PROJECT 1
TURING MACHINE

CSc 304 THEORETICAL OF COMPUTER SCINCE

PROF. LUCCI

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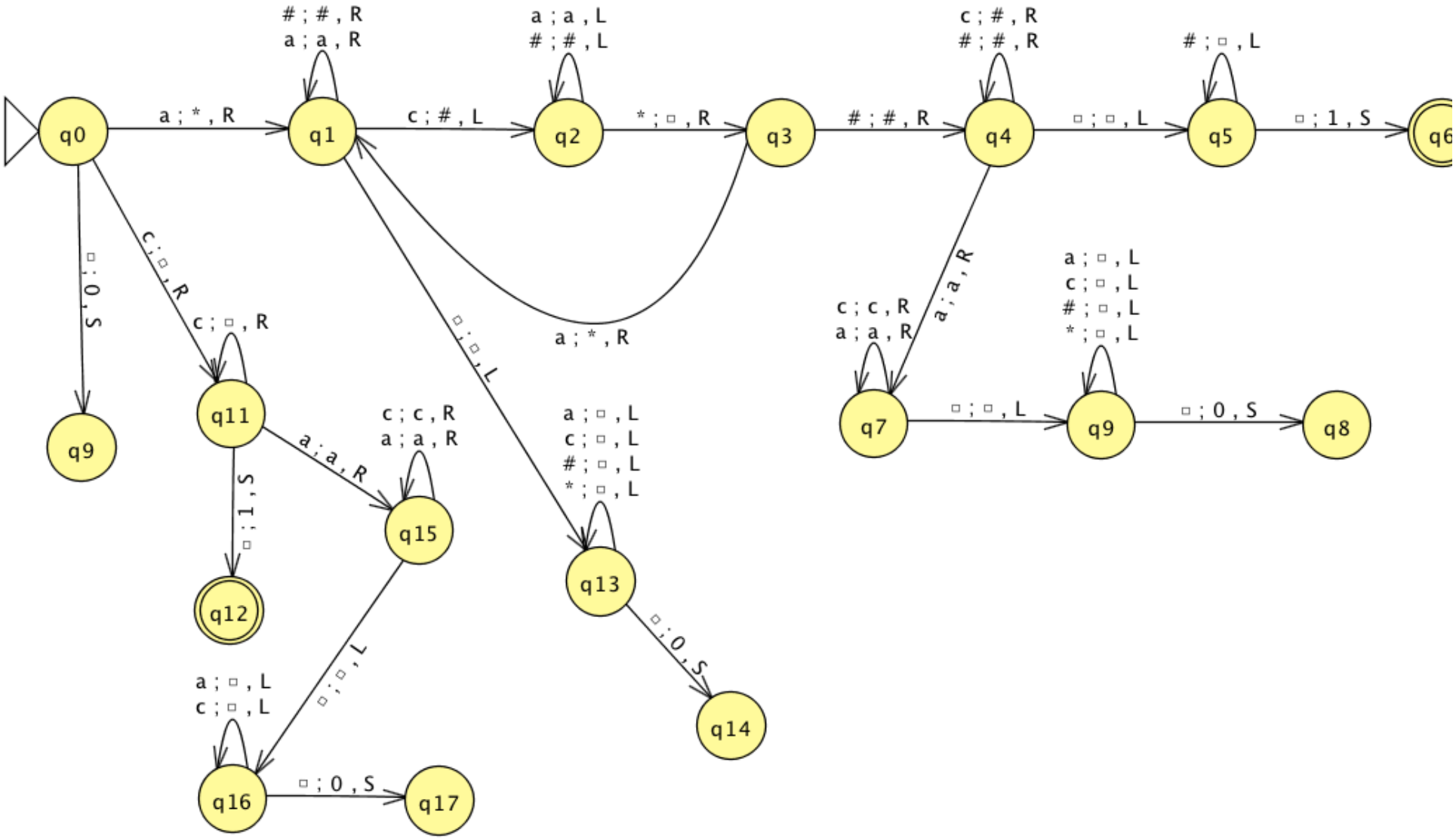
$L = \{ a^n c^m | n, m \geq 0 \, ; n \leq m \}$



The following are test inputs and their outputs using JFLAP

Input	Result
ac	Accept
aaaacccc	Accept
aaacc	Reject
acccc	Accept
cccc	Accept
acacacacac	Reject
a	Reject
aaaa	Reject
op	Reject
xyx	Reject
	Accept

The machine accepts inputs of the right type. The last input shows that the empty string (epsilon) is accepted. Also, it shows that different characters are rejected.

The Turing machine's running time:

- Given the worst case: $\underset{n}{\mathbb{B}aaa.....ccc.....\underset{n}{\mathbb{B}}}$
    - When there is an equal number of *a*'s and *c*'s
- On each loop there are two writes (a changed to *, c changed to #)
- Therefore, there are n+1 moves to the right and n+1 moves to the left
- There are n loops in total:
    - $n(2n + 2) = 2n^2 + 2n$
- Now, cleaning up the tape takes n writes of # $\Rightarrow \mathbb{B}$ and n + 1 moves
    - $2n + 1$ +1 last move and +1 write of '1'
    - $2n^2 + 2n + 2n + 1 + 2 = 2n^2 + 4n + 3$
- Time Complexity: $t(n) = O(n^2)$

The Turing Machine's space complexity:

- Assuming n is the total number of elements in the input tape
- Space Complexity: $(n + 2)$