

Theory of Computation

Regular Languages & Non Regular Languages

DPP-06

[MCQ]

1. Which of the following language is not regular?

- (a) $L = \{w \mid w \in \{a, b\}^*\}$
- (b) $L = \{xy \mid x, y \in \{a, b\}^*\}$
- (c) $L = \{xy \mid |x| = |y|, x, y \in \{a, b\}^*\}$
- (d) None of these

[MSQ]

2. Which of the following language is/are regular?

- (a) $L = \{ww^R \mid w \in \{0, 1\}^*\}$.
- (b) $L = \{\text{Set of all palindrome}\}$.
- (c) $L = \{\text{Number of a's equal to number of b's}\}$.
- (d) $L = \{wwp \mid w, p \in \{0, 1\}^*\}$

[MCQ]

3. Consider the following given language L.

$$L = \{p q w w y r \mid w, p, q, r \in \{a, b\}^*\}$$

The regular expression generated by above language is?

- (a) $(a + b)^2 (aa + bb) (a + b)$
- (b) $[(a + b)^2]^* (aa + bb) (a + b)^*$
- (c) $(a + b)^*$
- (d) None of these

[MCQ]

4. Consider the language $L = \{w w p \mid w, p \in \{a, b\}^+\}$
Which of the following regular expression generated by above language?

- (a) $(a + b)^+$
- (b) $(a + b)^+ (a + b)^+$
- (c) $(aa + bb) (a + b)^+$
- (d) None of these

[NAT]

5. Consider the following language L:

$$L = \{xw \mid |x| = 2, w \in \{a, b\}^*\}$$

For the above language L, how many equivalence classes are possible? _____.

[MCQ]

6. Consider the following languages.

$$L_1 = \{w x w^R \mid w, x \in \{a, b\}^+\}$$

$$L_2 = \{w w^R x \mid w, x \in \{a, b\}^+\}$$

Which of the following language is regular?

- (a) L_1 is regular.
- (b) L_2 is regular.
- (c) Both L_1 and L_2 are regular.
- (d) None of these.

Answer Key

1. (d)
2. (d)
3. (c)
4. (d)

5. (3)
6. (a)



Hints and Solutions

1. (d)

(a) Regular = $(a + b)^*$

(b) Regular = $(a + b)^* (a + b)^*$
 $= (a + b)^* \text{ Regular}$

(c) $L = \{xy \mid |x| = |y|, x, y \in \{a, b\}^*\}$

$L = \{aa, ab, ba, bb, bbaa, bbab, \dots\}$

$L = \text{All even length string} = \text{Regular.}$

Hence, option (d) is correct.

2. (d)

$L = \{wvp \mid w, p \in \{0, 1\}^*\}$

$L = \epsilon, \epsilon, p = (0 + 1)^*$

$= \text{Regular}$

3. (c)

$L = \{pqwwr \mid p, q, r, w \in \{a, b\}^*\}$

$L = pq \in \epsilon r$

$= pqr$

$= (a + b)^* (a + b)^* (a + b)^*$

$= (a + b)^*$

Hence, option (c) is correct.

4. (d)

$L = \{wvp \mid w, p \in \{a, b\}^+\}$

$= \text{minimal string} = aap, bvp$

- $aaaap \in aap$
- $ababp \notin \text{any minimal string}$
- $babap \notin \text{any minimal string}$

- $bbbbp \in bvp$

so, regular expression not possible.

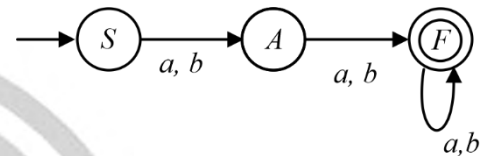
Hence, option (d) is correct.

5. (3)

$L = \{xw \mid |x| = 2, w \in \{a, b\}^*\}$

Regular expression = $(a + b)^2 (a + b)^*$

DFA:



Number of equivalence classes = 3

6. (a)

$L_1 = \{wxw^R \mid w, x \in \{a, b\}^+\}$

minimal string = $a x a \mid b x b$

$aaxaa \mid bbbbb \mid abxba \mid baxab$

L_1 is regular.

$L_2 = \{ww^R x \mid w, x \in \{a, b\}^+\}$

minimal string = $aax \mid bbx$

$abbax \mid aaaax \mid babbx \mid bbbbx$

Not cover

Not regular

Hence, option (a) is correct



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