

# Assignment #3. 192-1196 (5C)

To: Ms Sobia Tarig

Q6.2(b) prove by pumping lemma

let  $L_1 = L$  and  $|L_1| \geq n$

for pumping lemma II

$$L_1 = UVWxy$$

$$U = \Lambda$$

$$W = \Lambda$$

$$y = a^{2^{n-k}}$$

$$v = a^{2^{k-1}}$$

$$x = a^{2^l}$$

$$|vx| \geq 0 \quad |vwx| \leq p$$

$$UV^iWx^i y$$

$$\Lambda (a^{2^{k-m}})^i \Lambda (a^{2^m})^i a^{2^{n-k}}$$

$$\text{let } i = 3$$

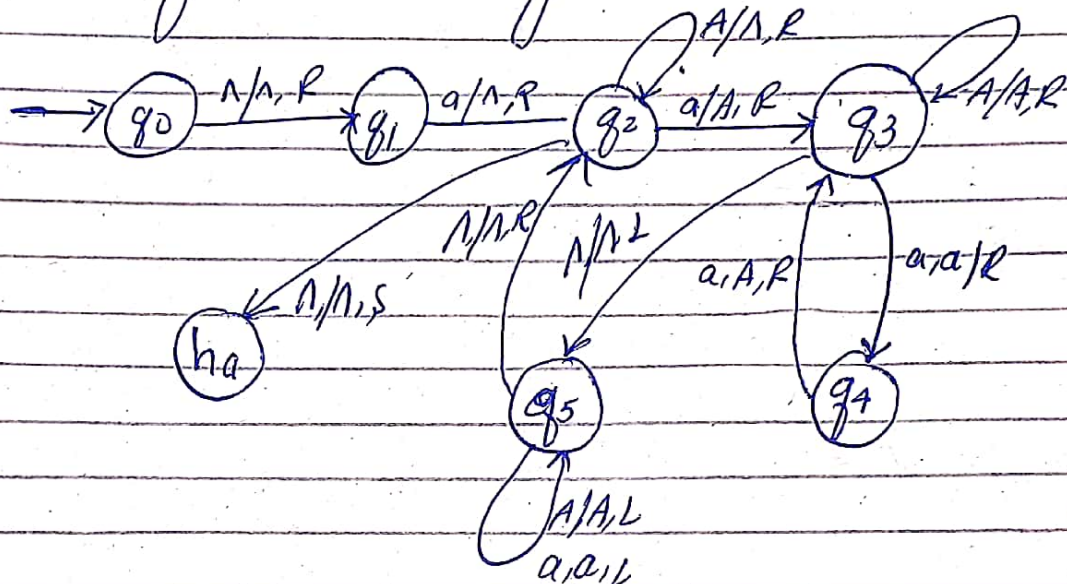
$$(a^{2^{k-m}})^3 (a^{2^m})^3 a^{2^{n-k}}$$

$$a^{2^{n+2k}} \notin L$$

so The language is non context free.

