

ЛДБ 8 ВАР 1

№ (3, 7)

Сог. до конца на станции

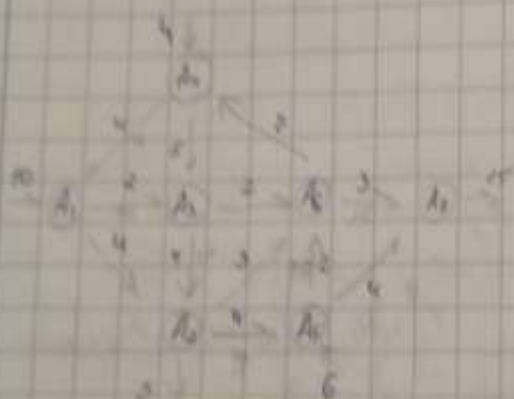
A_1 A_4 A_5
10 4 6

Необходимые на станции

A_6 A_7
5 15

Сх-ма переезда 1 Вокна

P_{12} G_{12} G_{13} G_{14} G_{15} G_{16} G_{17} G_{18} G_{19} G_{20} G_{21} G_{22}
4 2 4 3 4 2 4 5 2 4 7 3



$$Z = 4x_{12} + 2x_{13} + 4x_{24} + 3x_{35} + 4x_{46} + 2x_{57} + 4x_{68} + 5x_{79} + 2x_{80} + 4x_{91}$$

$$\begin{cases} -x_{12} + x_{13} - x_{24} = 10; \\ -x_{12} - x_{13} + x_{24} + x_{35} = -5; \\ -2x_{13} - 5x_{24} + 2x_{35} + 4x_{46} = 0; \\ -2x_{35} - 2x_{46} + 3x_{57} + 7x_{68} = 0; \\ -2x_{46} + 4x_{57} + 5x_{68} = 4; \\ -4x_{57} + 2x_{68} + 4x_{79} = +6; \\ -4x_{68} - 2x_{79} = 15 \end{cases}$$

$$x_{ij} \geq 0$$

$10 - 5 \cdot 0 + 0 + 4 \cdot 6 - 15 = 0$ - условие закрытия.

$\{(9, 1), (1, 3), (3, 2), (2, 5), (5, 6), (6, 8)\}$

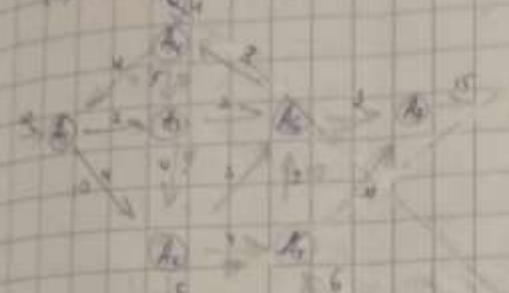
$$Z = 10 + 24 + 20 + 10 = 64$$

$$\begin{aligned}
 u_4 - u_1 &= 4, & u_1 &= 0, \\
 u_6 - u_3 &= 2, & u_2 &= -6, \\
 u_3 - u_2 &= 4, & u_3 &= 2, \\
 u_4 - u_5 &= 4, & u_4 &= 4, \\
 u_5 - u_6 &= 2, & u_5 &= -10, \\
 u_6 - u_3 &= 3, & u_6 &= -2, \\
 & & u_3 &= -5,
 \end{aligned}$$

$$\begin{aligned}
 \Delta_{12} &= 4 - (0 - 6) \neq 0 \\
 \Delta_{13} &= 2 - (0 - 1) \neq 0 \\
 \Delta_{14} &= 4 - (-6 - 10) \neq 0 \\
 \Delta_{15} &= 3 - (-6 - 10) \neq 0 \\
 \Delta_{16} &= 4 - (-2 - 6) \neq 0 \\
 \Delta_{23} &= 2 - (-1 - 10) \neq 0
 \end{aligned}$$

$$\begin{aligned}
 \Delta_{34} &= 4 - (4 - 0) \neq 0 \\
 \Delta_{35} &= 2 - (2 - 10) \neq 0 \\
 \Delta_{36} &= 3 - (2 - 10) \neq 0 \\
 \Delta_{45} &= 4 - (4 - 10) \neq 0 \\
 \Delta_{46} &= 2 - (2 - 10) \neq 0 \\
 \Delta_{56} &= 3 - (10 - 10) \neq 0
 \end{aligned}$$

