

Operations Research

Problem 1	34 Punkte
------------------	------------------

1.

x_{ij}	$z_1(0.10)$	$z_2(0.20)$	$z_3(0.50)$	$z_4(0.20)$	μ_i
a_1	2	5	7	3	5.3
a_2	6	3	5	4	4.5
a_3	4	8	4	5	5.0

$$a^* = a_1$$

2.

u_{ij}	$z_1(0.10)$	$z_2(0.20)$	$z_3(0.50)$	$z_4(0.20)$	μ_i
a_1	39.92	99.50	139.02	59.82	105.366
a_2	119.28	59.82	99.50	79.68	89.578
a_3	79.68	158.72	79.68	99.50	99.452

$$a^* = a_1$$

3.

x_{ij}	$z_1(0.10)$	$z_2(0.20)$	$z_3(0.50)$	$z_4(0.20)$	μ_i	σ_i^2	Φ_i
a_1	2	5	7	3	5.3	3.61	5.2278
a_2	6	3	5	4	4.5	0.85	4.4830
a_3	4	8	4	5	5.0	2.40	4.9520

$$a^* = a_1$$

Problem 2

33 Punkte

1.

i	j	a_{ij}	m_{ij}	b_{ij}	\bar{t}_{ij}	$\sigma_{t_{ij}}^2$
1	2	5	8	17	9.00	4.00
2	3	7	10	14	10.17	1.36
2	3	4	5	7	5.17	0.25
2	4	1	3	5	3.00	0.44
3	4	4	6	8	6.00	0.44
3	5	3	3	3	3.00	0.00
4	5	3	4	6	4.17	0.25

$\sigma_{T_i^e}^2$	\bar{T}_i^e		1	2	3	4	5
0.00	<u>0.00</u>	1		9.00 4.00	10.17 1.36		
4.00	<u>9.00</u>	2			5.17 0.44		
4.25	<u>14.17</u>	3			6.00 0.44	3.00 0.00	
4.69	<u>20.17</u>	4				4.17 0.25	
4.94	<u>24.34</u>	5					
		\bar{T}_j^l	<u>0.00</u>	<u>9.00</u>	<u>14.17</u>	<u>20.17</u>	<u>24.34</u>
		$\sigma_{T_j^l}^2$	4.94	0.94	0.69	0.25	0.00

Kritischer Weg: 1 -> 2 -> 3 -> 4 -> 5

2.

$$P(X \leq 28) \approx P(X < 28) = F(28)$$

$$= \Phi\left(\frac{28 - 24.32}{\sqrt{4.94}}\right) \approx \Phi(1.66) = 0.9515 \text{ (95.15\%).}$$

Problem 3

33 Punkte

Sei

x_1 : Morgen Land für den Anbau von Erbsen

x_2 : Morgen Land für den Anbau von Möhren

1.

Das Modell:

$$z = 200x_1 + 300x_2 \rightarrow \text{Max!}$$

$$x_1 + x_2 \leq 30$$

$$100x_1 + 50x_2 \leq 2500$$

$$x_1 + 2x_2 \leq 50$$

$$x_1, x_2 \geq 0$$

2.

Die Normalform:

$$z = 200x_1 + 300x_2 \rightarrow \text{Max!}$$

$$x_1 + x_2 + x_3 = 30$$

$$100x_1 + 50x_2 + x_4 = 2500$$

$$x_1 + 2x_2 + x_5 = 50$$

$$x_i \geq 0, i = 1, 2, \dots, 5$$

Simplextableau

BV	x_1	x_2	x_3	x_4	x_5	x_0
x_3	1	1	1	0	0	30
x_4	100	50	0	1	0	2500
x_5	1	2	0	0	1	50
z	-200	-300	0	0	0	0
x_3	$\frac{1}{2}$	0	1	0	$-\frac{1}{2}$	5
x_4	75	0	0	1	-25	1250
x_2	$\frac{1}{2}$	1	0	0	$\frac{1}{2}$	25
z	-50	0	0	0	150	7500
x_1	1	0	2	0	-1	10
x_4	0	0	-150	1	50	500
x_2	0	1	-1	0	1	20
z	0	0	100	0	100	8000

$$x^* = (10 \ 20 \ 0 \ 500 \ 0)^T, \quad \lambda^* = (100 \ 0 \ 100 \ 0 \ 0)^T, \quad z^* = Z^* = 8000$$

3.

500 €, da $x_4 = 500$.

4.

100, da $\lambda_3 = 100$.