

1 a)

DFA

NFA

① definite / deterministic

① non-deterministic
 $\{ \delta \rightarrow 2^Q \}$

② cannot use empty string transition

② can use empty string transition

③ Backtracking allowed

③ May / May not allowed

④ rejects a string at end, even if not an accepting state.

④ If all branches of NFA dies / reject, we can say NFA rejects the string.



One one input \rightarrow one state



One 1 i/p - More than 1 state.

②

$0^n, 1^n \mid n > 0$

Eg: $uvw = 0^n, 1^n$

$uv = 0^n \quad v = 0^{n-1}$

$w = 1^n$

$u(v^i)w = 0 \cdot (0^{n-1})^i \cdot 1^n$

for $i=1$, $0^1 0^{n-1} 1^n = 0^n 1^n$
 $n=1$, $0^1 1^n$

$n=1, i=2$; $0 \neq 0^n, 1^n$

However times u pump 'i', it won't give you $0^n, 1^n$
 so irregular.

I
B

FA:-

02

FA = $F = \{Q, \epsilon, \delta, q_0, F\}$

Applns: String matching algos
N/w protocols
lexical Analyzers.

d)

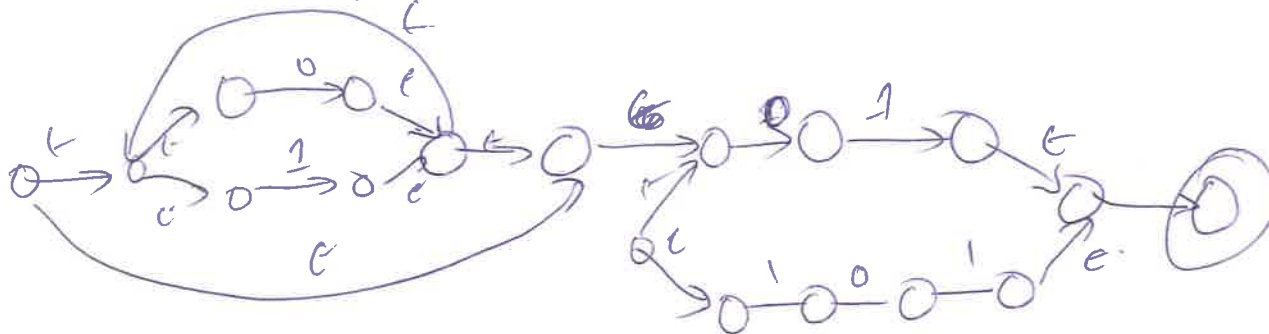
Recursively enumerable if

① If w is in L , then M accepts w , and so halts

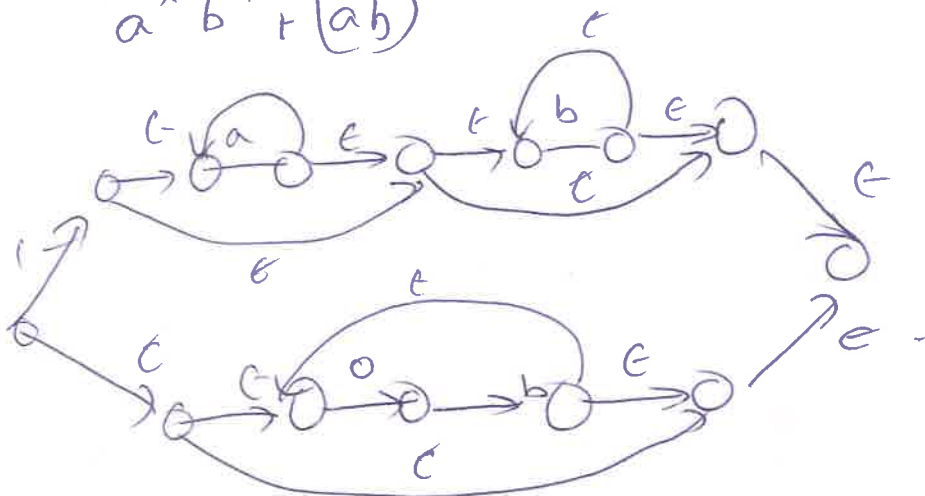
② If w is not in L , then M may or may not halt.

2)

$(0+1)^*$ $(01+101)^*$



$a^*b^+(ab)^*$



4(a) Theory 0 → 03

(b) Theory (Each sub question 5 Marks)

5(a) Push all a's till you read first b

(b) Read and ignore all b's

(c) For every a, pop one a from the stack

(d) Continue step three till i/p ends,

If stack empty, accept the string.

5(b)

	0	1	a	c	B
a, R	-	-	-	R	accept
R	c, L	-	-	R	-
L	-	-	R	L	-
-	-	-	-	R	accept
c	-	-	-	-	-

a

6(a)

$S \rightarrow aAS$

$\rightarrow aSbAS$

$\rightarrow aabbas$

$\rightarrow aabbaa$ (leftmost)

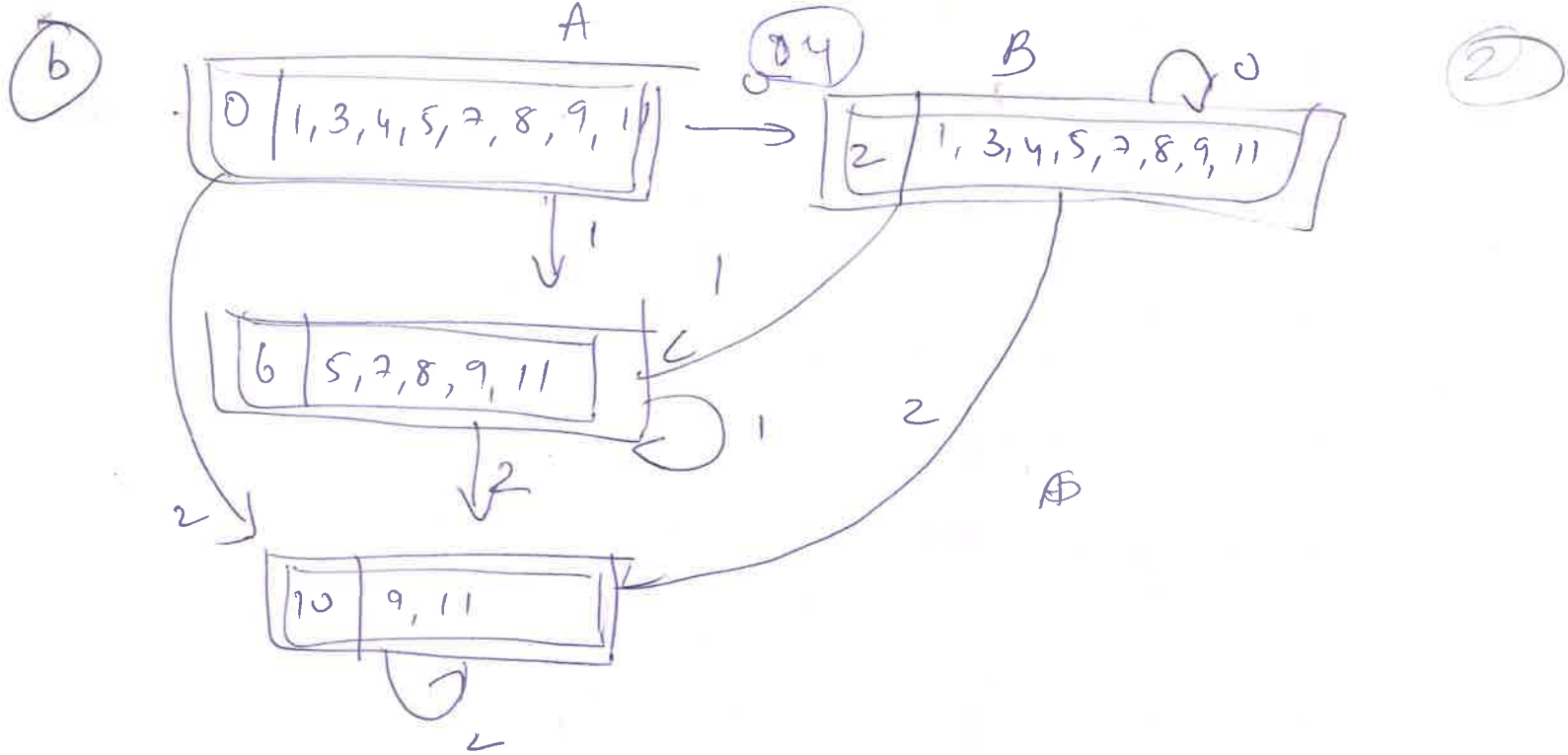
$S \rightarrow aAS$

$\rightarrow aAa$

$\rightarrow aSbAa$

$\rightarrow aSbbaa$

$\rightarrow aabbaa$



	0	1	2
A	A	AC	AD
B	-	C	D
D	-	-	D

Reduced table

(3) (b)

Q \ E	0	1
A	B	C
B	D	C
C	B	E
D	D	C
E	B	E

(3) (a)

$S \rightarrow a A B A \mid a B A \mid a A B \mid a B \mid b B A \mid b A \mid a A A \mid a A \mid a \mid b b \mid b$

$A \rightarrow a A \mid a$

$B \rightarrow b B \mid b$