Theory Of Automata

Spring 2021 Solution

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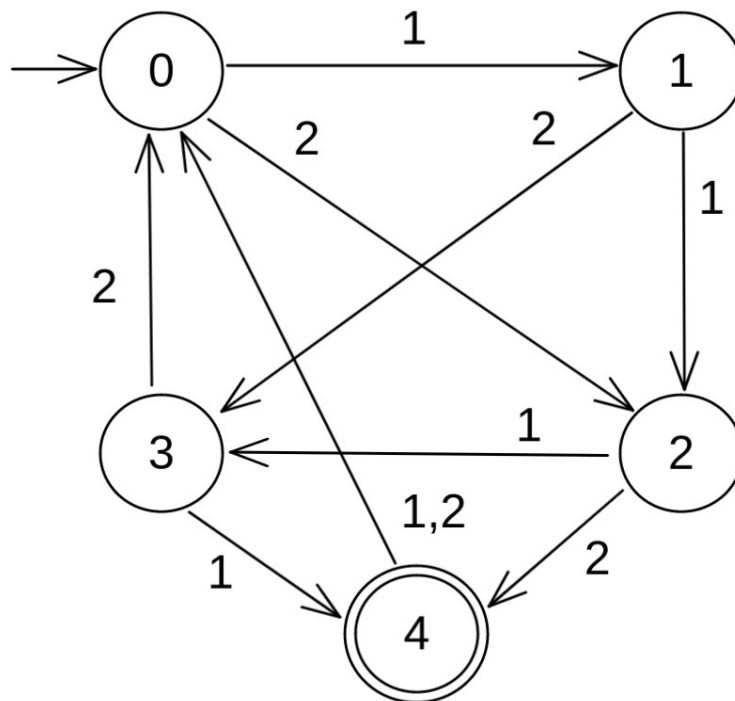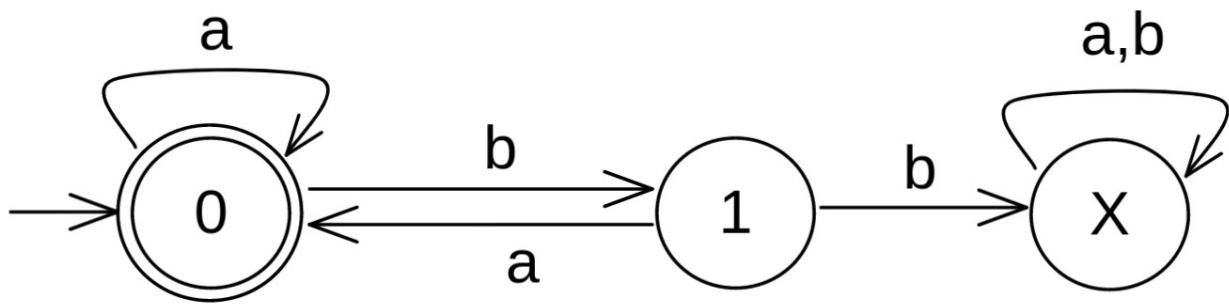
Question 1

A vending machine is an automated selling machine. Give a DFA and the transition table for this machine that sells a number of items (chips, candies, etc.) for 4 rupees each. It accepts only 1 and 2 rupees, and refunds all money if more than 4 rupees is added.

