Math 322

Q5 BJ #11 $P = \{ S \to C,\ C \to 0CAB,\ \cancel{S \to \lambda},\ BA \to AB,\ 0A \to 01,\ 1A \to 11,\ 1B \to 12,\ 2B \to 22 \}$

$C \to \lambda$

type 0

type 1

type 2

$L(G) = 0^n 1^n 2^n$

012

Derivation:

$S \underset{3}{\Rightarrow} \lambda$? no prod!

$S \underset{1}{\Rightarrow} C \underset{2}{\Rightarrow} 0CAB \underset{2}{\Rightarrow} 00CABAB$

$\underset{4}{\Rightarrow} 00CAABB \underset{3}{\Rightarrow} 00AABB$

5) $001ABB$

6) $0011BB$

7) $00112B$

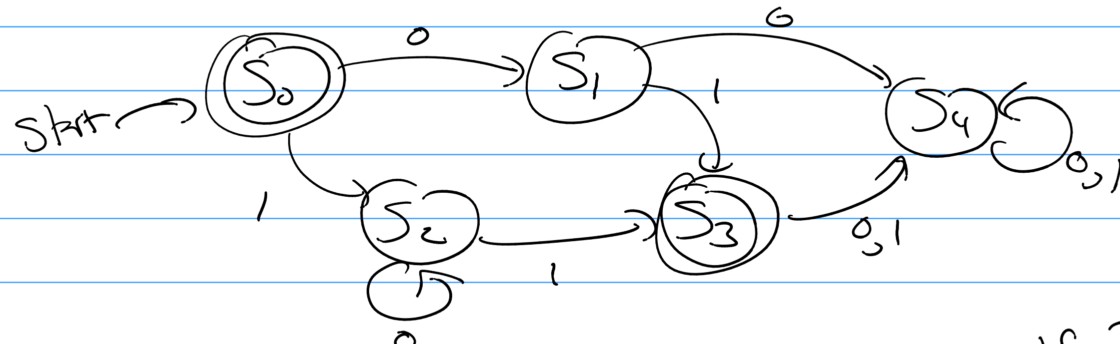
8) $001122 = 0^n 1^n 2^n$

F.S.A $M = (S, I, f, s_0, F)$

Deterministic F.S.A. $f : S \times I \to S$ (triples)

① $L(M) = \{ x \mid \text{string } x \text{ takes } s_0 \text{ to a final state} \}$

Ex



$L(M) = ?$

final states	paths to final state
s_0	λ
s_3	$01, 10^*1$

$\boxed{L(M) = \lambda, 01, 10^*1}$

simplify?

Ex $1\{01, 1^*\}$

$1, 101, 11^*$

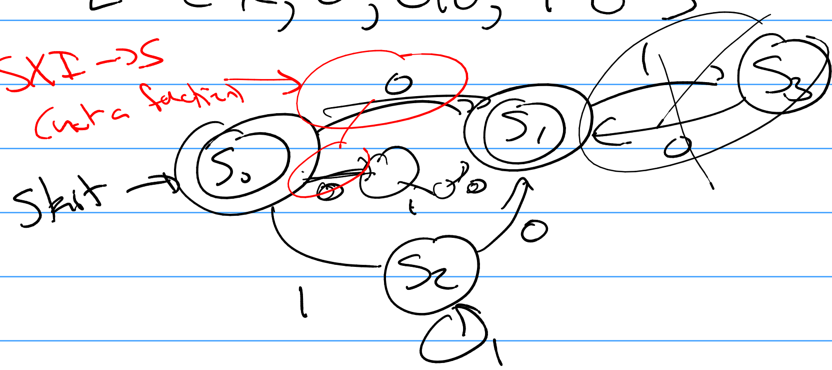
Def: M_1 and M_2 are equivalent if $L(M_1) = L(M_2)$