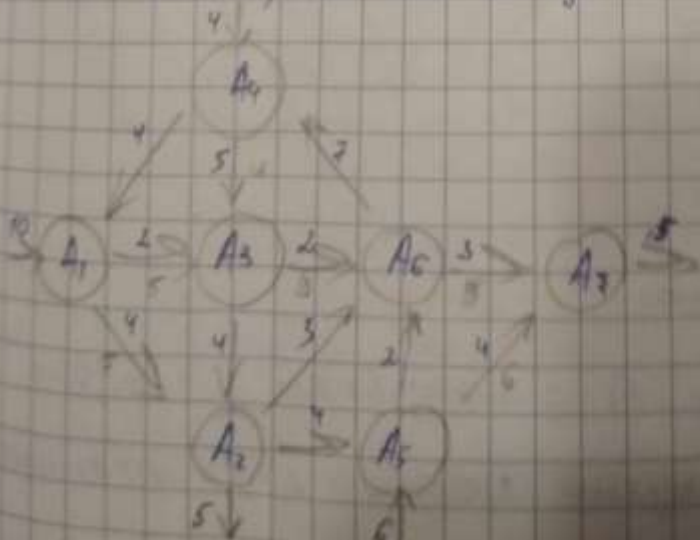
(1, 2) - несут 6 единиц;
(5, 1) - несут 3



$$\begin{aligned}
 u_4 - u_3 &= 5, \\
 u_2 - u_1 &= 4, \\
 u_1 - u_2 &= 4, \\
 u_3 - u_6 &= 2, \\
 u_6 - u_3 &= 3,
 \end{aligned}$$

$$\begin{aligned}
 u_4 &= 0, & \Delta_{14} &= 4 - (0 - 4) \neq 0 \\
 u_5 &= 4, & \Delta_{15} &= 2 - (0 - 4) \neq 0 \\
 u_6 &= 0, & \Delta_{16} &= 4 - (4 - 4) = 0 \\
 u_1 &= 5, & \Delta_{21} &= 2 - (4 - 4) \neq 0 \\
 u_2 &= -3, & \Delta_{22} &= 4 - (0 - 4) \neq 0 \\
 u_3 &= -10, & \Delta_{23} &= 2 - (0 - 10) \neq 0 \\
 u_4 &= 13, & \Delta_{24} &= 4 - (5 - 4) \neq 0 \\
 & & \Delta_{34} &= 5 - (5 - 0) = 0 \\
 & & \Delta_{35} &= 2 - (3 - 0) = 0 \\
 & & \Delta_{36} &= 3 - (3 - 0) = 0 \\
 & & \Delta_{45} &= 4 - (3 - 0) \neq 0 \\
 & & \Delta_{46} &= 2 - (0 - 0) = 0 \\
 & & \Delta_{56} &= 3 - (0 - 0) = 0
 \end{aligned}$$

Т.к. $\exists \Delta_{44} = 0$, то опт. поток не ег.



$$Z = 20 + 10 + 20 + 18 + 22 + 24 = 114$$

$u_1 = 1;$	$A_{11} = 4 - (1 + 3) = 0$	$A_{11} = 4 - (1 + 3) = 0$
$u_2 = -3;$	$A_{12} = 2 - (1 - 1) = 2$	$A_{12} = 2 - (1 - 1) = 2$
$u_3 = 1;$	$A_{13} = 4 - (1 - 3 - 0) = 6$	$A_{13} = 4 - (1 - 3 - 0) = 6$
$u_4 = 6;$	$A_{14} = 3 - (3 + 1) = -1$	$A_{14} = 3 - (3 + 1) = -1$
$u_5 = 0;$	$A_{15} = 4 - (1 + 3) = 0$	$A_{15} = 4 - (1 + 3) = 0$
$u_6 = -1;$	$A_{16} = 2 - (1 + 1) = 0$	$A_{16} = 2 - (1 + 1) = 0$
$u_7 = -11;$	$A_{17} = 4 - (3 - 0) = 1$	$A_{17} = 4 - (3 - 0) = 1$
$u_8 = 0;$	$A_{18} = 5 - (3 + 2) = 0$	$A_{18} = 5 - (3 + 2) = 0$
$u_9 = -7;$	$A_{19} = 2 - (-3 + 4) = -1$	$A_{19} = 2 - (-3 + 4) = -1$
$u_{10} = -2;$	$A_{110} = 4 - (-3 + 7) = 14$	$A_{110} = 4 - (-3 + 7) = 14$
$u_{11} = 3;$	$A_{111} = 7 - (-7 - 3) = 17$	$A_{111} = 7 - (-7 - 3) = 17$
$u_{12} = -3;$	$A_{112} = 3 - (-7 + 7) = 10$	$A_{112} = 3 - (-7 + 7) = 10$
$u_{13} = -4;$		
$u_{14} = -7;$		

