FLAC Assignment 5

Exercise 1 Are the following two DFAs equivalent? "→" and "*" is used to denote start and accept state here. Justify your conclusion. minimize, make isomorphism

	0	1
→ A	B	F
B	G	C
*C	A	C
D	C	G
E	H	F
F	C	G
G	G	E
H	G	C

	0	1
→ A	G	C
B	B	A
C	D	B
*D	A	D
G	B	D

Exercise 2 $\Sigma = \{0, 1\}$, build a two-way finite automaton that recognizes the following language:

$$\{w\Sigma^* w^R \mid w \in \Sigma^{100}\}$$

Try to minimize the number of states of the automata. At least how many states does a minimum DFA have for the same language?

Exercise 3 Given the following Context Free Grammar:

$$S \to AB \mid CD \quad \text{a^ib^jc^k where j!=k or i!=j}$$
$$A \to \mathtt{a}A \mid \epsilon \quad \text{a*}$$
$$B \to \mathtt{b}B\mathtt{c} \mid E \mid \mathtt{c}D \quad \text{b^n(c+ + b+)c^n}$$
$$C \to \mathtt{a}C\mathtt{b} \mid E \mid \mathtt{a}A \quad \text{a^n(a+ + b+)b^n}$$
$$D \to \mathtt{c}D \mid \epsilon \quad \text{c*}$$
$$E \to \mathtt{b}E \mid \mathtt{b} \quad \text{b+}$$

Please answer the following question:

1. What are the variables? A,B,C,D,E,S
2. What are the terminals? a,b,c
3. Which is the start variable? S
4. Give three strings in the language. ac,aacc,aaaccc
5. Give three strings not in the language. e, abc, aabbcc
6. Is "aaabbcc"in the language? no
7. Give a description of the language in English.

Exercise 4 Make an OBDD for the boolean function

$$x_1 \oplus x_2 \oplus x_3.$$

Hint: This is the parity function; it is true if and only if an odd number of variables are true.

Exercise 5 (bonus) Is $\{(\mathtt{d}^*\mathtt{c})^m(\mathtt{c}^*\mathtt{d})^m \mid m \geq 1\}$ a regular language? Prove your conclusion.

A->XAY
X generates (d*c)
Y generates (c*d)