

$$S \rightarrow aTb|b$$
$$T \rightarrow Ta \mid \lambda$$

Diagram illustrating the states and transitions of a Turing Machine:

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graph LR; q0((q0)) -- "λ, λ → S" --> q1((q1)); q1 -- "λ, z0 → z0" --> q2(((q2)))
```

The diagram shows three states:  $q_0$ ,  $q_1$ , and  $q_2$ . Transitions are labeled with input/output pairs:

- From  $q_0$  to  $q_1$ :  $\lambda, \lambda \rightarrow S$
- From  $q_1$  to  $q_2$ :  $\lambda, z_0 \rightarrow z_0$

$\lambda, S \rightarrow aTb$	$a, a \rightarrow \lambda$
$\lambda, S \rightarrow b$	$b, b \rightarrow \lambda$
$\lambda, T \rightarrow Ta$	$\lambda, T \rightarrow \lambda$

				$a$
	$\lambda, \lambda \rightarrow s$		$\lambda, s \rightarrow aTb$	$T$
	$q_0 \rightarrow q_1$	$s$		$b$
$z_0$		$z_0$		$z_0$

$a, a \rightarrow \lambda$   
(pop "a")

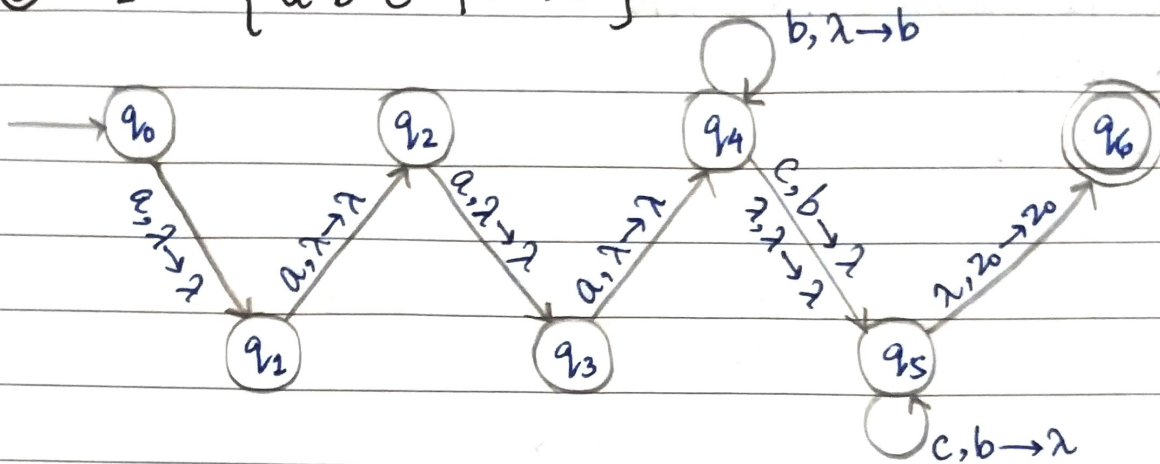
	T				
	a			T	
$\lambda, T \rightarrow \lambda$	a	$\lambda, T \rightarrow Ta$		a	$\lambda, T \rightarrow Ta$
	b			b	T
	z <sub>0</sub>			z <sub>0</sub>	b
					z <sub>0</sub>

	a					
→	a	pop "a"	a	pop "a"	pop "b"	
	b	a, a → λ	b	a, a → λ	b, b → λ	
	z <sub>0</sub>		z <sub>0</sub>		then q <sub>1</sub> → q <sub>2</sub>	z <sub>0</sub>

REB3/2.

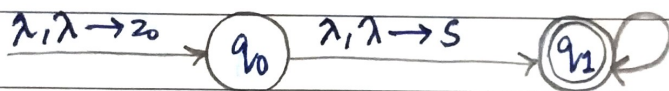
accepted.

©  $L = \{ a^4 b^n c^n \mid n \geq 0 \}$



Q2:  $S \rightarrow OTT$

$T \rightarrow OS \mid IS \mid O$



$1, 1 \rightarrow \lambda$

$0, 0 \rightarrow \lambda$

$\lambda, S \rightarrow OTT$

$\lambda, T \rightarrow OS$

$\lambda, T \rightarrow IS$

$\lambda, T \rightarrow O$

$\lambda, \lambda \rightarrow \lambda$

Q3: (a)  $L = \{ b^n a^n \mid n \geq 0 \}$

Ans:  $w = \{ ba, bb aa, bbb aaa \dots \}$

let  $x = \epsilon$

$y = ba$

$z = \epsilon$

$\therefore xy^kz$  should belong to  $w$ .

✓ at  $k=1 \rightarrow (\epsilon)(ba)^1(\epsilon) = ba \in w$

✓ at  $k=2 \rightarrow (\epsilon)(ba)^2(\epsilon) = baba \notin w$

$\therefore$  therefore not regular language.

⑥  $L = \{ (ba)^n \mid n \geq 0 \}$

Ans:  $\omega = \{ ba, baba, bababa \dots \}$

let  $x = \epsilon$

$y = ba$

$z = \epsilon$

$\therefore xy^kz$  should belong to  $\omega$

✓ at  $k=1 \rightarrow (\epsilon)(ba)^1(\epsilon) = ba \in \omega$

✓ at  $k=2 \rightarrow (\epsilon)(ba)^2(\epsilon) = baba \in \omega$

✓ at  $k=3 \rightarrow (\epsilon)(ba)^3(\epsilon) = bababa \in \omega$

✓ at  $k=4 \rightarrow (\epsilon)(ba)^4(\epsilon) = babababa \in \omega$

$\therefore$  Therefore regular language.