№3.2.

$$Z = 4x_1 + 2x_2 + 4x_3 + 3x_4 + 4x_5 + 2x_6 + 4x_7 + 5x_8 + 2x_9 + 4x_{10} + 7x_{11} + 3x_{12} \rightarrow \min,$$

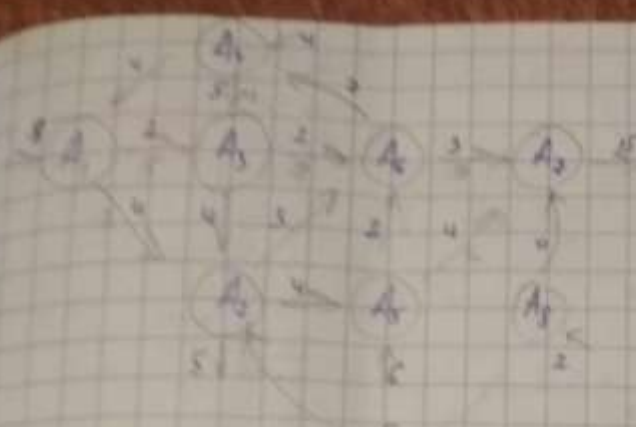
$$\begin{cases} -x_1 + x_3 = 8; \\ -x_2 - x_4 + x_6 = -5; \\ -2x_3 - 5x_5 + 2x_6 - 4x_7 = 0; \\ -2x_8 - 2x_9 - 5x_{10} + 7x_{11} = 0; \\ -7x_2 - 4x_4 + 5x_8 = 4; \\ -4x_5 + 2x_6 + 4x_7 = 6; \\ -4x_9 - 3x_{10} = -15; \end{cases}$$

$$8 - 5 + 4 - 15 = -2 \text{ - отрицат.}$$

Добавим для источника A_8 с интенсивностью 2 и $G_2, G_3 = 0$

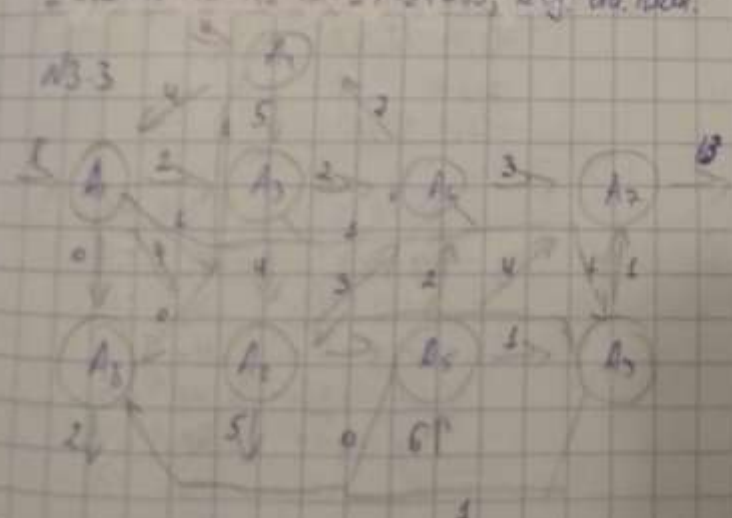
Построим начальный базисный сетевой поток методом круговых строк

$$\{x_{11}, x_{12}, x_{13}, x_{35}, x_{56}, x_{67}\} \quad Z = 16 + 22 + 76 + 36 + 30 + 45 = 225$$

