

# Theory of Computation

## Regular languages

DPP-05

[MCQ]

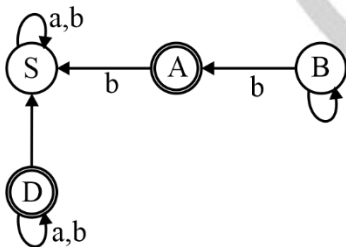
1. Design deterministic finite automata of set of all binary strings over  $\Sigma = \{0,1\}$ , where every binary string starting with 00100. How many minimum numbers of states required for above FA?
- (a) 6 (b) 5  
(c) 7 (d) 4

[NAT]

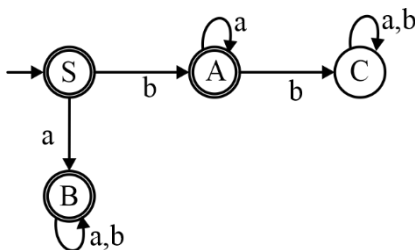
2. How many states are required to design a minimal DFA for set of all binary strings over  $\Sigma = \{0, 1\}$  where every binary string containing '0110' as a substring? \_\_\_\_\_

[MCQ]

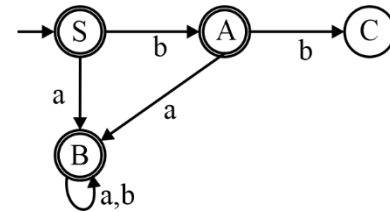
3. Which of the following is correct design of a minimal DFA for set of all strings over  $\Sigma = \{a, b\}$  where every string does not start with bb?
- (a)



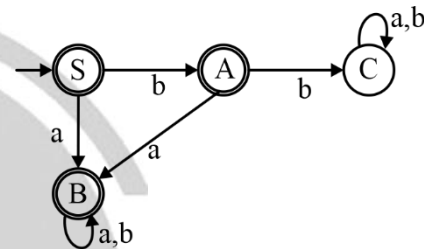
(b)



(c)



(d)



[MSQ]

4. Which of the following statement is/are correct?
- (a) DFA is possible for every regular language  
(b) DFA is also possible for some non-regular languages.  
(c) DFA is possible for both finite language and regular infinite language.  
(d) There exist only 1 unique DFA for every regular language.

[NAT]

5. How many states required to design a minimal DFA for  $L = \{Xba \mid X \in \{a, b\}^*\}$ ? \_\_\_\_\_

[NAT]

6. Number of final states required to design a minimal DFA for  $L = \{(\epsilon + b + a)^2 \mid \Sigma = \{a, b\}\}$  is / are \_\_\_\_\_.

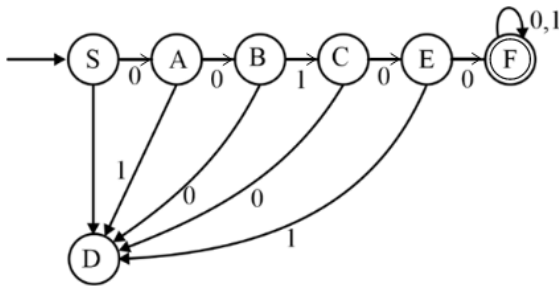
## Answer Key

- |        |              |
|--------|--------------|
| 1. (c) | 4. (a, c, d) |
| 2. (5) | 5. (3)       |
| 3. (d) | 6. (6)       |



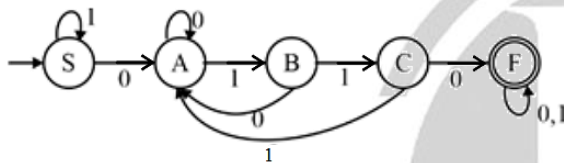
## Hints and solutions

1. (c)



Number of states = 7.

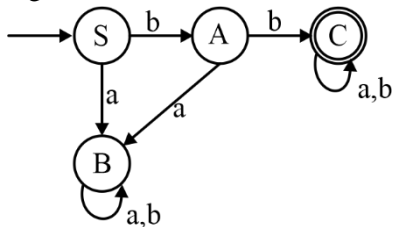
2. (5)



Number of States = 5.

3. (d)

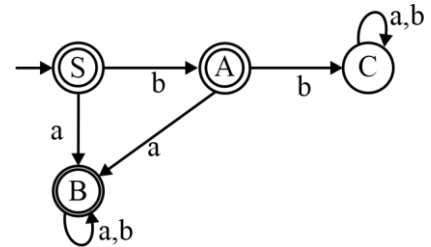
- Every string does not start with bb is a complement of the language of starting with ab.
  - To design complement of the DFA make non-final states and final. Final states make non-final.
- starting with bb:



Final states = {C}

Non final states = {S, A, B}

⇓ complement of above DFA



Final states = {S, A, B}

Non final states = {C}

Hence, option (d) is correct.

4. (a, c, d)

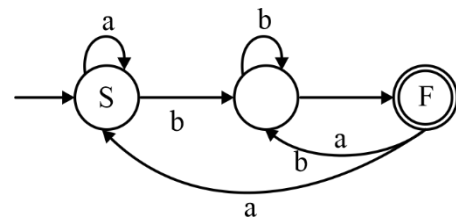
- If language is regular, there exist 1 unique DFA (Minimal DFA).
- If language is non-regular, DFA design not Possible.
- Regular language can be finite or infinite.
- Minimal DFA (Unique DFA) possible for every regular language.

Hence, statement (a, c, d) are correct.

5. (3)

$$L = \{Xba \mid X \in \{a, b\}^*\}$$

L = set of all strings where every string ends with 'ba'.



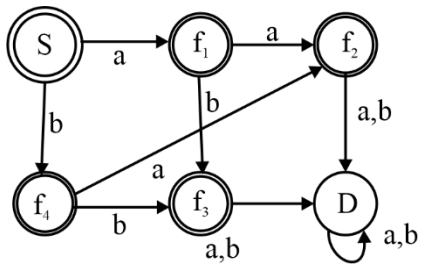
Number of states = 3

6. (6)

$$L = \{(\epsilon + a + b)^2\}$$

$$L = \{\epsilon, aa, ab, ba, bb, a, b\}$$

Minimal DFA Design:



Any issue with DPP, please report by clicking here:- <https://forms.gle/t2SzQVvQcs638c4r5>

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