PES UNIVERSITY, Bangalore

(Established under Karnataka Act No. 16 of 2013)

Department of Computer Science & Engineering

Automata Formal Languages & Logic

Q&A - Regular Expression(RE)

1) Construct regular expression for each of the following

a) Binary strings with at least two occurrences of at least two consecutive 1 s, the two occurrences not being adjacent (i.e., 011011 is acceptable but 011111 is not).

Solution: There must be at least one 0 between the two occurrences of 11:

(0+1)*11(0 + 1)*0(0 + 1)*11(0 + 1)*

b) Binary strings containing at least one 00 and at least one 11.

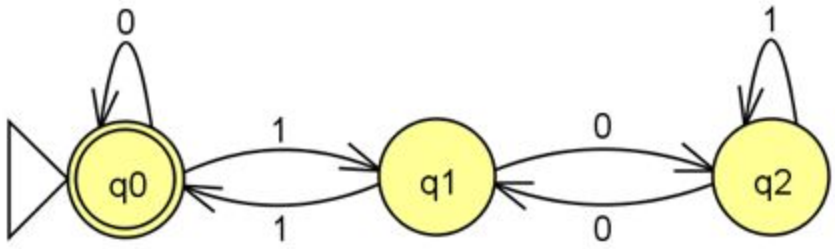
Solution: 00 can come first and then 11 or 11 first and then 00:

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

2)convert the following RegEx to an equivalent NFA/DFA

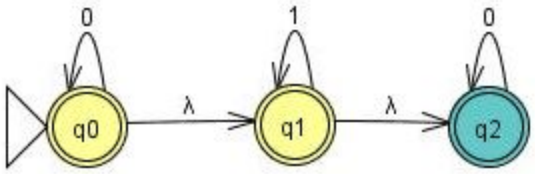
a) $(0+\lambda)(1+\lambda)(1+2)^*0(2+1)^*$

Binary strings representing positive integers divisible by 3.

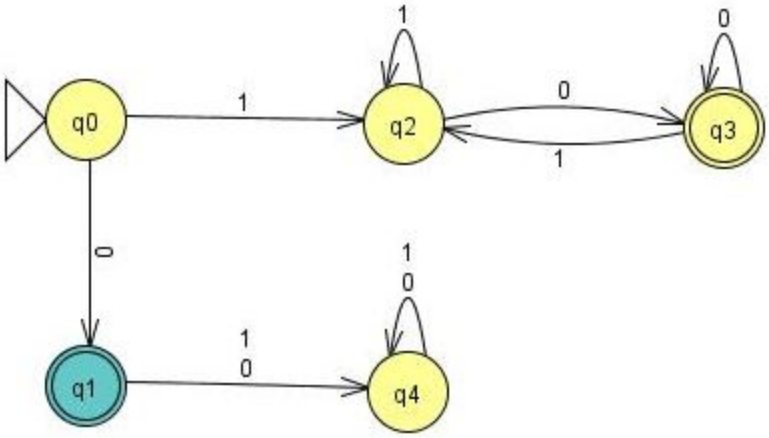


b) 0*1*0* with three states

Solution:



3) Convert the following DFA/NFA to an equivalent RegEx



Solution:

0 + 11*0(0 + 11*0)*

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4) Are the following pairs of RegEx's equivalent(do they represent same set of strings $(0+\lambda)(11^*0)^*(1+\lambda)$ and $(1+\lambda)(011^*)^*(0+\lambda)$

Solution: Yes, both can start with 0 or 1; both can end with 0 or 1; both do not allow consecutive 0 s. Both represent the language of all binary strings without consecutive 0 s (except 11* which neither of them include). The first RegEx excludes consecutive 0 s by requiring every 0 except the first one to be preceded by a 1; the second RegEx achieves the same result by requiring every 0 except the last one to be followed by a 1.