Complete the below problems and upload your solutions in Canvas. Uploads can either contain the file itself if completing everything digitally (e.g., LaTex, Word, etc.) or a screenshot/picture of your handwritten solution. You are encouraged to work together, but you must submit your own work for grading. Each problem is worth 5 points.

1. List in canonical order the first 12 elements of the subset of {0,1}* that are of odd length

$\{\lambda, 0, 1, 000, 001, 010, 011, 100, 101, 110, 111, 00000\}$
1 2 3 4 5 6 7 8 9 10 11 12

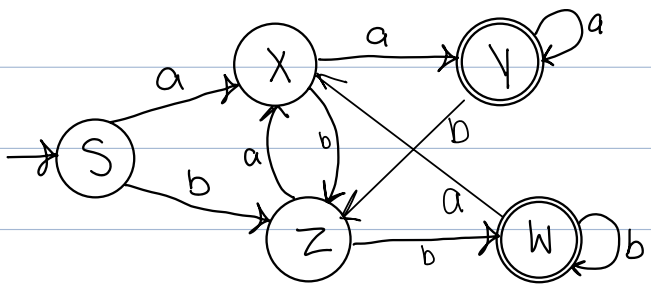
2. Write a formal grammar that generates all strings of odd length over the alphabet {a,b}.

$S \to a|b|aSa|bSb|aSb|bSa$ $(a+b)(ab+bc+aa+bb)^*$

1 plus any combination of 2 will always result in an odd length

3. Draw an NFA over the alphabet {a,b} that accepts strings whose last two characters are the same

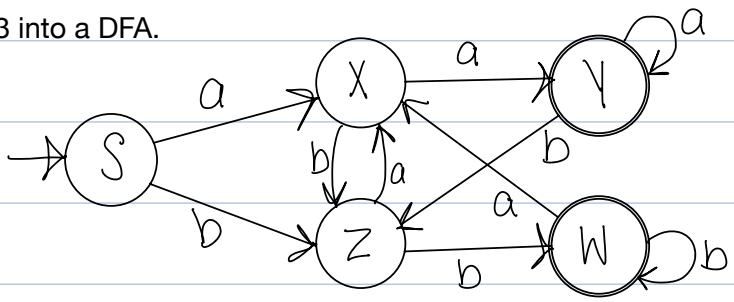
accepts strings ending in aa or bb

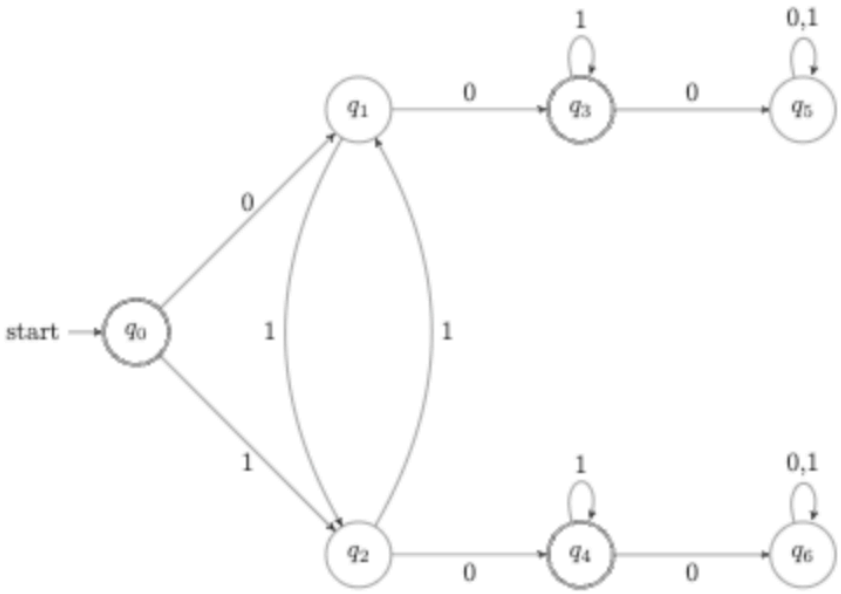


NFA is the DFA

4. Convert the NFA from problem 3 into a DFA.

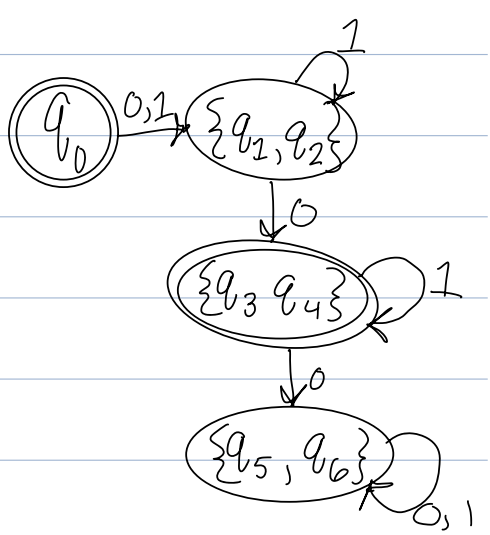
State	a	b
{S}	{X}	{Z}
{X}	{Y}	{Z}
{Z}	{X}	{W}
{Y}	{Y}	{Z}
{W}	{X}	{W}





5. Minimize the below DFA.

	q_1	q_2	q_3	q_4	q_5	q_6
q_0	√	√	•	•	√	√
q_1		○	√	√	•	•
q_2			√	√	•	•
q_3				○	√	√
q_4					√	√
q_5						○
q_6						



(q_0, q_3): $(q_0, 0) = q_1$, $(q_3, 0) = q_5$ } NO $(q_0, 1) : q_2$, $(q_3, 1) : q_3$ } Yes

(q_0, q_4): $(q_0\ 0) = q_1$, $(q_4\ 0) = q_6$ } NO $(q_0\ 1)$

(q_1, q_2): $(q_1, 0) = q_3$, $(q_2, 0) = q_4$ } NO $q_1\ 1 = q_2$, $q_2\ 1 = q_1$ } NO

(q_1, q_5): $(q_1\ 0) = q_3$, $(q_5, 0) = q_5$ } Yes

(q_3, q_4): $(q_3, 0) = q_5$, $(q_4, 0) = q_6$ } NO $(q_3, 1) = q_3$, $(q_4, 1) = q_4$ } NO

Accepts strings ending with aa or bb