Q1. $S \rightarrow bS$

$S \rightarrow aA$

$S \rightarrow A|$

$S \rightarrow A$

$A \rightarrow aA|$

$A \rightarrow bA$

$A \rightarrow \#$

Q2. $S \rightarrow aSa \mid a \mid aaA \mid B$

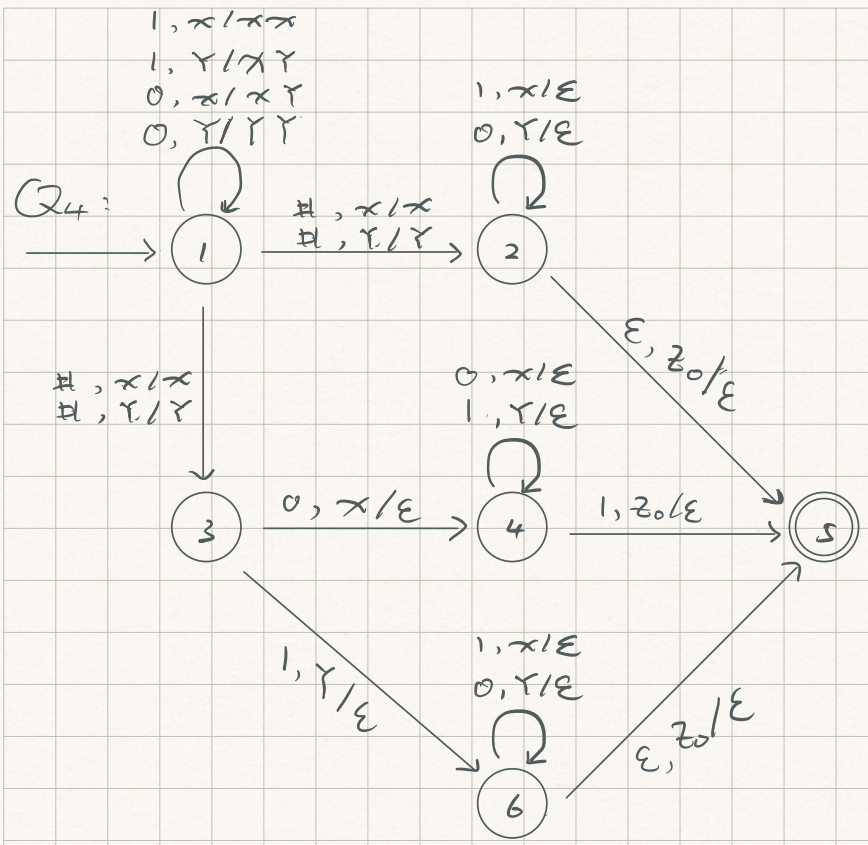
$A \rightarrow aA$

$B \rightarrow bbaa \mid bb$

Q3.

```
boolean valid = 1
int position = 1
for i = 0 to |out(z)| - 1 :
    boolean match = 0
    for j = position to |z| :
        if out(z)[i] = z[j]
            position = j + 1
            match = 1
    b = b && match
```

the complexicity of the algorithm above is $O(n^3)$ and it could determine subword w' is $Out(w)$ or not. Since CYK algorithm is also having complexicity $O(n^3)$, $out(z) \cap L(G)$ is $O(n^3)$.



1-2-5 accept words that bin(w) = bin(w^R)

1-3-4-5 accept words that bin(w)+1 = bin(w^R)
and bin(w) is odd

1-3-6-5 accepts words that bin(w)+1 = bin(w^R)
and bin(w) is even.