Task 1 (US)
Using Switching Sequence Table method, design an asynchronous sequential circuit with two monostable (impulse) switches which, when pressed on, both can turn on and off the light. The circuit should work as follows: when pressing the first switch turns the light on, then the same first switch is used to turn the light off. When the second switch turns on the light, then this second switch is also used for turning it off. Present a solution in the form of minimal expressions describing a circuit, and a logical diagram based on PAL element.

state	0	1	2	3	4	5	6	7	0
2° a	-	+		-					
2¹ b	-					+		-	
2² w	-	↔	↔	↔	-	↔	↔	↔	-
NCS	0_1	1_1	5_1	4_1	0_1	2_1	6_1	4_1	0_1

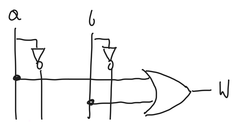
SST

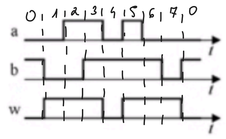
$W = \begin{cases} \Sigma(1,2,5,6)_{wba} \\ \Pi(0,4)_{wba} \end{cases}$

w \ ba	00	01	11	10
0	0^0	1^1	3	1^2
1	0^7	1^6	4	1^5

$W = b + a$

1) a +
2) a -
same for b





Task 2 (BZ)
Using Huffman method, design the circuit working according to the presented timing chart. Provide the solution for Mealy machine in the form of logic expressions and a logical diagram based on 2-input NOR gates.

ab	00	01	11	10	W
0	1	①	5		0
1	④	0		2	1
2			3	②	1
3		❷	③		1
4		④	5		0
5		6	⑤		1
6	A	⑥			1
7		⑦	a		A

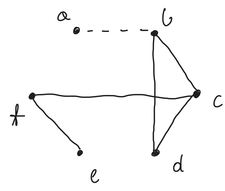
1st step minimisation

states to be merged:
1 - 7
0 - 4

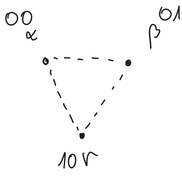
ab	00	01	11	10	W
0,4	1	⓪	5		0
1,7	①	0		2	1
2			3	②	1
3		0	③		1
5		6	⑤		1
1	⑥				1

2nd step minimisation

ab	00	01	11	10	W
a	1	⓪	5		0
b	①	0		2	1
c			3	②	1
d		0	③		1
e		6	⑤		1
f	1	⑥			1



a
b, c, d
e, f



ab	00	01	11	10	
a	1/1	⓪/0	5/1		α
b, c, d	⓪/1	0/–	③/1	②/1	β
e, f	1/1	⑥/1	⑤/1		γ
1	1/1				

$Q_1^n Q_0^n$ \ ab	00	01	11	10
00	01	00	10	
01	01	00	01	01
11	01			
10	11	10	10	

Q_1^{n+1} Q_0^{n+1}

$Q_1^n Q_0^n$ \ ab	00	01	11	10
00	0	0	1	
01	0	0	0	0
11	0			
10	1	1	1	

Q_1^{n+1}

$Q_1^n Q_0^n$ \ ab	00	01	11	10
00	1	0	0	
01	1	0	1	1
11	1	0		
10	1	0	0	

$Q_1^n Q_0^n$ \ ab	00	01	11	10
00	1	0	1	
01	1	–	1	1
11	1			
10	1	1	1	

Q_0^{n+1} W

$Q_1^{n+1} = \overline{Q_0^n (Q_1^n + a)} = \overline{Q_0^n} + \overline{(Q_1^n + a)}$

$W = Q_1^n + a + \overline{b} =$

$= \overline{Q_1^n a} + \overline{Q_1^n \overline{b}} =$

$= \overline{Q_1^n + a} + \overline{Q_1^n + b}$

$Q_0^{n+1} = \overline{(a + \overline{b})(Q_0^n + \overline{b})} = \overline{(a + \overline{b})} + \overline{(Q_0^n + \overline{b})}$