

Theory of Computation

Chapter : Finite Automata

Closure Properties of Regular Languages-1

DPP 13

[MCQ]

1. Consider the following statements:
 S_1 : Kleene Closure (*) of infinite set is always finite.
 S_2 : Kleene Closure (*) of finite set is always infinite.
 Which of the following is correct?
 (a) S_1 only.
 (b) S_2 only.
 (c) Both S_1 and S_2 are correct.
 (d) None of these.

[MCQ]

2. Consider a language L, then subset of L will be?
 (a) Regular.
 (b) Regular but finite.
 (c) Non-regular.
 (d) None of these.

[MSQ]

3. Consider two languages L_1 and L_2 .
 $L_1 = a^*b^*$
 $L_2 = b^*a^*$
 Which of the following is/are correct for above languages.
 (a) $L_1 \cup L_2$ is regular.
 (b) For $L_1 \cup L_2$ regular expression will be $(a + b)^*$.
 (c) $L_1 \cap L_2$ is regular.
 (d) For $L_1 \cap L_2$ regular expression will be $(a^* + b^*)$.

[MCQ]

4. If subset of L_1 is regular then what is L_1 ?
 (a) L_1 must be finite.
 (b) L_1 must be regular.
 (c) L_1 must be non-regular.
 (d) None of these.

[MCQ]

5. Regular language does not close under on which operation?
 (a) Complement
 (b) Union
 (c) Subset
 (d) Intersection.

[NAT]

6. Consider the following statements:
 [I] If L is regular, then \bar{L} is regular.
 [II] If \bar{L} is regular, then L is regular.
 [III] Union of L and its complement is Σ^* .
 Number of correct statement is/are_____.

[MSQ]

7. Let $L_1 = \{\epsilon\}$
 $L_2 = \{a^+\}$
 Then which of the following is correct?
 (a) $L_1 \cap L_2 = \epsilon$.
 (b) $L_1 \cup L_2 = \text{any language}$.
 (c) $L_1 \cup \bar{L}_2 = \epsilon$.
 (d) None of these.

Answer Key

- | | |
|--------------|-----------|
| 1. (d) | 5. (c) |
| 2. (d) | 6. (3) |
| 3. (a, c, d) | 7. (b, c) |
| 4. (d) | |



Hints & Solutions

1. (d)

S_1 : False

Set = $\{\epsilon\} = \{\epsilon\}^* = \epsilon$ only (Finite)

S_2 : Set = $\{a\} = \{a\}^* = \epsilon, a, aa, aaa, \dots = (a^*)$ (Infinite)

So, both statements are false.

Hence, option (d) is correct.

2. (d)

Let, Language $(L) = (a + b)^*$

- $a^n b^n$ is a subset of $(a + b)^*$ but $a^n b^n$ is not a regular and also not finite.
- ab is a subset of L but ab is a finite and regular.

Hence, option (d) is correct.

3. (a, c, d)

$L_1 = a^* b^*$ (Regular)

$L_2 = b^* a^*$ (Regular)

- $L_1 \cup L_2 = a^* b^* + b^* a^*$
- Union is closed under regular.
 $L_1 \cup L_2 = \text{regular}$
- $L_1 \cap L_2 = a^* b^* \cap b^* a^* = a^* + b^*$
- Intersection closed under intersection
 $L_1 \cap L_2 = \text{Regular} \cap \text{Regular} = \text{Regular}$

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

4. (d)

If subset of L_1 is regular then L_1 can be either regular or non-regular.

Hence option (d) is correct.

5. (c)

Subset of regular language need not be regular

6. (3)

- L is regular if and only if \bar{L} is regular.
- $L \cup \bar{L} = \Sigma^*$

Hence, all are correct statements.

7. (b, c)

(a) False:

$L_1 = \{\epsilon\}$

$L_2 = a^+$

$L_1 \cap L_2 = \phi$

(b) True:

$L_1 \cup L_2$

$\{\epsilon\} \cup \{a^+\} = a^*$

(c) True:

$L_1 = \{\epsilon\}$

$\bar{L}_2 = \{\epsilon\}$

$L_1 \cup \bar{L}_2 = \{\epsilon\}$

Hence, option (c) is correct.



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