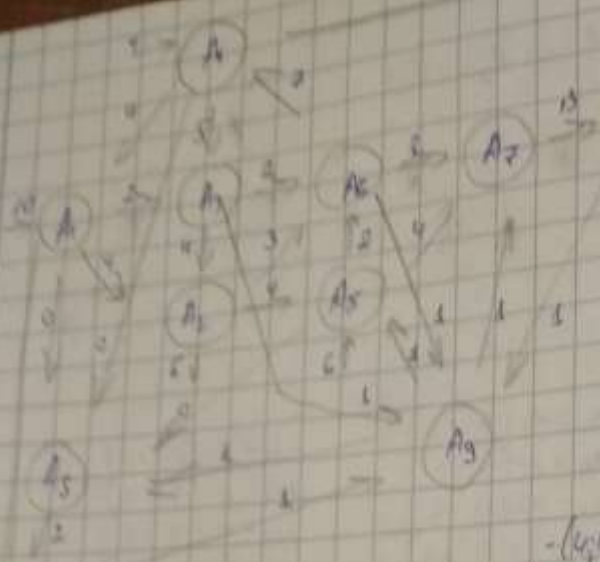


$$\begin{aligned}
 u_1 - u_2 &= 5 & u_1 &= 0 & a_{12} &= 4 - (0 + 4) &= 0 & a_{13} &= 5 - (3 + 2) &= 0 \\
 u_2 - u_3 &= 2 & u_2 &= -9 & a_{24} &= 2 - (0 + 2) &= 0 & a_{14} &= 2 - (3 + 4) &= - \\
 u_3 - u_4 &= 4 & u_3 &= -7 & a_{25} &= 4 - (-4 + 3) &= - & a_{26} &= 4 - (-3 + 2) &= 0 \\
 u_4 - u_5 &= 2 & u_4 &= 3 & a_{27} &= 3 - (-4 + 4) &= - & a_{28} &= 7 - (-4 - 3) &= \\
 u_5 - u_6 &= 3 & u_5 &= -3 & a_{342} &= 4 - (-2 + 4) &= - & a_{27} &= 5 - (-4 + 2) &= 0 \\
 u_6 - u_7 &= 4 & u_6 &= -4 & a_{35} &= 2 - (-2 + 4) &= 0 & a_{22} &= 0 - (-4 + 4) &= 0 \\
 u_7 - u_8 &= 0 & u_7 &= -7 & a_{41} &= 4 - (3 - 0) &= - & a_{22} &= 0 - (-4 - 7) &= 0 \\
 u_8 &= 4
 \end{aligned}$$

