CENG213 Assigment - 2

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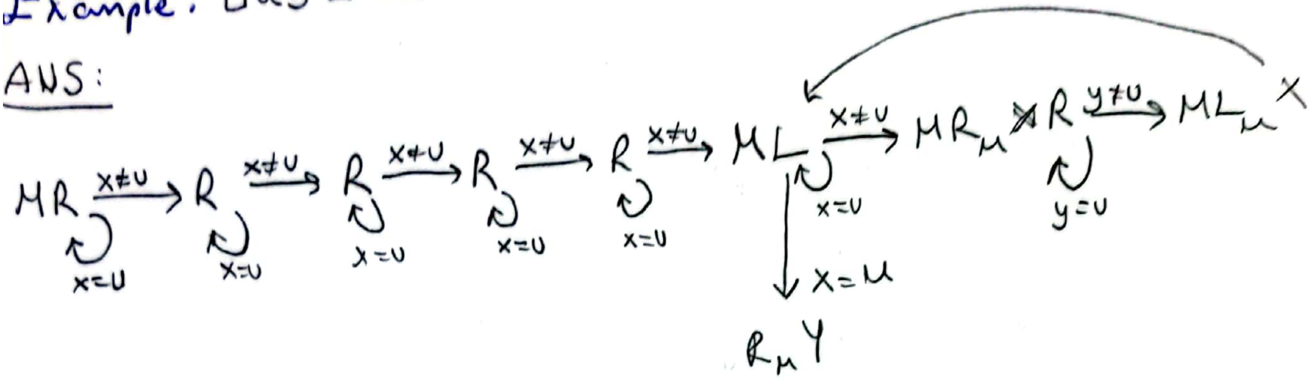
1) Construct a Turing machine that copies the first four nonblank symbols over the next four nonblank symbols, in reverse order.

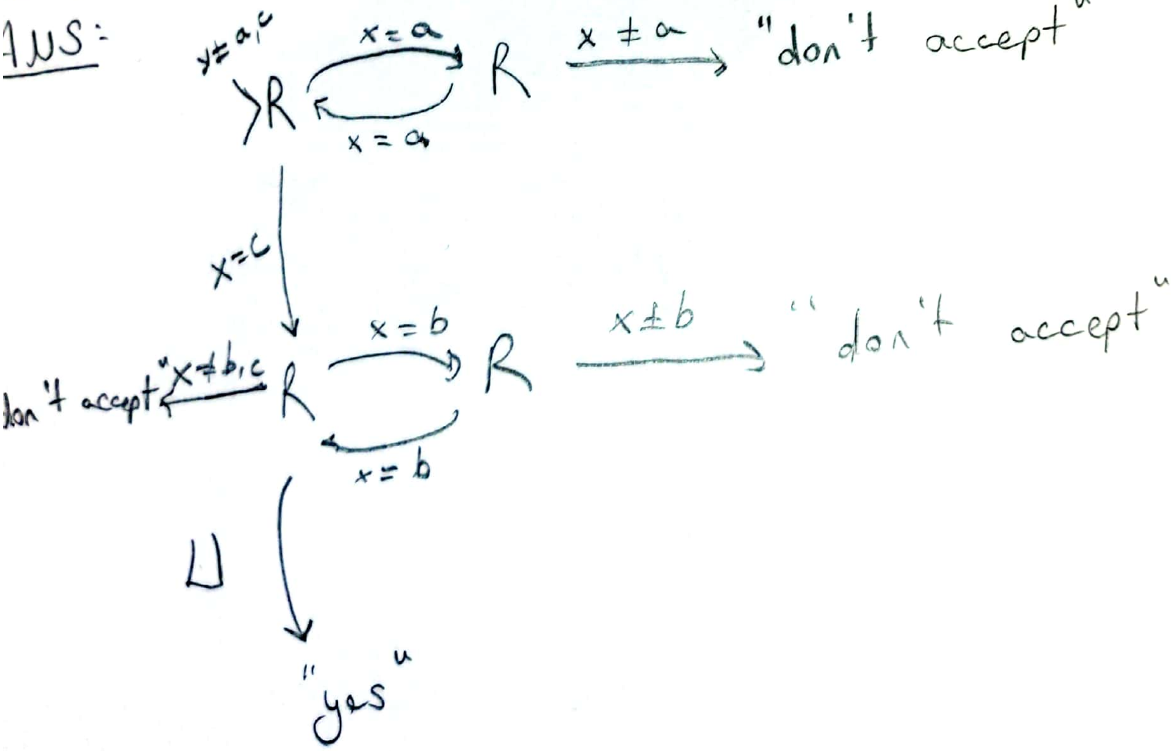
Example: ⊔ab⊔c⊔d⊔ef⊔gh⊔ → ⊔ab⊔c⊔d⊔dc⊔ba⊔

ANS:



2) Construct a standard Turing machine to decide the language $aa)^* c (bb)^*$

ANS:



