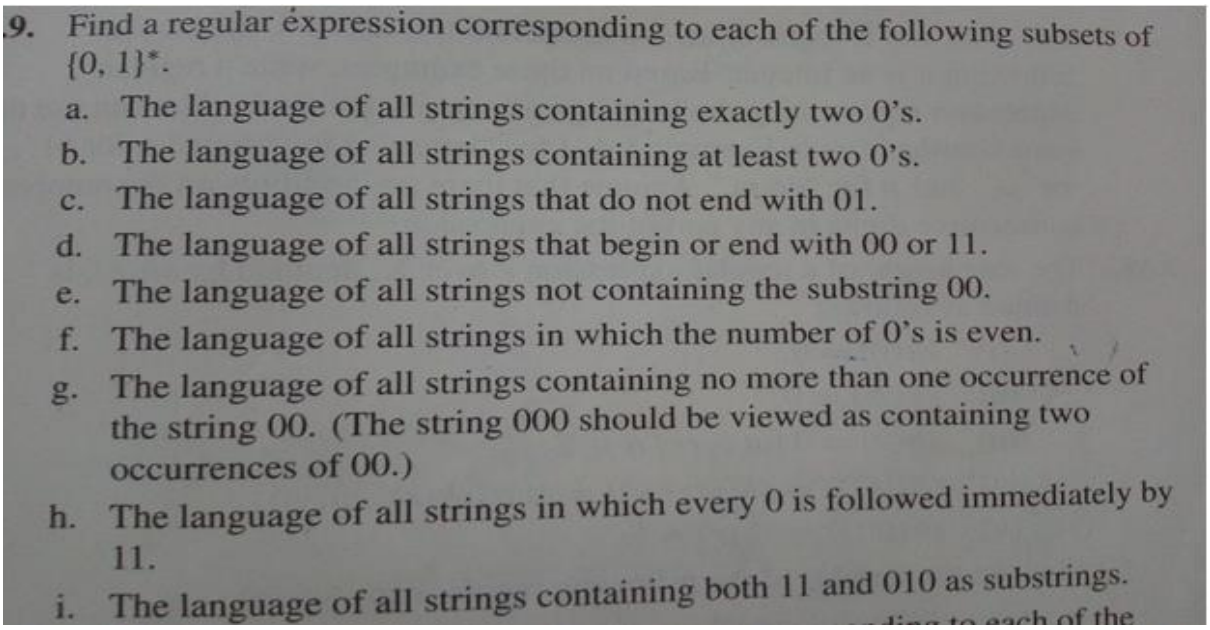
Theory of Automata

Practice Questions

Q1)3.9:



9. Find a regular expression corresponding to each of the following subsets of $\{0, 1\}^*$.

a. The language of all strings containing exactly two 0's.

b. The language of all strings containing at least two 0's.

c. The language of all strings that do not end with 01.

d. The language of all strings that begin or end with 00 or 11.

e. The language of all strings not containing the substring 00.

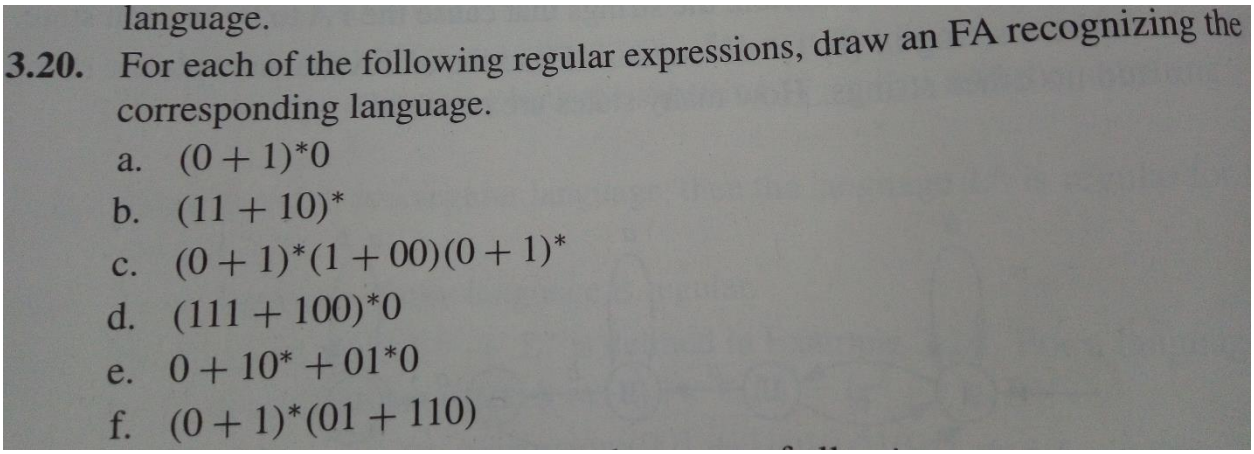
f. The language of all strings in which the number of 0's is even.

g. The language of all strings containing no more than one occurrence of the string 00. (The string 000 should be viewed as containing two occurrences of 00.)

h. The language of all strings in which every 0 is followed immediately by 11.

i. The language of all strings containing both 11 and 010 as substrings.

