Quiz on Regular Language

I. Tell whether the following languages are regular or non-regular, explain your answer briefly.

1. $\{a^m b^n | 3m = 2n, m, n \in \mathbb{N}\}$
2. $\{a^{3m} b^{2n} | m, n \in \mathbb{N}\}$
3. $\{a^m b^{n+2016} | m, n \in \mathbb{N}\}$
4. $\{a^m b^n | m \neq n(\mod 3) \wedge m, n \in \mathbb{N}\}$
5. $\{a^m b^n | m - n = 3 \wedge m, n \in \mathbb{N}\}$
6. $\{a^m b^n c^k | m, n, k \in \mathbb{N}\}$
7. $\{a^m b^n c^k | m = k \wedge m, n, k \in \mathbb{N}\}$
8. $\{a^m b^n c^k | m \geq 3 \wedge n \geq 2 \wedge m, n, k \in \mathbb{N}\}$
9. Let $L = \{a^n b^n | n \in \mathbb{N}\}$, what about $\overline{L}$?
10. Let A be a regular language and $B \subseteq A$, then B is also regular.

II. Describe an algorithm that can convert a NFA to an equivalent DFA, and analyze its time complexity.

Possible Solutions: FTTTF TFTFF

Quiz on CFL

I. Tell whether the following languages are context free or not, explain your answer briefly.

1. $\{a^{3m}b^{2n}|m,n\in\mathbb{N}\}$
2. $\{a^{n}b^{2n}c^{n+2018}|n\in\mathbb{N}\}$
3. $\{a^{m}b^{n}c^{k}d^{l}|m=n,k\neq l,m,n,k,l\in\mathbb{N}\}$
4. $\{a^{m}b^{n}c^{n}d^{m}|m,n\in\mathbb{N}\}$
5. $\{a^{m}b^{n}c^{k}|m=n=k,m,n,k\in\mathbb{N}\}$
6. $\{a^{m}b^{n}c^{k}|m\geq k\wedge n\geq 5\wedge m,n,k\in\mathbb{N}\}$
7. $\{a^{m}b^{n}c^{k}|n\geq m+k\wedge m,n,k\in\mathbb{N}\}$
8. $\{w|w\in\{a,b,c\}^{\star},w$ have the same numbers of $a's$, $b's$ and $c's\}$

II. PDA and Context-free languages:

1. Give a context-free grammar that generates language
$$L=\{ww^{R}ca^{2m}b^{2n}|w\in\{a,b\}^{\star},m,n\in\mathbb{N},m\geq n\}$$
2. Design a PDA $M=(K,\Sigma,\Gamma,s,F)$ accepting the language L

Possible Solutions: TFTT FTTF