3) Let G be the grammar (W, Σ, R, S), where

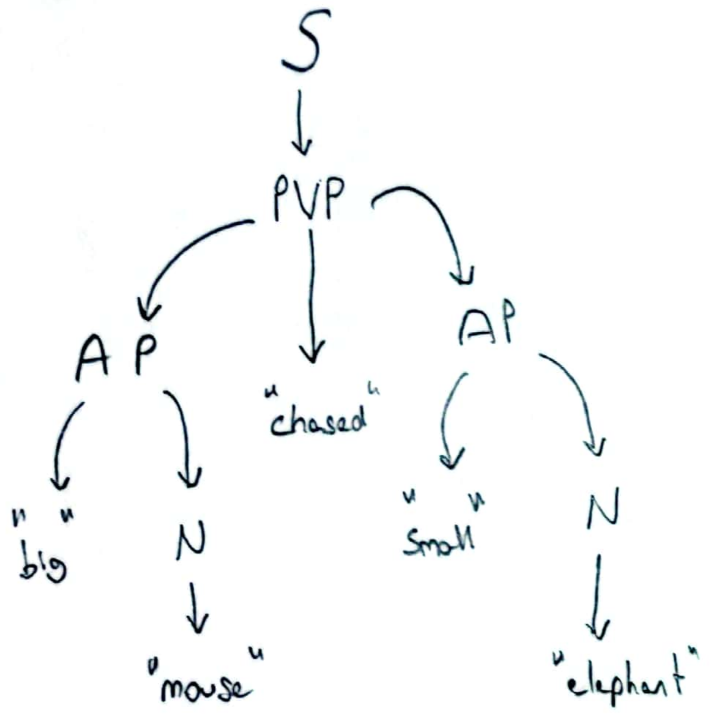
$W = \{S, A, N, V, P\} \cup \Sigma$,

$\Sigma = \{$elephant, big, mouse, small, chased$\}$,

$R = \{P \to N$, $A \to$ big,
$P \to AP$, $N \to$ elephant,
$S \to PVP$, $N \to$ mouse,
$A \to$ small, $V \to$ chased$\}$.

"big mouse chased small elephant" Parse tree, ambiguous.

ANS:



(NOT AMBG.)

⇒ If there exists at least 1 string in the language that can be generated by the grammar in more than one way; it is ambiguous.

This tree cannot draw by different way to exp. the string.

So it is $\boxed{\text{not ambiguous}}$ because there is only one valid parse.

4) Construct a pushdown automaton for the following language;

$\{a^i b^j c^k \mid i, j, k \geq 0, \; i+k = j\}$

ANS

$(s, e, e) \rightarrow (q_1, x)$

$(q_1, a, x) \rightarrow (q_1, ax)$

$(q_1, a, a) \rightarrow (q_1, aa)$

$(q_1, e, e) \rightarrow (q_2, e)$

$(q_2, b, a) \rightarrow (q_2, e)$

$(q_2, b, x) \rightarrow (q_2, bx)$

$(q_2, b, b) \rightarrow (q_2, bb)$

$(q_2, e, e) \rightarrow (q_3, e)$

$(q_3, c, b) \rightarrow (q_3, e)$

$(q_3, e, e) \rightarrow (q_4, e)$

$(q_4, e, x) \rightarrow (q_4, e)$

5) Construct a pushdown automaton for the following language;

$\{a^i b^j c^k d^m \mid i, j, k, m \geq 0, \; i = k \text{ or } j = m\}$

for $i = k \Rightarrow a^i b^j c^i d^m$

$b^j d^m$ if $i = 0$

d^m if $i, j = 0$

ANS

$(s, e, e) \longrightarrow (q_1, x)$

$(q_1, a, x) \longrightarrow (q_1, ax)$

$(q_1, a, a) \longrightarrow (q_1, aa)$

$(q_1, e, a) \longrightarrow (q_2, a)$

$(q_2, b, a) \longrightarrow (q_2, a)$

$(q_2, e, a) \longrightarrow (q_3, a)$

$(q_3, c, a) \longrightarrow (q_3, e)$

$(q_3, e, x) \longrightarrow (f, x)$

$(f, d, x) \longrightarrow (f, e)$

for $j = m \Rightarrow a^i b^j c^k d$

$a^i c^k$

a^i

if $j = 0$

if $j, k = 0$

$(s, e, e) \longrightarrow (q, x)$

$(q_1, a, x) \longrightarrow (q, x)$

$(q_1, e, x) \longrightarrow (q_2, x)$

$(q_2, b, x) \longrightarrow (q_2, bx)$

$(q_2, b, b) \longrightarrow (q_2, bb)$

$(q_2, e, b) \longrightarrow (q_3, b)$

$(q_3, c, b) \longrightarrow (q_3, b)$

$(q_3, e, b) \longrightarrow (f, b)$

$(f, d, b) \longrightarrow (f, e)$

$(f, e, x) \longrightarrow (f, e)$