Q	1	2
0	1	2
1	2	3
2	3	4
3	4	0
4	0	0

Question 2a

Find the DFA for the language L of string which does not contain the substring bb and ends with 'a' defined over alphabet {a, b}
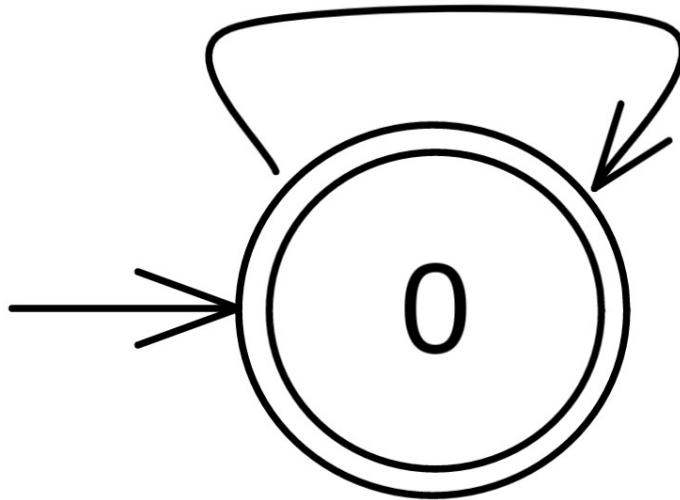
Question 2b
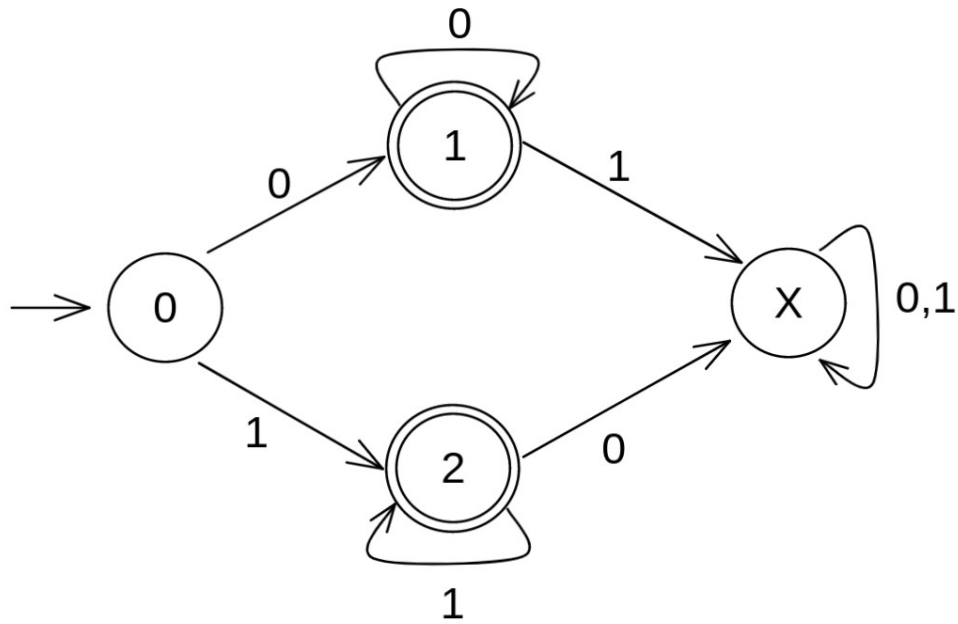
Construct the FA for the following regular expression.
$$1*(0*01*)*+1+0+\lambda$$

1,0

Question 2c

Find the DFA corresponding to set of strings with either no 1 preceding a 0 or no 0 preceding a 1.

Exit zen mode

Question 3

Express each of these languages over using a regular expression.

a) L_1 = the set consisting of the strings 0, 11, and 010

$$0 + 11 + 010$$

b) L_2 = the set of strings of three 0s followed by two or more 0s, containing no 1s

$$00000.0*$$

c) L_3 = the set of strings of odd length

$$(a+b).[(a+b)^2]*$$

d) L_4 = the set of strings that contain exactly one 1

$$0*10*$$

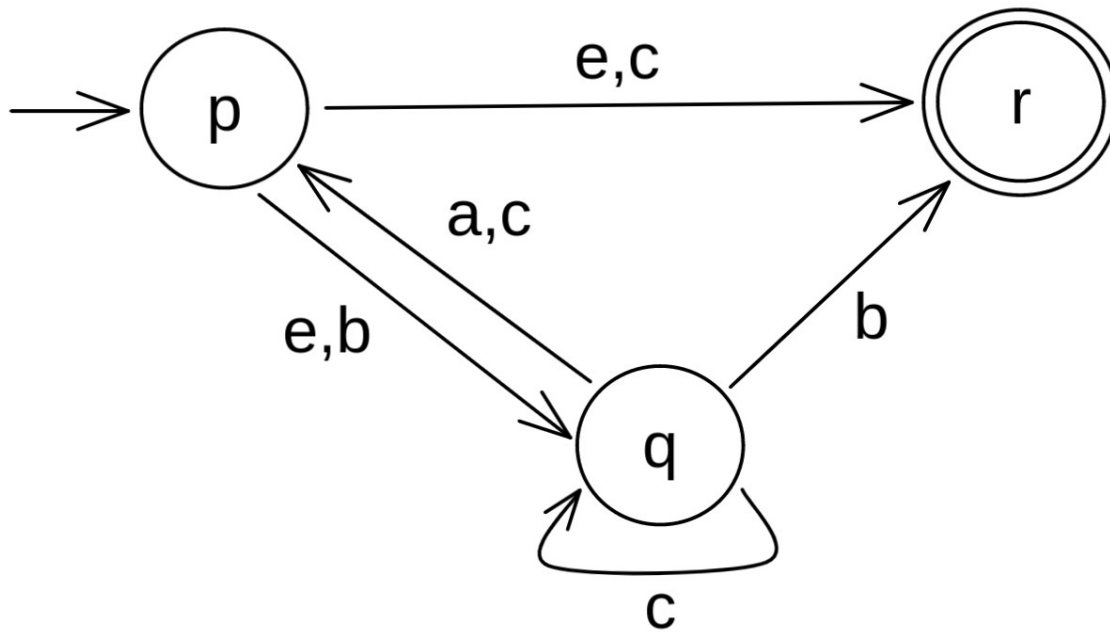e) L_5 = the set of strings ending in 1 and not containing 000