Q2)



language.

3.20. For each of the following regular expressions, draw an FA recognizing the corresponding language.

a. $(0 + 1)^*0$

b. $(11 + 10)^*$

c. $(0 + 1)^*(1 + 00)(0 + 1)^*$

d. $(111 + 100)^*0$

e. $0 + 10^* + 01^*0$

f. $(0 + 1)^*(01 + 110)$

Q3)

3.33. Let M_1, M_2, and M_3 be the FAs pictured in Figure 3.13, recognizing languages L_1, L_2, and L_3, respectively.

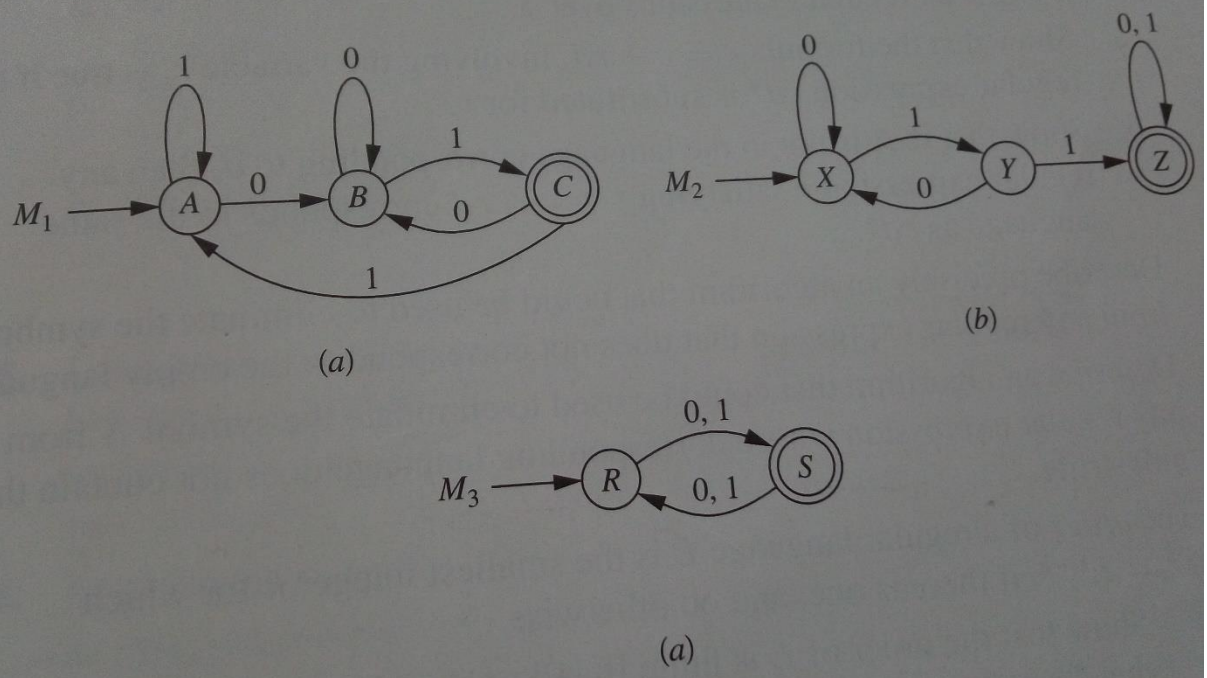


Figure 3.13 |

Draw FAs recognizing the following languages.

a. $L_1 \cup L_2$
b. $L_1 \cap L_2$
c. $L_1 - L_2$
d. $L_1 \cap L_3$
e. $L_3 - L_2$

Q4)

3.36. Find a regular expression corresponding to each of the following subsets of $\{0, 1\}^*$.

a. The language of all strings not containing the substring 000.

b. The language of all strings that do not contain the substring 110.

c. The language of all strings containing both 101 and 010 as substrings.

d. The language of all strings in which both the number of 0's and the number of 1's are even.

e. The language of all strings in which both the number of 0's and the number of 1's are odd.

Q5)

4.2. An NFA with states 1–5 and input alphabet $\{a, b\}$ has the following transition table.

q	$\delta(q, a)$	$\delta(q, b)$
1	$\{1, 2\}$	$\{1\}$
2	$\{3\}$	$\{3\}$
3	$\{4\}$	$\{4\}$
4	$\{5\}$	$\emptyset$
5	$\emptyset$	$\{5\}$

a. Draw a transition diagram.

b. Calculate $\delta^*(1, ab)$.

c. Calculate $\delta^*(1, abaab)$.

