Week 2 CS-312 Homework

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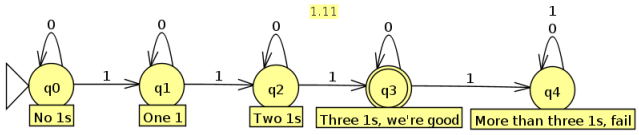
1 Problem 1.11

1.1 Question

Construct an FA that accepts all binary strings with precisely three 1's.

1.2 Answer

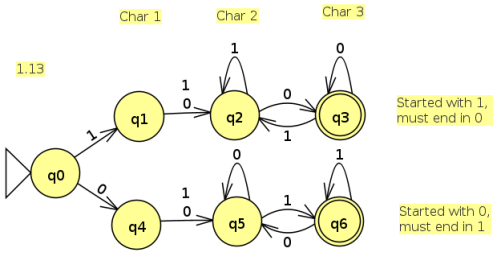


2 Problem 1.13

2.1 Question

Give an FA for the language of all binary strings that have at least three symbols and whose first and last symbols are different.

2.2 Answer

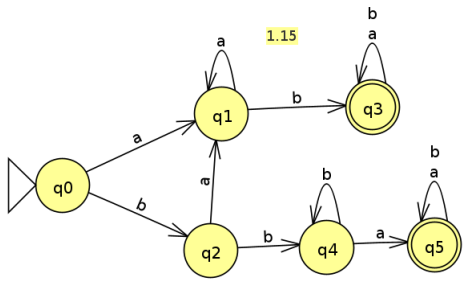


3 Problem 1.15

3.1 Question

Construct an FA that accepts all strings of $\{a, b\}$ that contain either ab or bba (or both) as substrings.

3.2 Answer

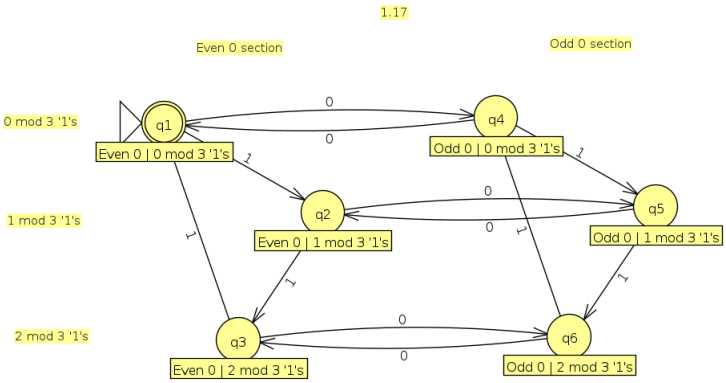


4 Problem 1.17

4.1 Question

Construct an FA that accepts all binary strings with an even number of 0's and the number of 1's is a multiple of 3.

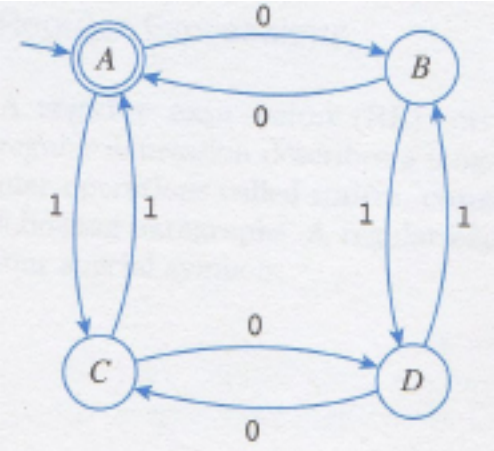
4.2 Answer



5 Problem 1.19

5.1 Question

Explain in English what the following FA accepts:



5.2 Answer

The FA accepts any binary string with an even number of 0's and an even number of 1's.

6 Problem 2.3

Give RE's for:

6.1 All binary strings with exactly two R1's

```
0*10*10*
```

6.2 All binary strings with a double symbol (contains 00 or 11) somewhere

```
(0+1)*(00+11)(0+1)*
```

6.3 All binary strings that contain both 00 and 11 as substrings

```
(0+1)*((00(0+1)*11)+(11(0+1)*00))(0+1)*
```

6.4 All binary strings without a double symbol anywhere

```
((01)*(!+0))+((10)*(!+1))+0+1+!
```

7 Problem 2.7

7.1 Question

Give an RE for the language of Exercise 1.12

7.2 Answer

```
((b+c)*+((b+c)*a(b+c)*a(b+c)*)*)a(b+c)*
```

8 Problem 2.10

8.1 Question

Give an RE for the language of Exercise 1.15

8.2 Answer

```
(a+b)*((ab)+(bba))(a+b)*
```