problems 3

Design context-free grammars for the following languages:

1. L= { $a^i b^j c^{i+j}$ | i, j $\geqslant$ 0 }

2. L= { $0^n 1^n$ | n $\geq$ 0 and n$\neq$ 3}

3. The set {$a^i b^j c^k$ | i $\neq$ j or j $\neq$ k}, that is, the set of strings of a's followed by b's followed by c's, such that there are either a different number of a's and b's or a different number of b's and c's, or both.

4. The set of all strings 0's and 1's that are not of the form ww, that is , not equal to any string repeated..

5. The set of all strings with twice as many 0's as 1's.

Design push-down automata **DIRECTLY for** the following languages:
(Note: draw diagram)

6. L= { w | w$\in$ { 0,1 }* and if m is the number of 1s, n is the number of 0s, then n$\leq$ 2m }.

7. The set of all strings of 0's and 1's with twice as many 0's as 1's.

8. L= {$a^i b^j c^k$ | i $\neq$ j or j $\neq$ k}.

9. The set of all strings 0's and 1's that are not of the form

ww, that is , not equal to any string repeated..

10. L= { $a^{3n} b^{2n}$ | n ⩾ 0 }.