HW-2

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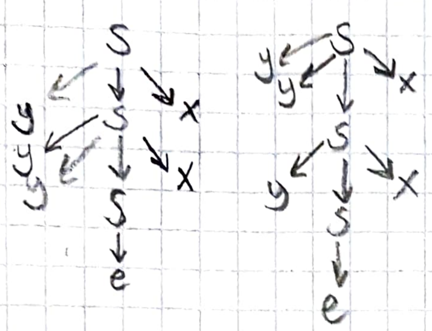
1)

a.

$L = \{yx, yyx, yyxx \ldots\ldots\}$



There are two variations so the grammar is ambigous

b.

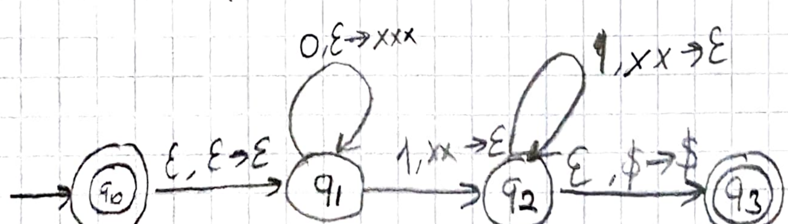
$S \rightarrow ySx \mid M \mid \varepsilon$

$M \rightarrow yyMx$

2)

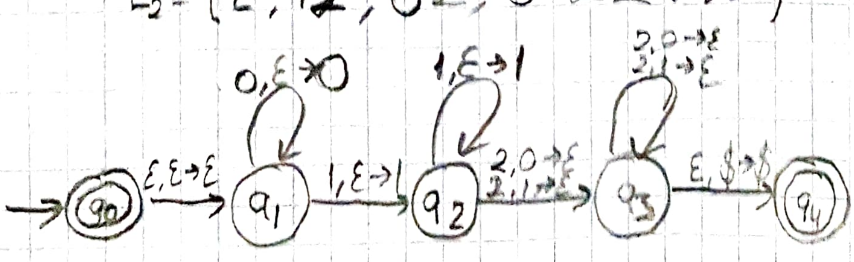
a.

$L_1 = \{\varepsilon, 00111, 0000111111, 000000111111111 \ldots\ldots\}$



b.

$L_2 = \{\varepsilon, 12, 02, 0122 \ldots\}$



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3) a.

For example we have S_1 and S_2 (context free grammar)

$S \rightarrow S_1 | S_2$ The union of two context free languages are also a context free languages. This propety shows us that context free languages are closure under union operator,

a.

The intersection of two context free languages is not always a context free language. So that it is not closure under intersection.

$L_1 \cap L_2 = \{ a^m b^n c^n \mid m,n \geq 0 \}$

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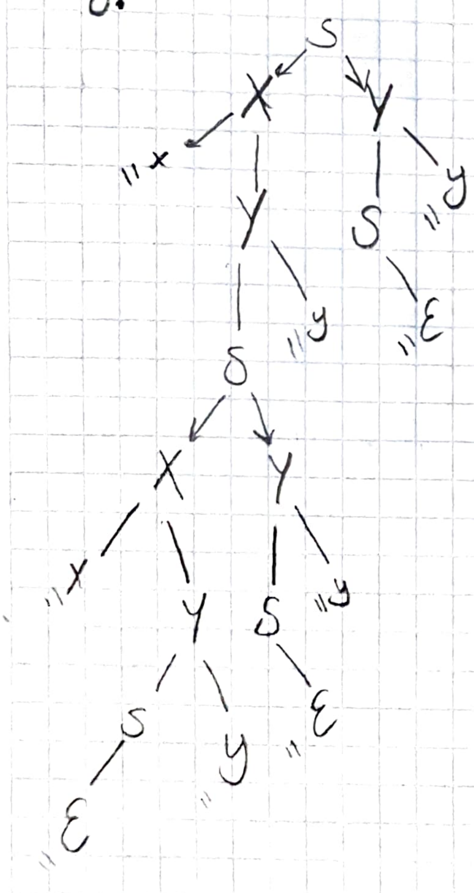
4)

a.

b.



xxyyyy

$\Longrightarrow$ xxεyεyyεy

5)

$S \to ASA \mid A \mid \varepsilon$

$A \to 11 \mid \varepsilon$

$\longrightarrow$

$S \to ASA$

$S \to A$

$S \to \varepsilon$

$A \to 11$

$A \to \varepsilon$

$\longrightarrow$

$S \to A$

$S \to \varepsilon$

$A \to 11$

$A \to \varepsilon$

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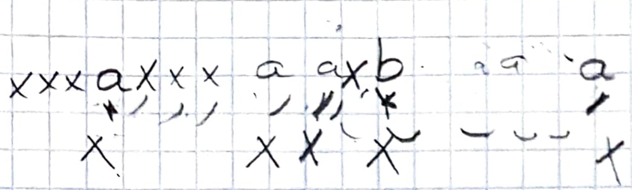
6)



The machine ~~is~~ turns all the characters to x in the tape and accepts the strings containing equal number of a and b in the input
$\{ a^n b^n ; n \geq 0 \}$

7) Suppose that there are two Turing machine and a given input. First machine runs with the given input and if it accepts, then the second machine runs with the given input. If the second machine accepts the input then we can design another Turing Machine TM.

TM = if Machine 1 AND Machine 2 accepts
accepts

8) a.

b.