Q 6.2 (b)  $L = \{ a^{2^n} \mid n \geq 0 \}$

making its turing machine



Q 5/a prove by pumping lemma

$$L = \{ a^n b^m a^m b^n \mid m, n \geq 0 \}$$

$$\text{let } L_1 = L = xyz^2z$$

$$|xy| \leq n \quad |y| \geq 1$$

$$z = b^m a^m b^n$$

$$xy = a^n, \quad x = a^{n-k}, \quad y = a^k$$

pumping lemma I

$$(a^{n-k}) (a^k)^i (b^m a^m b^n)$$

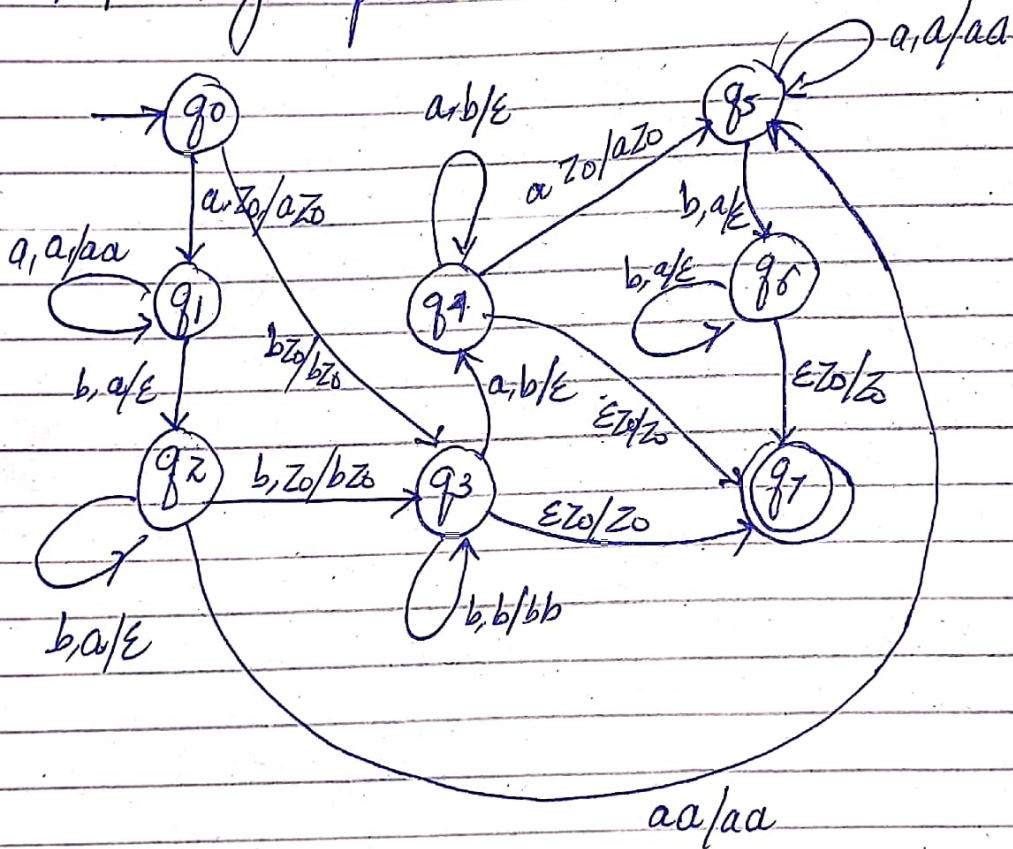


$a^{n+k} b^m a^m b^n$   
 for  $k \geq 0$   $L_1 \neq L$

because let  $k = 5$

$a^{5+n} b^m a^m b^n \notin L$

Making push down automata



Q 6.5(d)

$$L = \{x y x \mid x, y \in \{a, b\}^*$$

where  $|x| \geq 1$

$$\text{let } x = a^n b$$

$$x \in \{a, b\}^*$$

using pumping lemma

$$A B^i C$$

$$AB = a^n = C = b$$

$$|AB| \leq n \text{ where } A = a^{n-k}$$

$$B = a^k \text{ where } |B| \geq 1$$

$$a^{n-k} (a)^i b$$

$$\text{putting } i = 2$$

$$a^{n-k} a^{2k} b = a^{n+k} b \notin L$$

$$\text{for } k \geq 1$$

Hence  $L$  is not a regular language.



## push down automata

pda is not possible as this string does not follow a specific sequence of a's and b's. It is quite uncertain to determine that how many a's to be popped against how many b's.

Q 6.9 (b)

$$L = \{ a^i b^j c^k \mid i \neq j \text{ or } i \neq k \}$$

$$\text{Let } j = 2k \\ i = 3k$$

$$L = \{ a^{3k} b^{2k} c^k \}$$

Using pumping lemma II

$$\underline{a^{2k}} \mid L = UVWXY$$

$$|UVWX| \leq n$$

$$|vx| \geq 1$$

$$\text{Let } U = \Lambda \\ Y = \Lambda$$

$$W = a^{3k-1}$$

$$V = a$$

$$UV^i W X^i Y = \Lambda (a^{3k-1})^2 (a^1)^i (b^{2k} c^k)$$

for  $k=5$  and  $i=2$

$(a^{5k-1})^2 a^2 b^{2k} c^k$

$a^{30k-2} a^2 b^{2k} c^k$

$a^{30k} b^{2k} c^k \neq a^{3k} b^{2k} c^k$

hence, it is not context free language.

Q6.9(a) Turing machine

