Branch : CSE & IT **Batch : Hinglish**

Theory of Computation
Regular Languages & Non Regular Languages

DPP 07

[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 L1?
(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 $\overline{L}$ is regular.
[II] If $\overline{L}$ is regular, then L is regular.
[III] Union of L and its complement is Σ^*.
Number of correct statement is/are______.

[MSQ]

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

Answer Key

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

Hints & Solutions

1. (d)

S_1: False

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

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

So, both statements are false.

Hence, option (d) is correct.

2. (d)

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

- a^nb^n is a subset of $(a + b)^*$
  but a^nb^n is not a regular and also not finite.
- ab is a subset of L bit 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.
  $L_1 \cup L_2$ = regular
- $L_1 \cap L_2 = a^*b^* \cap b^*a^* = a^* + b^*$
- Intersection closed under intersection
  $L_1 \cap L_2$ = Regular ∩ Regular = 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 $\overline{L}$ is regular.
- $L \cup \overline{L} = \Sigma^*$

Hence, all are correct statements.

7. (b, c)

(a) False:

$L_1 = \{\in\}$

$L_2 = a^+$

$L_1 \cap L_2 = \phi$

(b) True:

$L_1 \cup L_2$

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

(c) True:

$L_1 = \{\in\}$

$\overline{L}_2 = \{\in\}$

$L_1 \cup \overline{L}_2 = \{\in\}$

Hence, option (c) is correct.