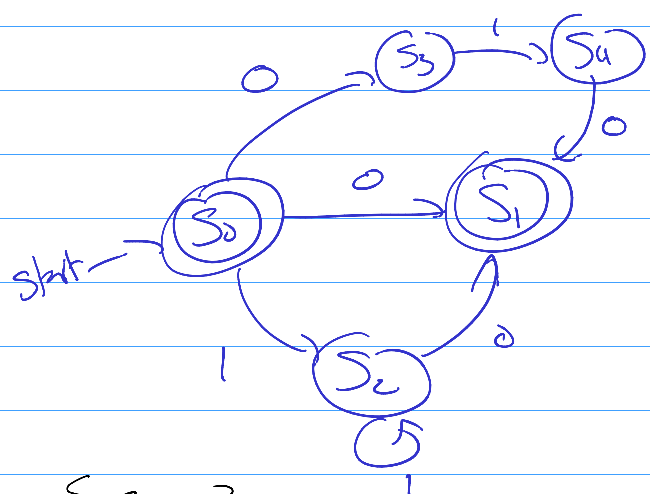
Given a L = string expression → can you create M that recog. the Language?

tech #1 **be creative**

(ex) $L = \{\lambda, 0, 010, 1^*0\}$

$f: S \times I \to S$
(not a function)





$L(M) = \lambda, 0, 1^*0, 010$

$f: S \times I \to P(S)$

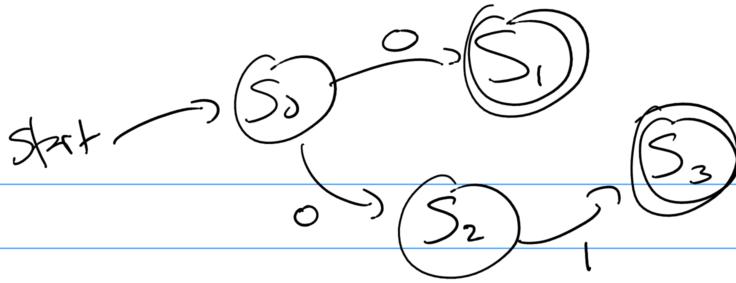
non-deterministic

$(S_0, 0) \to \underline{\{S_1, S_3\}}$

Th^n if L is recognized by a non-det F.S.A then there is a det. F.S.A that also recog. L.

New:

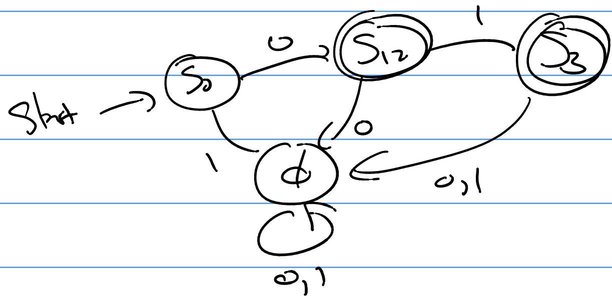
ex

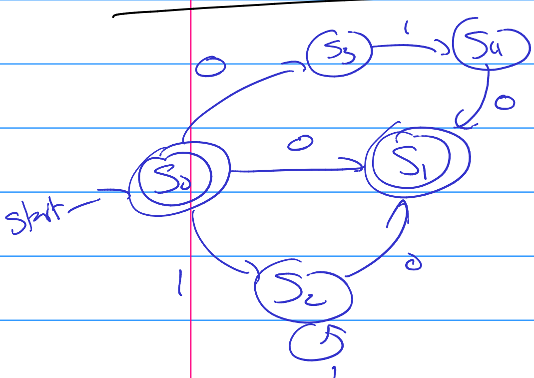


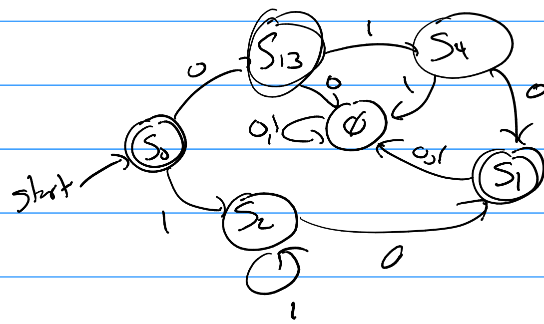
step 1: $P(S)$: $\emptyset$, S_0, S_1, S_2, S_3

$S_0, S_1 = S_{01}$ $\quad$ S_{01}, S_{02}, S_{03}, S_{12}, S_{13}, S_{23}

$S_1, S_2, S_3 = S_{123}$ $\quad$ etc.