$$(0+00+λ)(1+10+100)*$$

f) L_6 = The set of strings containing a string of 1s such that the number of 1s equals 2 modulo 3, followed by an even number of 0s

$$11(111)*(00)*$$

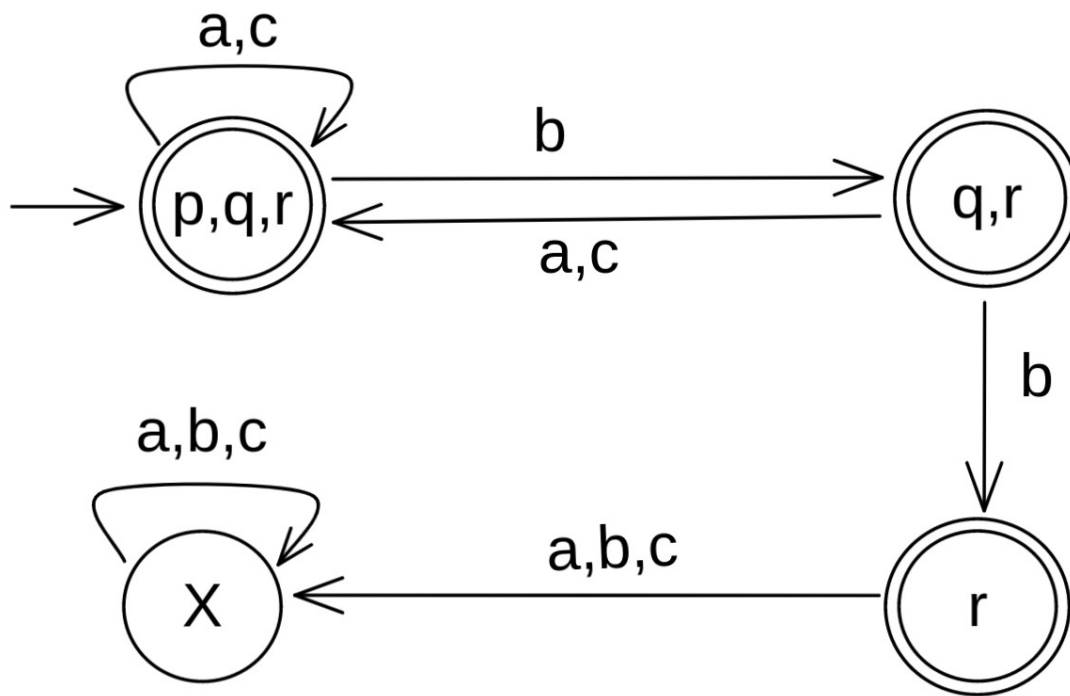# Question 4

Construct the DFA from the given Epsilon NFA

€ - Closure Table:

Q	λ-transition
p	p q r
q	q
r	r

Transition Table:

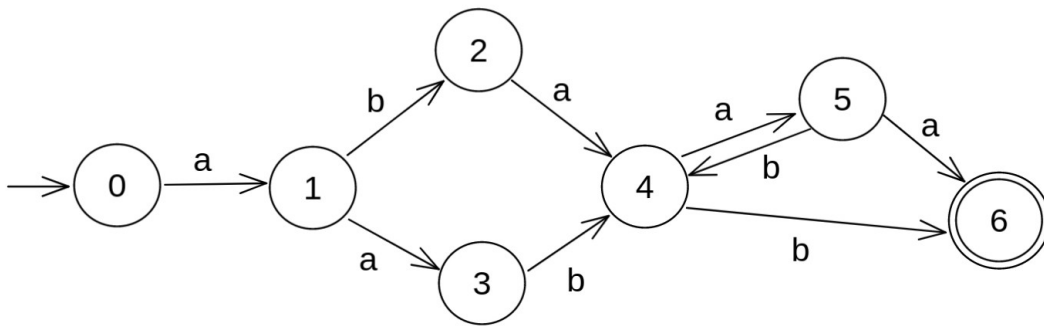| Q	a	b	c
p q r	p q r	q r	p q r
q r	p q r	r	p q r
r	-	-	-

Question 5

Find the regular expression of the DFA given in figure, using state elimination method.

```
        a           ba+ab          ab          aa+b
→ (0) ────→ (1) ─────────→ (4) ⟲ ─────────→ ((6))
```

State 0 → 1: a
State 1 → 4: ba+ab
State 4 → 4: ab
State 4 → 6: aa+b

```
        a        (ab+ba)(ab)*(aa+b)
→ (0) ────→ (1) ──────────────────→ ((6))
```

State 0 → 1: a
State 1 → 6: (ab+ba)(ab)*(aa+b)

$$0 \xrightarrow{\text{a(ab+ba)(ab)*(aa+b)}} 6$$