$$Z = 20 + 10 + 12 + 18 + 2 + 27 + 24 = 113; \text{ - max. value.}$$



$$\begin{aligned}
 u_3 - u_2 &= 1 & u_2 &= 1 \\
 u_3 - u_4 &= 1 & u_4 &= -1 \\
 u_3 - u_5 &= 1 & u_5 &= 0 \\
 u_4 - u_6 &= 1 & u_6 &= 1 \\
 u_5 - u_7 &= 1 & u_7 &= 1 \\
 u_6 - u_8 &= 1 & u_8 &= 0 \\
 u_7 - u_9 &= 1 & u_9 &= 0 \\
 u_8 - u_{10} &= 1 & u_{10} &= -1 \\
 u_9 - u_{11} &= 1 & u_{11} &= -1 \\
 u_{10} - u_{12} &= 1 & u_{12} &= 0 \\
 u_{11} - u_{13} &= 1 & u_{13} &= 0 \\
 u_{12} - u_{14} &= 1 & u_{14} &= 0 \\
 u_{13} - u_{15} &= 1 & u_{15} &= 0 \\
 u_{14} - u_{16} &= 1 & u_{16} &= 0 \\
 u_{15} - u_{17} &= 1 & u_{17} &= 0 \\
 u_{16} - u_{18} &= 1 & u_{18} &= 0 \\
 u_{17} - u_{19} &= 1 & u_{19} &= 0 \\
 u_{18} - u_{20} &= 1 & u_{20} &= 0 \\
 u_{19} - u_{21} &= 1 & u_{21} &= 0 \\
 u_{20} - u_{22} &= 1 & u_{22} &= 0 \\
 u_{21} - u_{23} &= 1 & u_{23} &= 0 \\
 u_{22} - u_{24} &= 1 & u_{24} &= 0 \\
 u_{23} - u_{25} &= 1 & u_{25} &= 0 \\
 u_{24} - u_{26} &= 1 & u_{26} &= 0 \\
 u_{25} - u_{27} &= 1 & u_{27} &= 0 \\
 u_{26} - u_{28} &= 1 & u_{28} &= 0 \\
 u_{27} - u_{29} &= 1 & u_{29} &= 0 \\
 u_{28} - u_{30} &= 1 & u_{30} &= 0 \\
 u_{29} - u_{31} &= 1 & u_{31} &= 0 \\
 u_{30} - u_{32} &= 1 & u_{32} &= 0 \\
 u_{31} - u_{33} &= 1 & u_{33} &= 0 \\
 u_{32} - u_{34} &= 1 & u_{34} &= 0 \\
 u_{33} - u_{35} &= 1 & u_{35} &= 0 \\
 u_{34} - u_{36} &= 1 & u_{36} &= 0 \\
 u_{35} - u_{37} &= 1 & u_{37} &= 0 \\
 u_{36} - u_{38} &= 1 & u_{38} &= 0 \\
 u_{37} - u_{39} &= 1 & u_{39} &= 0 \\
 u_{38} - u_{40} &= 1 & u_{40} &= 0 \\
 u_{39} - u_{41} &= 1 & u_{41} &= 0 \\
 u_{40} - u_{42} &= 1 & u_{42} &= 0 \\
 u_{41} - u_{43} &= 1 & u_{43} &= 0 \\
 u_{42} - u_{44} &= 1 & u_{44} &= 0 \\
 u_{43} - u_{45} &= 1 & u_{45} &= 0 \\
 u_{44} - u_{46} &= 1 & u_{46} &= 0 \\
 u_{45} - u_{47} &= 1 & u_{47} &= 0 \\
 u_{46} - u_{48} &= 1 & u_{48} &= 0 \\
 u_{47} - u_{49} &= 1 & u_{49} &= 0 \\
 u_{48} - u_{50} &= 1 & u_{50} &= 0 \\
 u_{49} - u_{51} &= 1 & u_{51} &= 0 \\
 u_{50} - u_{52} &= 1 & u_{52} &= 0 \\
 u_{51} - u_{53} &= 1 & u_{53} &= 0 \\
 u_{52} - u_{54} &= 1 & u_{54} &= 0 \\
 u_{53} - u_{55} &= 1 & u_{55} &= 0 \\
 u_{54} - u_{56} &= 1 & u_{56} &= 0 \\
 u_{55} - u_{57} &= 1 & u_{57} &= 0 \\
 u_{56} - u_{58} &= 1 & u_{58} &= 0 \\
 u_{57} - u_{59} &= 1 & u_{59} &= 0 \\
 u_{58} - u_{60} &= 1 & u_{60} &= 0 \\
 u_{59} - u_{61} &= 1 & u_{61} &= 0 \\
 u_{60} - u_{62} &= 1 & u_{62} &= 0 \\
 u_{61} - u_{63} &= 1 & u_{63} &= 0 \\
 u_{62} - u_{64} &= 1 & u_{64} &= 0 \\
 u_{63} - u_{65} &= 1 & u_{65} &= 0 \\
 u_{64} - u_{66} &= 1 & u_{66} &= 0 \\
 u_{65} - u_{67} &= 1 & u_{67} &= 0 \\
 u_{66} - u_{68} &= 1 & u_{68} &= 0 \\
 u_{67} - u_{69} &= 1 & u_{69} &= 0 \\
 u_{68} - u_{70} &= 1 & u_{70} &= 0 \\
 u_{69} - u_{71} &= 1 & u_{71} &= 0 \\
 u_{70} - u_{72} &= 1 & u_{72} &= 0 \\
 u_{71} - u_{73} &= 1 & u_{73} &= 0 \\
 u_{72} - u_{74} &= 1 & u_{74} &= 0 \\
 u_{73} - u_{75} &= 1 & u_{75} &= 0 \\
 u_{74} - u_{76} &= 1 & u_{76} &= 0 \\
 u_{75} - u_{77} &= 1 & u_{77} &= 0 \\
 u_{76} - u_{78} &= 1 & u_{78} &= 0 \\
 u_{77} - u_{79} &= 1 & u_{79} &= 0 \\
 u_{78} - u_{80} &= 1 & u_{80} &= 0 \\
 u_{79} - u_{81} &= 1 & u_{81} &= 0 \\
 u_{80} - u_{82} &= 1 & u_{82} &= 0 \\
 u_{81} - u_{83} &= 1 & u_{83} &= 0 \\
 u_{82} - u_{84} &= 1 & u_{84} &= 0 \\
 u_{83} - u_{85} &= 1 & u_{85} &= 0 \\
 u_{84} - u_{86} &= 1 & u_{86} &= 0 \\
 u_{85} - u_{87} &= 1 & u_{87} &= 0 \\
 u_{86} - u_{88} &= 1 & u_{88} &= 0 \\
 u_{87} - u_{89} &= 1 & u_{89} &= 0 \\
 u_{88} - u_{90} &= 1 & u_{90} &= 0 \\
 u_{89} - u_{91} &= 1 & u_{91} &= 0 \\
 u_{90} - u_{92} &= 1 & u_{92} &= 0 \\
 u_{91} - u_{93} &= 1 & u_{93} &= 0 \\
 u_{92} - u_{94} &= 1 & u_{94} &= 0 \\
 u_{93} - u_{95} &= 1 & u_{95} &= 0 \\
 u_{94} - u_{96} &= 1 & u_{96} &= 0 \\
 u_{95} - u_{97} &= 1 & u_{97} &= 0 \\
 u_{96} - u_{98} &= 1 & u_{98} &= 0 \\
 u_{97} - u_{99} &= 1 & u_{99} &= 0 \\
 u_{98} - u_{100} &= 1 & u_{100} &= 0
 \end{aligned}$$