$\lambda, 0, 1^*0$

010

13.4 Language Recognition

Sets & Strings

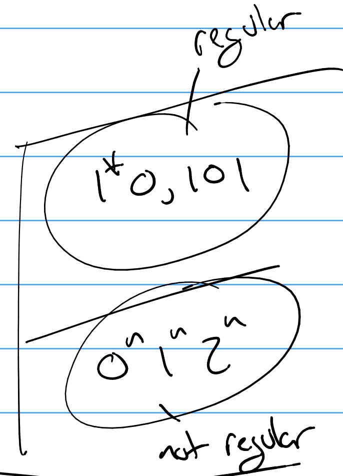
AB ← set concatenation, $A^0 = \{\lambda\}$, $A^{n+1} = A^n A$

$$A^* = \bigcup_{k=0}^{\infty} A^k, \quad \text{union}$$

Inductively Defined Set called **Regular Set**

Basis:
- ϕ is regular
- λ is regular
- $x \in I$, then x is regular

Inductive: if A, B are regular then
- AB is regular
- $A \cup B$ is regular
- A^* is regular

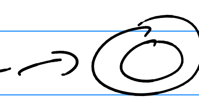


Th^y A set is regular iff it is recognized by a F.S.A.

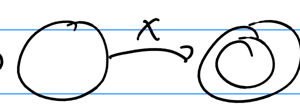
Pf Basis Machines

① ϕ (recognize nothing) M_ϕ : start →

② λ (recognize λ string) M_λ : start →

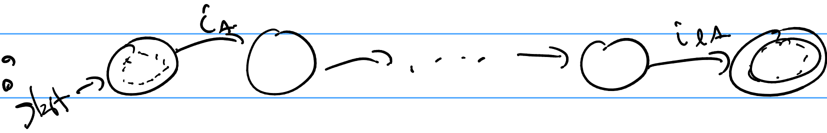


③ $x \in I$ M_x : start →

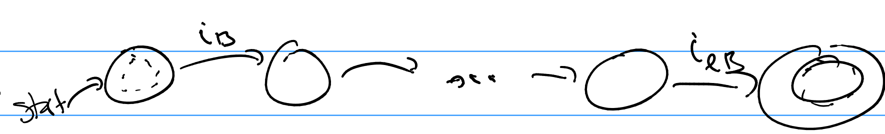


Inductive Machines AB, $A \cup B$, A^*

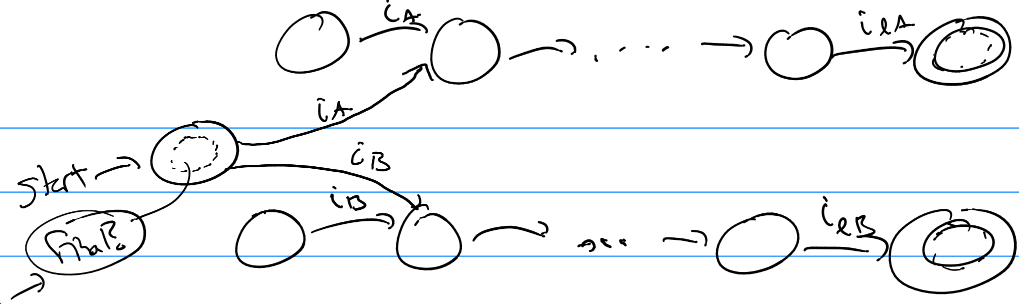
Assume: M_A : start →



M_B : start →



① **Union** $M_{A \cup B}$:



Make final if one of M_A or M_B recog. Σ.

② **Concat:** M_{AB}: