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EVEN ROLL NUMBERS

Q1. Construct regular expression defining each of the following language over the alphabet Σ={a, b} .

i. **All words having even length**

Ans: EVEN-EVEN = {Λ, aa, bb, aaaa,aabb,abab, abba, baab, baba, bbaa, bbbb,…} ,

its regular expression can be written as

$(aa+bb+(ab+ba)(aa+bb)^{*}(ab+ba))^{*}$

ii. **All words having at least three a and three b**

Ans: r1=(aaaa, baaa, abbb, bbbb)

Its regular expression can be written as

r1=(a+b)*(aaa+bbb)

r2=(a+b)*aaa+(a+b)*bbb

iii. **All words having at least double a or triple b**

Its regular expression can be written as

(a+b)*(aa+)(a+b)+(a+b)*(bbb)+(a+b)

iv. All words starts with four a or triple b.

Its regular expression can be written as

aaaa(a+b)*+bbb(a+b)*

Q2. For figure 3 if q0 is the initial state, the draw a transition table for it.

Ans: The states are named by capital letters this time for a bit of variation: Q ={q0,q1,q2,q3,q4}. While it is common to use symbols qi, i ∈ N to name states, we can pick any names we like. Another common choice is to use natural numbers; i.e., Q ⊂ N ∧ Q is finite.

The representation of the above DFA as a transition table is:

Q	0	1
→ q0	q1	q2
q1	q3	q2
q2	q1	q4
* q3	q3	q2
* q4	q1	q4

Q3. Define what is Finite Automaton. What can be the regular expression of the diagram given in figure 1.

Ans: A finite automaton (FA) is a simple idealized machine used to recognize patterns within input taken from some character set (or alphabet) C. The job of an FA is to accept or reject an input depending on whether the pattern defined by the FA occurs in the input

A Finite automaton (FA), is a collection of the followings

1) Finite number of states.
2) Finite set of input letters (Σ) from which input strings are formed.
3) Finite set of transitions.

Transition table

State	Reading a	Reading b
x-	z	y
y	y	y
Z+	z	z

Σ={a, b}, starting with a.

regular expression= $a\ (a + b)^*$

Q4. Draw a transition table for the diagram given in figure 2. (0) is the starting state

Ans:

state	a	b	c	d	e	f	g	h
→0	1	0	0	0	2	0	0	0
1	1	3	0	0	2	0	0	0
2	1	0	0	0	2	4	0	0
3	5	0	6	0	7	0	0	0
4	8	0	0	0	9	0	10	0
5	5	0	6	0	7	0	0	0
6	5	0	6	11	7	0	0	0
7	5	0	6	0	7	12	0	0
8	8	12	0	0	9	0	10	0
9	8	0	0	0	9	0	10	0
10	8	0	0	0	9	0	10	13
11	5	0	6	0	7	0	0	0
12	14	0	15	0	16	0	17	0
*13	8	0	0	0	9	0	10	0
14	14	0	15	0	16	0	17	0
15	14	0	15	18	16	0	17	0
16	14	0	15	0	16	0	17	0
17	14	0	15	0	16	0	17	19
*18	14	0	15	0	16	0	17	0
*19	14	0	15	0	16	0	17	0

The initial state is identified by putting an arrow $\rightarrow$ to the left of it, and all final states are similarly identified by a star $*$.