2,S3,S4,S5)≥0

C_i		200	240	0	0	0	0	0	R	Min Ratio
		x1	x2	S1	S2	S3	S4	S5	النتيجة	R/x2
0	S1	3	2	1	0	0	0	0	360	360/2=180
0	S2	1	2	0	1	0	0	0	160	160/2=80
0	S3	1/2	2	0	0	1	0	0	120	120/2=60
0	S4	1	0	0	0	0	1	0	120	---
0	S5	0	(1)	0	0	0	0	1	50	50/1=50→
Zj		0	0	0	0	0	0	0	Z=0	
Zj- Cj		-200	-240↑	0	0	0	0	0		

C_i		200	240	0	0	0	0	0	R	Min Ratio
		x1	x2	S1	S2	S3	S4	S5	النتيجة	R/x1
0	S1	3	0	1	0	0	0	-2	260	260/3=86.6667
0	S2	1	0	0	1	0	0	-2	60	60/1=60
0	S3	(1/2)	0	0	0	1	0	-2	20	20/1/2=40→
0	S4	1	0	0	0	0	1	0	120	120/1=120
240	x2	0	1	0	0	0	0	1	50	---
Zj		0	240	0	0	0	0	240	Z=12000	
Zj- Cj		-200↑	0	0	0	0	0	240		

C_i		200	240	0	0	0	0	0	R	Min Ratio
		x1	x2	S1	S2	S3	S4	S5	النتيجة	R/S5
0	S1	0	0	1	0	-6	0	10	140	140/10=14
0	S2	0	0	0	1	-2	0	(2)	20	20/2=10→
200	x1	1	0	0	0	2	0	-4	40	---
0	S4	0	0	0	0	-2	1	4	80	80/4=20
240	x2	0	1	0	0	0	0	1	50	50/1=50
Zj		**200**	**240**	**0**	**0**	**400**	**0**	**-560**	**Z=20000**	
Zj- Cj		0	0	0	0	400	0	-560↑		

C_i		200	240	0	0	0	0	0	R	Min Ratio
		x1	x2	S1	S2	S3	S4	S5	النتيجة	R/S3
0	S1	0	0	1	-5	(4)	0	0	40	40/4=10→
0	S5	0	0	0	1/2	-1	0	1	10	---
200	x1	1	0	0	2	-2	0	0	80	---
0	S4	0	0	0	-2	2	1	0	40	40/2=20
240	x2	0	1	0	-1/2	1	0	0	40	40/1=40
Zj		**200**	**240**	**0**	**280**	**-160**	**0**	**0**	**Z=25600**	
Zj- Cj		0	0	0	280	-160↑	0	0		

C_i		200	240	0	0	0	0	0	R
		x1	x2	S1	S2	S3	S4	S5	النتيجة
0	S3	0	0	1/4	-5/4	1	0	0	10
0	S5	0	0	1/4	-3/4	0	0	1	20
200	x1	1	0	1/2	-1/2	0	0	0	100
0	S4	0	0	-1/2	1/2	0	1	0	20
240	x2	0	1	-1/4	3/4	0	0	0	30
Zj		**200**	**240**	**40**	**80**	**0**	**0**	**0**	**Z=27200**
Zj- Cj		0	0	40	80	0	0	0	

We note that all Values Zj- Cj ≥0

optimal solution is:

X1=100, X2=30, S1 = 0, S2 = 0, S3 = 10, S4 = 20, S5 = 20

Max Z=27200