Q6)

4.15. For each of the NFA-Λs shown in Figure 4.22, find a regular expression corresponding to the language it recognizes.

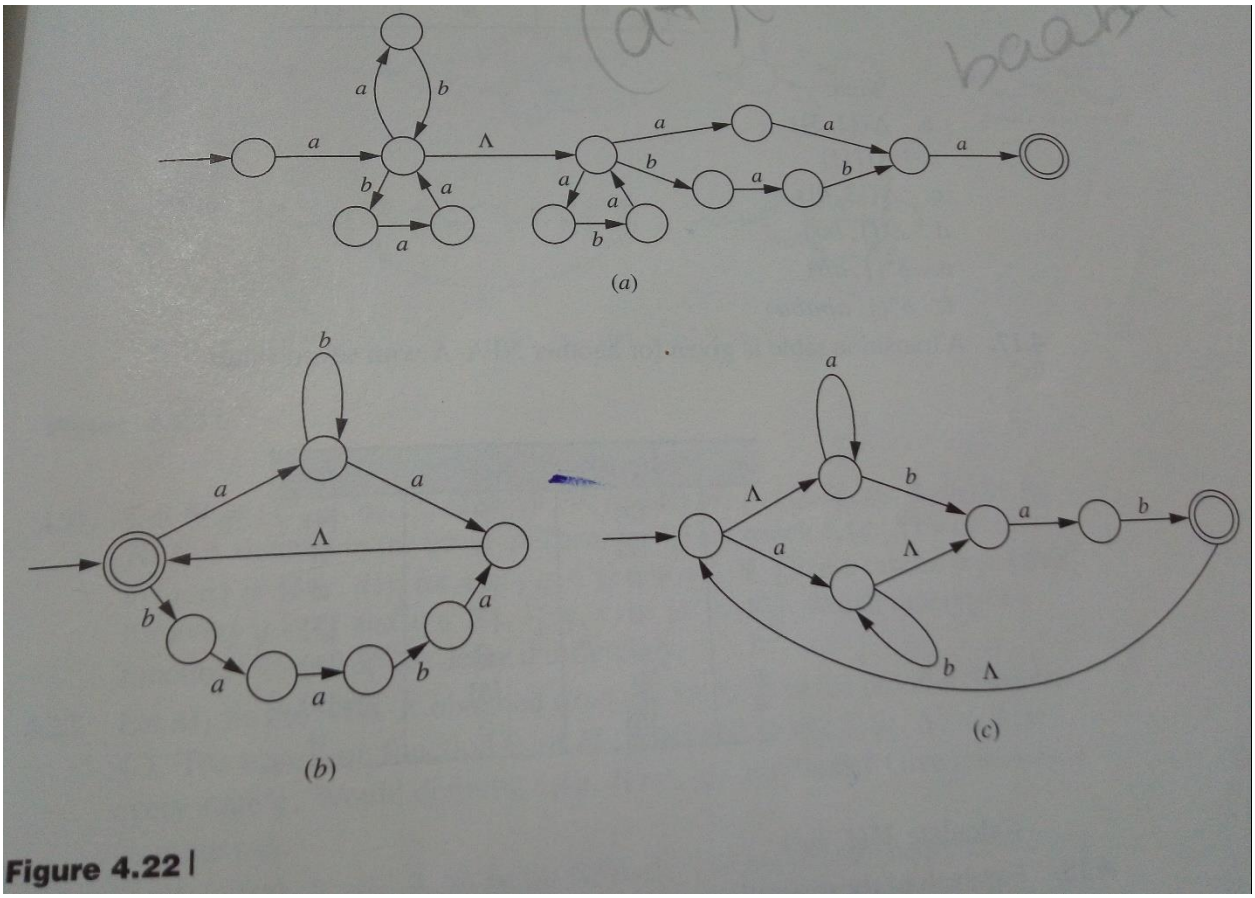


Figure 4.22 |

Q7)

4.16. A transition table is given for an NFA-Λ with seven states.

q	$\delta(q, a)$	$\delta(q, b)$	$\delta(q, \Lambda)$
1	Ø	Ø	{2}
2	{3}	Ø	{5}
3	Ø	{4}	Ø
4	{4}	Ø	{1}
5	Ø	{6, 7}	Ø
6	{5}	Ø	Ø
7	Ø	Ø	{1}

Find:

a. $\Lambda(\{2, 3\})$
b. $\Lambda(\{1\})$
c. $\Lambda(\{3, 4\})$
d. $\delta^*(1, ba)$
e. $\delta^*(1, ab)$
f. $\delta^*(1, ababa)$