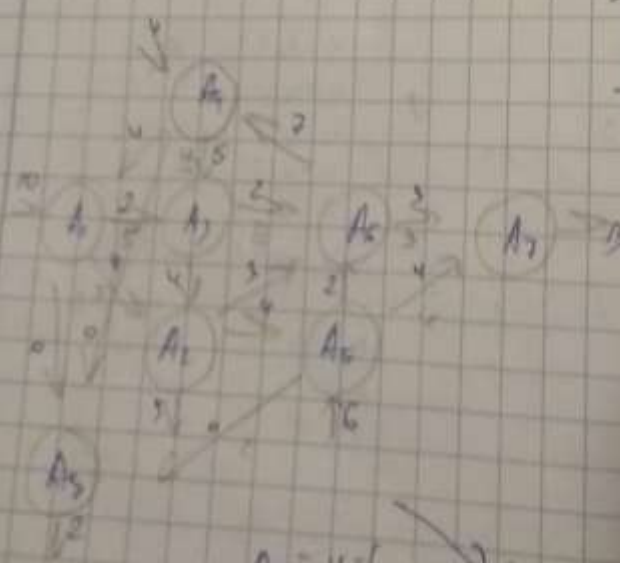


$$\begin{aligned}
 u_9 - u_1 &= 1 \\
 u_3 - u_9 &= 1 \\
 u_6 - u_9 &= 1 \\
 u_5 - u_9 &= 1 \\
 u_4 - u_9 &= 1 \\
 u_1 - u_2 &= 0 \\
 \hline
 u_9 &= 0 \\
 u_8 &= -1 \\
 u_7 &= -1 \\
 u_2 &= -1 \\
 u_6 &= 1 \\
 u_3 &= 1 \\
 u_5 &= 1 \\
 u_4 &= 1 \\
 u_1 &= -1 \\
 u_{11} &= 0
 \end{aligned}$$

$\{(4, 0), (1, 2), (1, 8), (9, 2), (5, 8), (5, 7), (6, 7)\}$
 Flow out of A_1 is 10
 $z = 10 \cdot 4 = 40$

$$\begin{aligned}
 &-(u_1) + (9, 2) \\
 &-(1, 2) + (4, 0) \\
 &-(6, 7) + (6, 9) \\
 &-(3, 2) + (3, 9) \\
 &-(5, 7) + (9, 8)
 \end{aligned}$$

$$\begin{aligned}
 &-(5, 8) + (6, 8)
 \end{aligned}$$



$$\begin{aligned}
 u_4 - u_5 &= 5 \\
 u_3 - u_2 &= 4 \\
 u_4 - u_8 &= 0 \\
 u_5 - u_6 &= 2 \\
 u_6 - u_9 &= 3 \\
 u_7 - u_2 &= 4 \\
 u_1 - u_3 &= 2 \\
 u_4 &= 0 \\
 u_2 &= -2 \\
 u_3 &= -5 \\
 u_5 &= 0 \\
 u_6 &= -6 \\
 u_7 &= -7 \\
 u_8 &= -10 \\
 u_9 &= 0
 \end{aligned}$$

$$\begin{aligned}
 D_{A1} &= 4 - 1 \\
 D_{A2} &= 2 - 1 \\
 D_{A3} &= 4 - 1 \\
 D_{A4} &= 3 - 1 \\
 D_{A5} &= 2 - 1
 \end{aligned}$$

$$\begin{aligned}
 D_{A6} &= 4 - (1 + 3) \\
 D_{A7} &= 5 - (1 + 5) \\
 D_{A8} &= 4 - (1 + 6 + 7) \\
 D_{A9} &= 1 - (6 + 10) \\
 D_{A10} &= 2 - (8 + 0)
 \end{aligned}$$